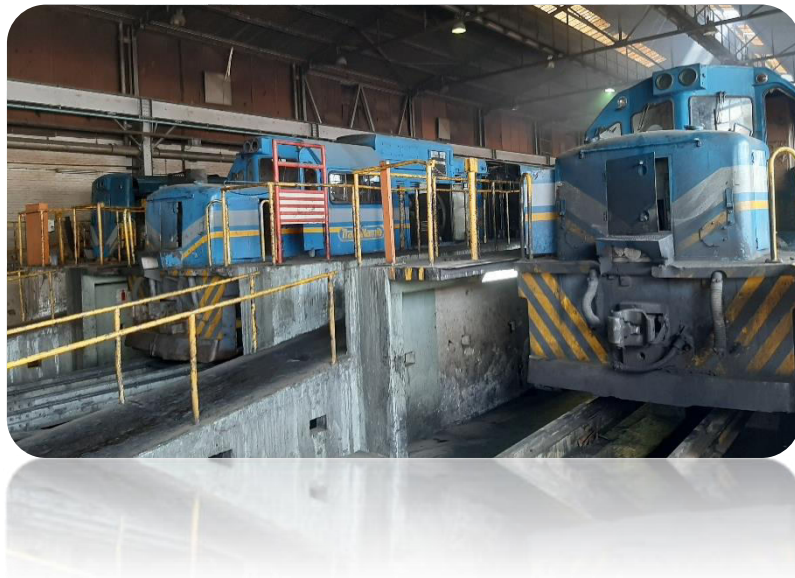


APP-00993

TRANSNAMIB WINDHOEK RAIL STATION LOCOMOTIVE REFURBISHMENT PROJECT

ENVIRONMENTAL MANAGEMENT PLAN




Prepared by:



Prepared for:



March 2023

Project:	TRANSNAMIB WINDHOEK RAIL STATION LOCOMOTIVE REFURBISHMENT PROJECT: ENVIRONMENTAL MANAGEMENT PLAN	
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Report Approval	 André Faul Conservation Ecologist	

I, Mberipura Hifitikeko, acting as representative of TransNamib Holdings Limited, hereby confirm that the project description contained in this report is a true reflection of the information which the Proponent provided to Geo Pollution Technologies. All material information in the possession of the Proponent that reasonably has or may have the potential of influencing any decision or the objectivity of this assessment is fairly represented in this report and the report is hereby approved.

Signed at Windhoek on the 27 day of March 2023.



TransNamib Holdings Limited

Business Registration/ID No.

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1 INTRODUCTION

TransNamib Holdings Limited (the Proponent) intends to embark on a locomotive refurbishment project at their existing locomotive and rolling stock repair workshop in Windhoek (Figure 2-1). Currently, a large number of TransNamib locomotives are out of service and it is these locomotives that the Proponent wishes to refurbish and reinstate as part of the TransNamib railway fleet. Refurbishment activities will be similar to the existing locomotive servicing and repair activities being conducted at the facility, although at a larger scale.

In order to comply with Namibian legislation, and to adhere to all codes and standards applied in their operations, the Proponent wishes to develop an environmental management plan (EMP) for the operations related to the locomotive refurbishment project. Geo Pollution Technologies (Pty) Ltd was subsequently requested to prepare an EMP. The EMP provides management options to ensure environmental impacts of the project are minimised. The environment being defined in the Environmental Management Act as “land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, paleontological or social values”.

The EMP is a tool used to take pro-active action by addressing potential problems before they occur. This limits potential future corrective measures that may need to be implemented and allows for application of mitigation measures for unavoidable impacts. This document should be used as an on-site reference document during all phases (planning, construction (care and maintenance), operations and decommissioning) of the project and related facilities. All monitoring and records kept should be included in a report to ensure compliance with the EMP. Parties responsible for transgression of the EMP should be held responsible for any rehabilitation that may need to be undertaken. A health, safety, environment and quality policy or similar could be used in conjunction with the EMP. Operators and responsible personnel must be taught the contents of these documents. Municipal or national regulations and guidelines must be adhered to and monitored regularly as outlined in the EMP.

The EMP will be used to apply for an environmental clearance certificate (ECC) in compliance with Namibia’s Environmental Management Act (Act No 7 of 2007) (EMA).

Project Justification – TransNamib is the national rail services operator in Namibia and is tasked with provision of rail transport services within and across the border of the country. As part of operations, TransNamib maintains locomotives and rolling stock. Benefits of the locomotive refurbishment project include increased rail supply services and increased operational efficiency as well as employment, skills development and training.

2 SCOPE

The scope of this EMP, in compliance with the requirements of EMA, is to:

- ◆ Provide a brief overview of all components and operations of the project.
- ◆ Summarise the legal and regulatory framework within which the project operates.
- ◆ Provide a brief overview of the environment, i.e. the physical, biological, social and economic conditions, potentially impacted by the project.
- ◆ To identify potential impacts of the project on the environment.
- ◆ Identify a range of management actions which could mitigate the potential adverse impacts to acceptable levels.
- ◆ To provide sufficient information to the relevant competent authorities and the Ministry of Environment, Forestry and Tourism to make informed decisions regarding the development.

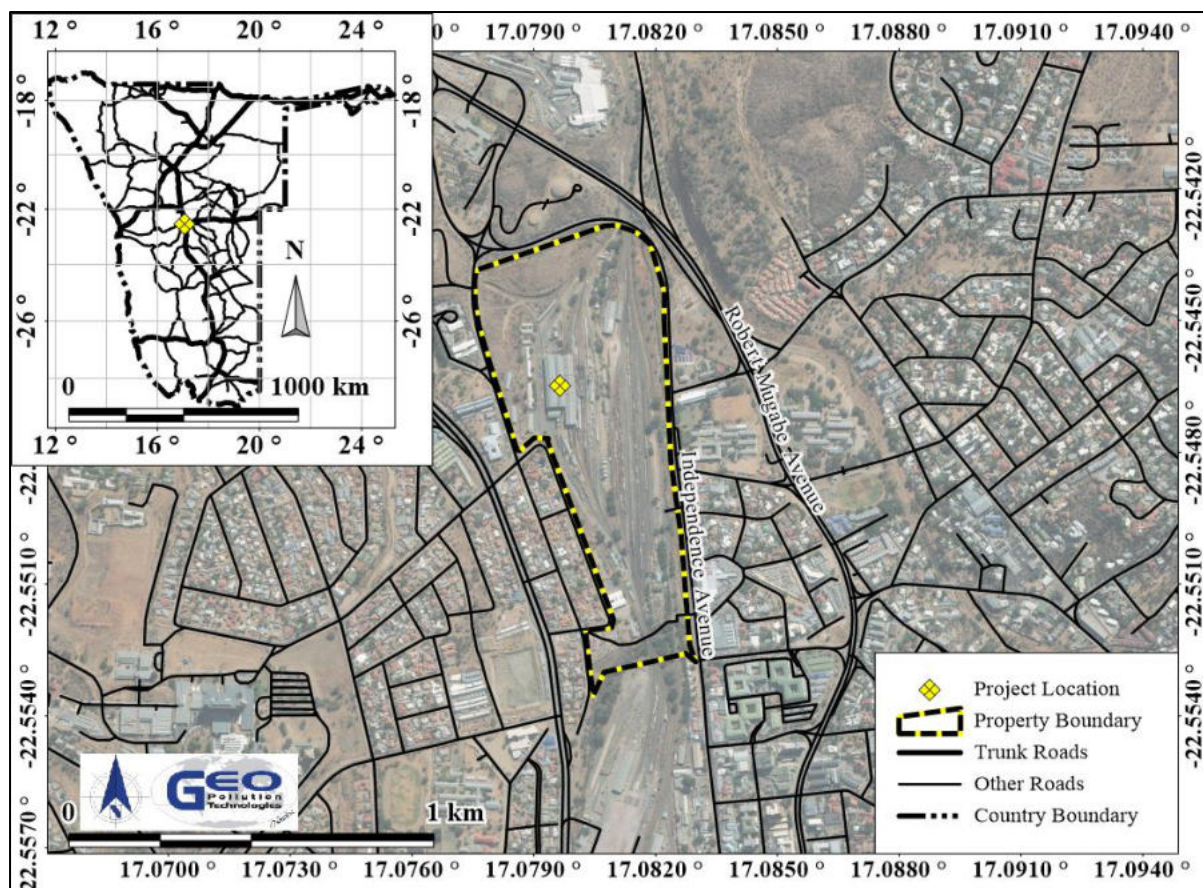


Figure 2-1 Project location

3 METHODOLOGY

The following methods were used to prepare the EMP:

1. Baseline information about the site and its surroundings was obtained from existing secondary information and a site visit.
2. Potential environmental impacts emanating from the operations, construction / maintenance and decommissioning of the facility were considered and possible enhancement measures were listed for positive impacts while mitigation / preventative measures were provided for negative impacts as part of the EMP.

4 PROJECT DESCRIPTION

TransNamib has existing workshops with the capacity to disassemble, repair/refurbish, and reassemble locomotives. Some construction activities and upgrades of existing infrastructure may be required to ensure the facility meets all the requirements for the locomotive refurbishment project. Throughout operations, care and maintenance of infrastructure will also be required and this will include repairs to infrastructure, general upkeep of the plant and associated infrastructure, including painting, servicing of equipment, replacement of parts, etc.

Old locomotives, including some that are currently non-operational, will be refurbished and upgraded in order to be re-commissioned in the service of TransNamib. This entails stripping down locomotives completely and systematically rebuilding locomotives with refurbished or new components. As part of the locomotive stripping process, old oil and lubricants are drained from the locomotive. These liquids are stored in various containers within the yard until collected by oil recycling companies. The workshop is divided into various sections, each specialising in different components and their refurbishment. A significant workforce of skilled and highly skilled personnel will be involved with the

project. A number of third parties will be contracted for support services such as waste removal, old oil collection, goods supply, etc.



Photo 4-1 Locomotives

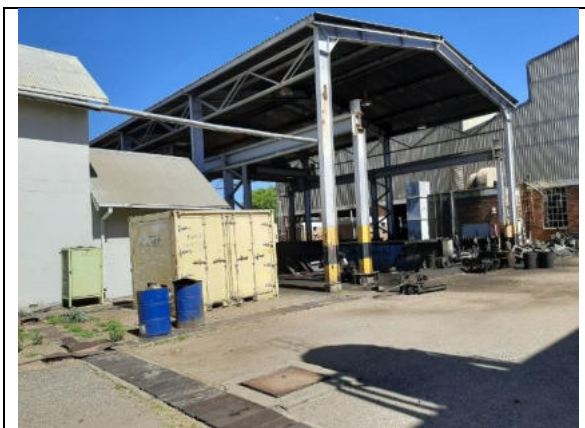


Photo 4-2 Facilities



Photo 4-3 Acid bath



Photo 4-4 Welding gas



Photo 4-5 Locomotive parts



Photo 4-6 Batteries



Photo 4-7 Battery charging station



Photo 4-8 Waste oil tank

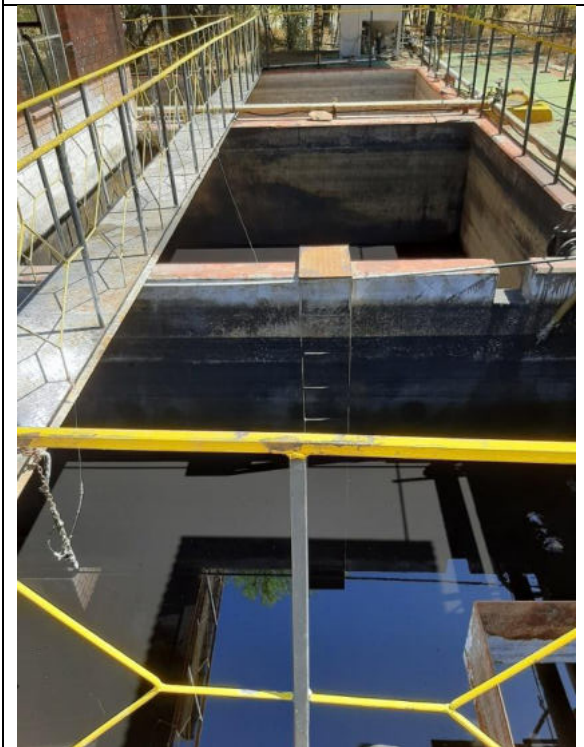


Photo 4-9 Oil water separator

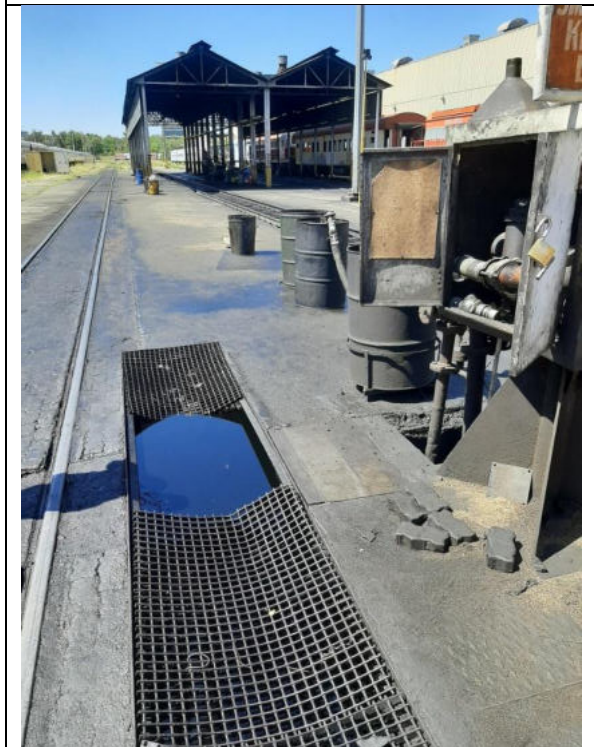


Photo 4-10 Spill catchment pits

5 ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

To protect the environment and achieve sustainable development, all projects, plans, programmes and policies deemed to have adverse impacts on the environment require an environmental assessment, as per the Namibian legislation. The legislation and standards provided in Table 5-1 to Table 5-4 govern the environmental assessment process in Namibia and/or are relevant to the facility.

Table 5-1 Namibian law applicable to the fuel retail facility

Law	Key Aspects
The Namibian Constitution	<ul style="list-style-type: none"> ◆ Promote the welfare of people ◆ Incorporates a high level of environmental protection ◆ Incorporates international agreements as part of Namibian law
Environmental Management Act Act No. 7 of 2007, Government Notice No. 232 of 2007	<ul style="list-style-type: none"> ◆ Defines the environment ◆ Promote sustainable management of the environment and the use of natural resources ◆ Provide a process of assessment and control of activities with possible significant effects on the environment
Environmental Management Act Regulations Government Notice No. 28-30 of 2012	<ul style="list-style-type: none"> ◆ Commencement of the Environmental Management Act ◆ List activities that requires an environmental clearance certificate ◆ Provide Environmental Impact Assessment Regulations
Petroleum Products and Energy Act Act No. 13 of 1990, Government Notice No. 45 of 1990	<ul style="list-style-type: none"> ◆ Regulates petroleum industry ◆ Makes provision for impact assessment ◆ Petroleum Products Regulations (Government Notice No. 155 of 2000) <ul style="list-style-type: none"> ○ Prescribes South African National Standards (SANS) or equivalents for construction, operation and decommissioning of petroleum facilities (refer to Government Notice No. 21 of 2002) ◆ Used Mineral Oil Regulations (Government Notice No. 48 of 1991) <ul style="list-style-type: none"> ○ Regulations relating to the purchase, sale, supply, acquisition, possession, disposal, storage, transportation, recovery and re-refinement of used mineral oil
The Water Act Act No. 54 of 1956	<ul style="list-style-type: none"> ◆ Remains in force until the new Water Resources Management Act comes into force ◆ Defines the interests of the state in protecting water resources ◆ Controls water abstraction and the disposal of effluent ◆ Numerous amendments
Water Resources Management Act Act No. 11 of 2013	<ul style="list-style-type: none"> ◆ Provide for management, protection, development, use and conservation of water resources ◆ Prevention of water pollution and assignment of liability ◆ Not in force yet
Local Authorities Act Act No. 23 of 1992, Government Notice No. 116 of 1992	<ul style="list-style-type: none"> ◆ Define the powers, duties and functions of local authority councils ◆ Regulates discharges into sewers

Law	Key Aspects
Public and Environmental Health Act Act No. 1 of 2015, Government Notice No. 86 of 2015	<ul style="list-style-type: none"> ◆ Provides a framework for a structured more uniform public and environmental health system, and for incidental matters ◆ Deals with Integrated Waste Management including waste collection disposal and recycling; waste generation and storage; and sanitation
Labour Act Act No 11 of 2007, Government Notice No. 236 of 2007	<ul style="list-style-type: none"> ◆ Provides for Labour Law and the protection and safety of employees ◆ Labour Act, 1992: Regulations relating to the health and safety of employees at work (Government Notice No. 156 of 1997)
Atmospheric Pollution Prevention Ordinance Ordinance No. 11 of 1976	<ul style="list-style-type: none"> ◆ Governs the control of noxious or offensive gases ◆ Prohibits scheduled process without a registration certificate in a controlled area ◆ Requires best practical means for preventing or reducing the escape into the atmosphere of noxious or offensive gases produced by the scheduled process
Hazardous Substances Ordinance Ordinance No. 14 of 1974	<ul style="list-style-type: none"> ◆ Applies to the manufacture, sale, use, disposal and dumping of hazardous substances as well as their import and export ◆ Aims to prevent hazardous substances from causing injury, ill-health or the death of human beings
Pollution Control and Waste Management Bill (draft document)	<ul style="list-style-type: none"> ◆ Not in force yet ◆ Provides for prevention and control of pollution and waste ◆ Provides for procedures to be followed for licence applications

Table 5-2 City of Windhoek regulations, plans and policies

Groundwater Protection Regulations	<ul style="list-style-type: none"> ◆ Provides for the protection of groundwater, landscape and vegetation sensitivity ◆ Requires an EIA and EMP for projects that may potentially impact on groundwater ◆ Identifies three groundwater control zones: medium, high and very high.
Windhoek Environmental Structure Plan and Environmental Policy	<ul style="list-style-type: none"> ◆ Integrates spatial planning decision-making, environmental planning and environmental impact management
Town Planning Scheme	<ul style="list-style-type: none"> ◆ Enables the comprehensive management of all property and related public sector functions across the city. ◆ Provides for the protection of groundwater and the environment. ◆ Prohibits any sewer, septic tank, pit latrine, VIP or French drain within 500 m of any private or production borehole without council's consent. ◆ Sets the Southern Development Limit for Windhoek.
Municipal Council of Windhoek: Noise Control Regulations General Notice No. 77 of 2006	<ul style="list-style-type: none"> ◆ Resolution 215/09/2006 dealing with noise ◆ Impose various noise limits for residential commercial and industrial areas for day and night time. ◆ Restricts noise reaching single residential areas at 55 dBA during the day and 45 dBA at night.
Drainage and Sewage Regulations	<ul style="list-style-type: none"> ◆ Regulates discharges into sewer systems. ◆ Provides standards to which effluents entering a sewer system must adhere to. ◆ Regulates storm water run-off.

Table 5-3 Relevant multilateral environmental agreements for Namibia and the development

Agreement	Key Aspects
Stockholm Declaration on the Human Environment, Stockholm 1972.	<ul style="list-style-type: none"> Recognizes the need for a common outlook and common principles to inspire and guide the people of the world in the preservation and enhancement of the human environment
1985 Vienna Convention for the Protection of the Ozone Layer	<ul style="list-style-type: none"> Aims to protect human health and the environment against adverse effects from modification of the Ozone Layer are considered Adopted to regulate levels of greenhouse gas concentration in the atmosphere
United Nations Framework Convention on Climate Change (UNFCCC)	<ul style="list-style-type: none"> The Convention recognises that developing countries should be accorded appropriate assistance to enable them to fulfil the terms of the Convention
Convention on Biological Diversity, Rio de Janeiro, 1992	<ul style="list-style-type: none"> Under article 14 of The Convention, EIAs must be conducted for projects that may negatively affect biological diversity

Table 5-4 Standards or codes of practise

Standard or Code	Key Aspects
South African National Standards (SANS)	<ul style="list-style-type: none"> The Petroleum Products and Energy Act prescribes SANS standards for the construction, operations and demolition of petroleum facilities SANS 10131 (2004): Above-ground storage tanks for petroleum products.

Some aspects of the locomotive refurbishment project are listed as activities requiring an ECC as per the following points from Section 9 of Government Notice No. 29 of 2012:

Hazardous Substance Treatment, Handling and Storage

- 9.1 “The manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974.” (The facility stores and handles hazardous substances in the form of hydrocarbon products)

6 ENVIRONMENTAL CHARACTERISTICS

This section lists pertinent environmental characteristics of the study area and provides a statement on the potential environmental impacts on each.

6.1 LOCALITY AND SURROUNDING LAND USE

The facility is situated in Windhoek West, in the Khomas Region (22.546422 °S; 17.07959 °E) (Figure 2-1). Access to the site is gained from Ooievaar Street. Nearby properties currently consist of mixed land use inclusive of residential, business, institutional and municipal.

6.2 CLIMATE

According to the Köppen-Geiger Climate Classification system the project is located in a hot semi-arid climate (BSh) (Kottek, 2006). This means that the area receives precipitation below potential evapotranspiration, but not as low as a desert climate and has a mean annual temperature of at least 18 °C. Average rainfall received is 300-350 mm/a with a variation of 30-40%. Monthly rainfall peaks in February. The potential evapotranspiration is 2,500 – 2,600 mm/a. By dividing the mean annual potential evapotranspiration into the mean annual precipitation, an aridity index value for the area was computed as 0.14, which indicates the area to be arid. The average annual minimum temperature is 6 - 8 °C, while the average annual maximum temperature is 30 - 32 °C, with an average annual temperature range of 24 - 26 °C. An average diurnal temperature (difference between daily minimum and maximum temperature) for this area is around 14 - 16 °C. Direct normal solar irradiance for the area is 7.768 kWh/m²/day.

The general lack of functioning weather stations in Namibia, in especially rural areas, limits the availability of long term, true weather data. For rainfall, as a best possible workaround, long term rainfall data from the CHIRPS-2 (Climate Hazards Group Infra-Red Precipitation with Station data version 2) database (Funk et al., 2015) was compiled. The CHIRPS-2 dataset consists of long term rainfall data (1981 to near-present) obtained from satellite imagery and in-situ station data. The resultant dataset provides a reasonably well represented overview of the historic rainfall of the general area. True values for single, site specific meteorological events may however differ to some degree. The average annual rainfall for the last 40 years was calculated as 322 mm/a, with a coefficient of variance of 35%. Heavier rainfall (single day events) occur between November and April, with a single event of 53.3 mm in April (last 40 years data) being the highest. Daily and seasonal rainfall data (Funk et al., 2015) is presented in Table 6-1 and in Figure 6-1. Seasonal (July to June) total rainfall, centered on the average line for the last 40 years, is presented, with the daily total rainfall and the seasonal cumulative rainfall. From the figure it is clear that 6 out of the last 10 seasons were below the average.

Table 6-1 Rainfall statistics based on CHIRPS-2 data (Funk et al., 2015)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum (mm/m)	11.99	18.54	9.31	7.06	0.00	0.00	0.00	0.00	0.00	0.00	5.28	8.02
Maximum (mm/m)	264.87	258.65	150.71	133.58	8.99	3.82	0.11	1.30	6.65	39.22	64.38	103.99
Average (mm/m)	71.4	86.2	57.3	32.7	1.1	0.2	0.0	0.0	1.6	10.4	20.4	32.8
Variability (%)	74.0	61.0	63.0	87.0	212.0	411.0	351.0	466.0	139.0	82.0	69.0	69.0
Daily maximum (mm)	48.6	45.6	43.2	53.3	9.0	3.8	0.1	1.3	5.1	18.1	25.2	24.6
Average rain days	8	9	6	3	0	0	0	0	1	2	4	5
Season July - June average: 322 mm						Season coefficient of variation: 35 %						
Data range	1981-Jul-01 to					2021-Jun-30			Lat: 22.5464°S Long: 17.0796°E			

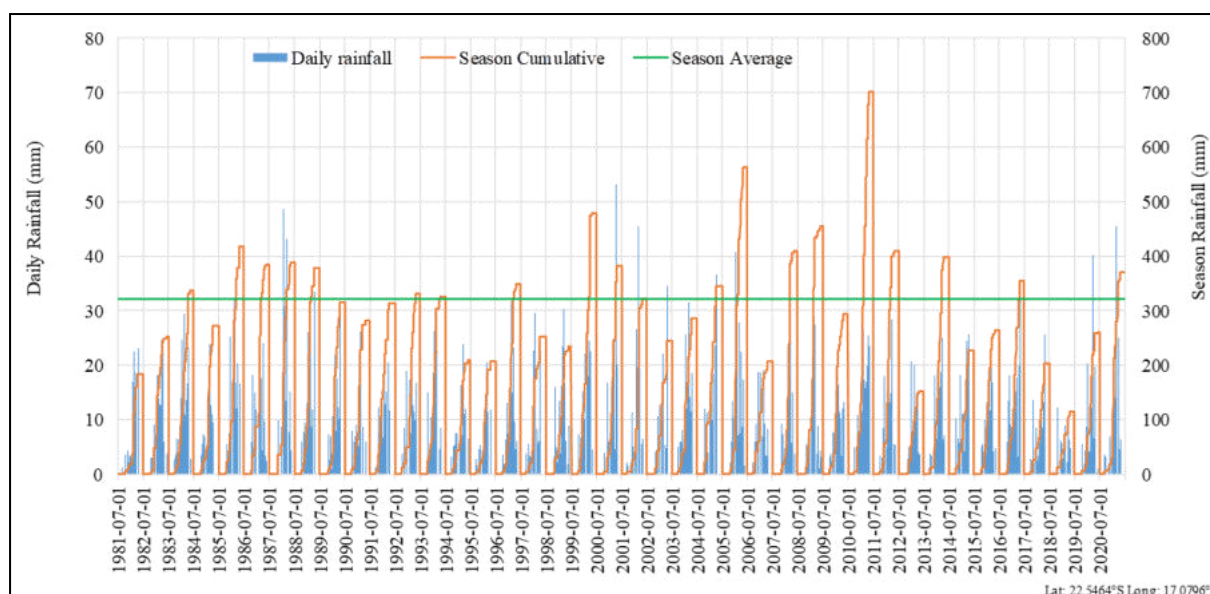


Figure 6-1 Daily and seasonal rainfall from CHIRPS-2 data (Funk et al., 2015)

6.3 TOPOGRAPHY AND DRAINAGE

The regional topography of the area can be described as a wide graben valley sloping north inside the surrounding hilly terrain. The valley floor is relatively flat compared to the surrounding terrain (Khomas Hochland to the west and Eros Mountains to the east) where moderate to steep slopes are the norm. A very distinct mountain range (Auas Mountains) cuts across the valley south of the city and divides the valley into two parts, with the southern part draining to the south.

The site itself is relatively flat as a result of earthworks conducted prior to construction of the workshops. A stream is located 260 m to the east of the workshop. During heavy rainfall, surface flow would generally be to the east.

6.4 GEOLOGY AND HYDROGEOLOGY

The complex geology of the Windhoek area is a result of numerous folding and faulting episodes, including thrusting and rifting, to which the area has been subjected. Metasedimentary rocks of the Swakop Group, which is part of the Damara Sequence, constitute the Windhoek Aquifer. A number of north to north-westerly striking faults and joints found in Windhoek form the major underground water conduits and therefore determine the conditions of the aquifer. Secondary porosity giving rise to high aquifer transmissivity is best developed in faults with post hydrothermal alteration brecciation in quartzitic environments. Moreover host rock fracturing along fault planes results in better development of secondary porosity in quartzite compared to schistose terrain such that the aquifer reaches its maximum potential in this type of setting. The metasedimentary formations of the study area strike in an east-north-easterly direction and dip 15-35° to the north-northwest.


The more competent quartzite is subject to brittle deformation and thus exhibits relatively high secondary porosity and permeability due to jointing. The joints of the quartzite show evidence of fluid flow by carbonate and quartz infill and iron staining. The micaceous schist on the other hand, which is prone to plastic deformation rather than brittle fracturing, exhibits significantly lower secondary porosity and permeability and therefore a lower risk of groundwater pollution.

Two main aquifer types are found in the area, namely secondary (fractured rock) aquifers hosted in the mica schist of the Kuiseb Formation, and primary (unconsolidated sediment) aquifers formed in the Klein Windhoek River valley alluvial (Qa). Windhoek has a regional groundwater flow from south to north. Groundwater flow is expected to take place through primary porosity in the surface cover, while it is expected to flow along fractures, faults and other geological structures (secondary porosity) present within the underlying formations (hard rock formations).

The project location is situated on mica schist from the Kuiseb Formation. The Kuiseb Formation formed during the Namibian Age and forms part of the Khomas Subgroup of the Swakop Group. Other rock types found in the area consists of minor quartzite, graphitic schist and marble. The risk of groundwater pollution is therefore considered to be comparatively low.

Water is utilized in the area, with 23 boreholes known of within a 5 km radius. Table 6-2 presents groundwater statistics of boreholes contained in the Department of Water Affairs database. Note that this database is generally outdated and more boreholes might be present. The water level is on average at 30 mbs with an average yield of 40 m³/h. The project area is located within the Okahandja Groundwater Basin. Groundwater flow at the site can be expected in a northerly direction. Local flow patterns may vary due to groundwater abstraction. The project area also falls within the Windhoek-Gobabis Subterranean Water Control Area (Extension) as per Government Notice 47 of 26 March 1976. This means that Government controls groundwater usage and development in this area.

Table 6-2 Groundwater statistics

Query Centre:	Locomotive Repair Yard; -22.5464°S; 17.0796°E											Query Box Radius: 5.0km
	NUMBER OF KNOWN BOREHOLES	LATITUDE	LONGITUDE	DEPTH (mbs)	YIELD (m ³ /h)	WATER LEVEL (mbs)	WATER STRIKE (mbs)	TDS (ppm)	SULPHATE (ppm)	NITRATE (ppm)	FLUORIDE (ppm)	
	23			20	19	20	13	17	15	16	16	
Data points												
Minimum		-22.501404	17.030880	38	2	1	18	30	50	0	0	
Average				173	40	30	49	737	178	5	1	
Maximum		-22.591396	17.128320	524	91	82	107	2567	510	36	4	
Group A				10.00%	84.21%	30.00%	0.00%	82.35%	73.33%	81.25%	68.75%	
<i>Limit</i>				50	>10	10	10	1000	200	10	1.5	
Group B				25.00%	0.00%	55.00%	53.85%	11.76%	26.67%	6.25%	12.50%	
<i>Limit</i>				100	>5	50	50	1500	600	20	2.0	
Group C				30.00%	15.79%	15.00%	38.46%	0.00%	0.00%	12.50%	0.00%	
<i>Limit</i>				200	>0.5	100	100	2000	1200	40	3.0	
Group D				35.00%	0.00%	0.00%	7.69%	5.88%	0.00%	0.00%	18.75%	
<i>Limit</i>				>200	<0.5	>100	>100	>2000	>1200	>40	>3	

Statistical grouping of parameters is for ease of interpretation, except for the grouping used for sulphate, nitrate and fluoride, which follow the Namibian guidelines for the evaluation of drinking-water quality for human consumption, with regard to chemical, physical and bacteriological quality. In this case the groupings has the following meaning:

Group A: Water with an excellent quality

Group C: Water with low health risk

Group B: Water with acceptable quality

Group D: Water with a high health risk, or water unsuitable for human consumption

6.5 PUBLIC WATER SUPPLY

Water consumption in Windhoek is well managed by means of water demand management. Nevertheless available water is one of the city's most scarce resources and represents a constraint for sustainable development in future. Consumption will increase with the soaring influx of people to the city.

Listed in order of resource development, Windhoek receives its water from boreholes in and around town, reclaimed water (New Goreangab Water Reclamation Plant), and a NamWater Scheme that transfers water from the Von Bach Dam, the Swakoppoort Dam, the Omatako Dam and the Grootfontein Karst Area. The city has also started with artificial recharge of the Windhoek aquifer and is extending this scheme through the installation of new recharge boreholes as well as the development of deeper abstraction boreholes, 400 to 500 m deep. This clearly illustrates the value of the aquifer. The boreholes are the second most important water resource of the city and the sustained use of the aquifer needs to be assured. The project is located within the Swakoppoort Dam catchment which is important in terms of public water supply for the central areas of Namibia.

6.6 FAUNA AND FLORA

The site lies in the Savanna Biome with a thornbush shrubland vegetation type. Trees such as *Acacia mellifera*, *Acacia reficiens*, *Acacia fleckii*, *Boscia albitrunca*, *Lonchocarpus nelsii*, *Acacia erioloba* and a variety of other trees are characteristic of this vegetation type.

The facility is an existing site which has been cleared of most vegetation during the initial establishment of the site.

6.7 DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS

The project area falls within the Khomas Region and lies in Windhoek, the capital of Namibia. Windhoek is the largest town in Namibia with more than 300,000 people. It is the economic and business centre of the country. The Hosea Kutako International Airport situated east of Windhoek, links Windhoek with the rest of the world, while the B1, B2 and B6 highways links Windhoek to the rest of Namibia and southern Africa.

7 ENVIRONMENTAL MANAGEMENT PLAN

7.1 IMPLEMENTATION OF THE EMP

The sections below outline the management of the environmental elements that may be affected by the different activities. Impacts addressed and mitigation measures proposed are seen as minimum requirements which have to be elaborated on. Delegation of mitigation measures and reporting activities should be determined by the Proponent and included in the EMP. The EMP is a living document that must be prepared in detail, and regularly updated, by the Proponent as the project progress and evolve.

The EMP and ECC must be communicated to the site managers. A copy of the ECC and EMP should be kept on site. All monitoring results must be reported on as indicated. Reporting is important for any future renewals of the ECC and must be submitted to the Ministry of Environment, Forestry and Tourism. Renewal of ECC will require six monthly reports based on the monitoring prescribed in this EMP.

Various potential and definite impacts will emanate from the operations and decommissioning phases. The majority of these impacts can be mitigated or prevented. The prevention and mitigation measures are listed below.

7.2 CONSTRUCTION (MAINTENANCE) AND OPERATIONS

The following section provide management measures for the operational phase, inclusive of periodic maintenance activities that may include some construction activities and repairs, related to the facility.

7.2.1 Planning

During the phases of planning for construction, operations and decommissioning of the facility, it is the responsibility of the Proponent to ensure that they are and remain compliant with all legal requirements. The Proponent must also ensure that all required management measures are in place prior to and during all phases, to ensure potential impacts and risks are minimised. The following actions are recommended for the planning phase and should continue during various other phases of the project:

- ◆ Ensure that all necessary permits from the various ministries, local authorities and any other bodies that governs the construction (maintenance) and operations of the project are in place and valid.
- ◆ Ensure all appointed contractors and employees enter into an agreement which includes the EMP. Ensure that the contents of the EMP are understood by the contractors, sub-contractors, employees and all personnel present or who will be present on site.

- ◆ Make provisions to have a Health, Safety and Environmental Coordinator to implement the EMP and oversee occupational health and safety as well as general environmental related compliance at the site.
- ◆ Have the following emergency plans, equipment and personnel on site where reasonable to deal with all potential emergencies:
 - Risk management / mitigation / EMP/ Emergency Response Plan and HSE Manuals
 - Adequate protection and indemnity insurance cover for incidents;
 - Comply with the provisions of all relevant safety standards;
 - Procedures, equipment and materials required for emergencies.
- ◆ If one has not already been established, establish and maintain a fund for future ecological restoration of the project site should project activities cease and the site is decommissioned and environmental restoration or pollution remediation is required.
- ◆ Establish and / or maintain a reporting system to report on aspects of construction activities, operations and decommissioning as outlined in the EMP.
- ◆ Submit bi-annual reports to the MEFT to allow for environmental clearance certificate renewal after three years. This is a requirement by MEFT.
- ◆ Appoint a specialist environmental consultant to update the EIA and EMP and apply for renewal of the environmental clearance certificate prior to expiry.

7.2.2 Skills, Technology and Development

During various phases of construction and operations, training is provided to a portion of the workforce. Skills are transferred to an unskilled workforce for general tasks. The technology required for the operations at the facility is often new to the local industry, aiding in operational efficiency. Development of people and technology are key to economic development.

Desired Outcome: To see an increase in skills as well as development and technology advancements in associated industries.

Actions

Mitigation:

- ◆ If the skills exist locally, contractors must first be sourced from the town, then the region and then nationally. Deviations from this practice must be justified.
- ◆ Skills development and improvement programs to be made available as identified during performance assessments.

Responsible Body:

- ◆ Proponent
- ◆ Contractors

Data Sources and Monitoring:

- ◆ Record should be kept of training provided.
- ◆ Ensure that all training is certified or managerial reference provided (proof provided to the employees) inclusive of training attendance, completion and implementation.

7.2.3 Revenue Generation and Employment

Project execution will lead to changes in the way revenue is generated and paid to the national treasury. An increase of skilled and professional labour will take place due to the operations of the facility. Employment will be sourced locally while skilled labour/contractors may be sourced from other regions.

Desired Outcome: Contribution to national treasury and provision of employment to local Namibians.

Actions

Mitigation:

- ◆ The Proponent must employ local Namibians where possible.
- ◆ If the skills exist locally, employees must first be sourced from the town, then the region and then nationally.
- ◆ Deviations from this practice must be justified.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Bi-annual summary report based on employee records.

7.2.4 Demographic Profile and Community Health

The project is reliant on labour during the operational phase. The workshop is well established with an established workforce. The addition of the locomotive refurbishment operations is not expected to create a change in the demographic profile of the local community. In-migration by job seekers may still occur. Community health may be exposed to factors such as communicable disease like HIV/AIDS and alcoholism/drug abuse. An increase in foreign people in the area may potentially increase the risk of criminal and socially/culturally deviant behaviour.

Desired Outcome: To prevent the in-migration and growth in informal settlements, prevent the spread of communicable disease and prevent / discourage socially deviant behaviour.

Actions:

Prevention:

- ◆ Employ only local people from the area where possible, deviations from this practice should be justified appropriately.
- ◆ Adhere to all municipal by-laws relating to environmental health which includes but is not limited to sanitation requirements.

Mitigation:

- ◆ Educational programmes for employees on HIV/AIDs and general upliftment of employees' social status.
- ◆ Appointment of reputable contractors.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Facility inspection sheet for all areas which may present environmental health risks, kept on file.
- ◆ Bi-annual summary report based on educational programmes and training conducted.
- ◆ Bi-annual report and review of employee demographics.

7.2.5 Traffic

The workshop is within mixed land use area. As it is an established facility, only a limited increase in traffic to the site may be expected as a result of the additional activities.

Desired Outcome: Minimum impact on traffic and no transport or traffic related incidents.

Actions

Mitigation:

- ◆ Trucks delivering or collecting goods should not be allowed to obstruct any traffic in surrounding areas and the town.
- ◆ If any traffic impacts are expected, traffic management should be performed to prevent these.
- ◆ The placement of signs to warn and direct traffic will mitigate traffic impacts.
- ◆ If required, consider moving security gate at Ooievaar Steet deeper into the property to accommodate truck parking at the gate to not obstruct Ooievaar Street

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Any complaints received regarding traffic issues should be recorded together with action taken to prevent impacts from repeating itself.
- ◆ A bi-annual report should be compiled of all incidents reported, complaints received, and action taken.

7.2.6 Health, Safety and Security

Activities associated with the operational phase is reliant on human labour and therefore expose them to health and safety risks. Activities such as the operations of machinery, overhead lifting of heavy equipment by cranes, working with hazardous substances such as acids and hydrocarbons, unsafe stacking and falling from heights poses the main risks to employees. Security risks are related to unauthorized entry, theft and sabotage.

Desired Outcome: To prevent injury, health impacts and theft.

Actions

Prevention:

- ◆ All health and safety standards specified in the Labour Act should be complied with.
- ◆ Clearly label and/or demarcate dangerous and restricted areas as well as dangerous equipment and products, e.g. acid baths.
- ◆ Chemical storage should follow material safety data sheets (MSDS) storage instructions and incompatible chemicals must be kept separate to avoid unsafe conditions.
- ◆ Provide all employees with required and adequate personal protective equipment (PPE) inclusive of hard hats, safety boots, reflective wear, hearing protectors and safety glasses. The wearing of these should be mandatory in selected areas.
- ◆ Due to the nature of operations and the enclosed space within which it occurs, maintaining good air quality and adequate lighting are important to ensure worker safety. Broken light bulbs and fittings must be replaced and activities like welding should be in a well ventilated area or respirators must be worn where noxious gases are present.
- ◆ Hydrocarbon products are carcinogenic in nature and personnel must be educated on the dangers of inhalation and dermal contact with hydrocarbon products. Where hydrocarbon products are handle, appropriate PPE should be worn.
- ◆ Ensure that all personnel receive adequate training on operation of equipment.
- ◆ Implementation of maintenance register for all equipment to ensure they do not pose risks of injury due to malfunctioning.
- ◆ Equipment that will be locked away on site must be placed in a way that does not encourage criminal activities (e.g. theft).

Mitigation:

- ◆ For chemical incidents follow relevant MSDS instructions.
- ◆ Selected personnel should be trained in first aid and first aid kits and emergency wash stations (showers and eyewash stations) must be available on site.
- ◆ The contact details of all emergency services must be readily available and clearly displayed throughout the facility.
- ◆ Security procedures and proper security measures must be in place to protect workers.
- ◆ Strict security procedures that prevents unauthorised entry during all phases should be practiced, with access logs for vehicles and personnel.

Responsible Body:

- ◆ Proponent
- ◆ Contractors

Data Sources and Monitoring:

- ◆ Any incidents must be recorded with action taken to prevent future occurrences.
- ◆ A bi-annual report should be compiled of all incidents reported. The report should contain dates when training were conducted and when safety equipment and structures were inspected and maintained.

7.2.7 Fire

Some flammable products are used or stored on site. Operational activities may increase the risk of the occurrence of fires if proper maintenance and housekeeping are not conducted. The site is located in a developed area and fires can pose significant risks to surrounding developments.

Desired Outcome: To prevent property damage, possible injury and impacts caused by uncontrolled fires.

Actions:

Prevention:

- ◆ Maintain regular site, mechanical and electrical inspections and maintenance.
- ◆ No spark generating activities near flammable material.
- ◆ Ensure sufficient firefighting and fire prevention measure are in place.
- ◆ Regularly update the firefighting and prevention plan and equipment.
- ◆ Maintain firefighting equipment, good housekeeping and personnel training (firefighting, fire prevention and responsible housekeeping practices).
- ◆ Regularly remove any dry vegetation on the premises that may increase the likelihood of fires spreading from the facility to neighbours and vice versa.

Mitigation:

- ◆ A holistic fire protection and prevention plan is needed. This plan must include an emergency response plan and firefighting plan. The plan should consider risks posed to and by neighbouring properties.

Responsible Body:

- ◆ Proponent
- ◆ Contractors

Data Sources and Monitoring:

- ◆ A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that such incidents do not repeat themselves.
- ◆ A bi-annual report should be compiled of all incidents reported. The report should contain dates when fire drills were conducted and when fire equipment was tested and training given.

7.2.8 Noise

Some aspects of operations are noisy in nature. This may negatively impact on workers on site. As the site is situated in a mixed land use area noise may also impact on surrounding properties. Construction (maintenance and upgrade) may generate excessive noise.

Desired Outcome: To prevent any nuisance and hearing loss due to noise generated.

Actions

Prevention:

- ◆ Follow the Health and Safety Regulations of the Labour Act pertaining to noise and the City of Windhoek guidelines for limits on noise pollution (Council Resolution 215/09/2006) to prevent hearing impairment and a nuisance at nearby receptors.
- ◆ Confine noise generating operational activities to daytime hours as far as possible.
- ◆ At night, the nuisance created by audible warning signals on trucks and forklifts can be prevented by switching to a flashing light or 'broadband white noise' system.
- ◆ All machinery must be regularly serviced to ensure minimal noise production.

Mitigation:

- ◆ Hearing protectors as standard PPE for workers in situations with elevated noise levels.

Responsible Body:

- ◆ Proponent
- ◆ Contractors

Data Sources and Monitoring:

- ◆ Health and Safety Regulations of the Labour Act and City of Windhoek guidelines for limits on noise pollution (Council Resolution 215/09/2006).
- ◆ Maintain a complaints register.
- ◆ Bi-annual report on complaints and actions taken to address complaints and prevent future occurrences.

7.2.9 Waste

Various waste streams will result from the operational phase. Waste include hazardous wastes such as used oil, radiator water, lubricants, used fuel and oil filters, batteries, etc. Domestic waste will also be generated by the facility and related operations. Waste presents a contamination risk and when not removed regularly may become a fire hazard. Construction waste may include building rubble and discarded equipment. Contaminated soil and water is considered as a hazardous waste.

Desired Outcome: To reduce the amount of waste produced, and prevent pollution and littering.

Actions

Prevention:

- ◆ Develop a waste management plan for the operations which include segregation of different categories of waste (hazardous vs non-hazardous and recyclable vs non-recyclable) and waste reduction and recycling measures.
- ◆ All staff should be educated on the waste management plan and importance of proper waste management procedures.
- ◆ All waste that can be re-used / recycled must be kept separate.
- ◆ Domestic waste must be kept separate from hazardous waste to reduce the amount of hazardous waste (contaminated domestic waste) to be disposed of at the hazardous waste disposal facility of the City of Windhoek.
- ◆ Adequate temporary waste storage facilities must be available throughout the facility and waste must be contained and as not to wash away or be blown away by wind.
- ◆ Prevent scavenging (human and non-human) of waste.
- ◆ All drains leading directly into sewers must be closed off, and locked where possible, to prevent any unwanted products from entering sewers should an accidental spill occur.

Mitigation:

- ◆ Waste should be disposed of regularly and at appropriately classified disposal facilities, this includes hazardous material (empty chemical containers and contaminated rugs, paper water and soil).
- ◆ See the MSDS available from suppliers for disposal of contaminated products and empty containers.
- ◆ Due to the nature of some hazardous materials they, or the containers they are packed in, should be disposed of in an appropriate way at an appropriately classified waste disposal facility. See the MSDS available from suppliers for disposal methods.
- ◆ Periodically, waste should be collected over the entire premises and discarded, but ultimately personnel on site should be educated in the importance of proper waste management and disposal.

Responsible Body:

- ◆ Proponent
- ◆ Contractors

Data Sources and Monitoring:

- ◆ A register of hazardous waste disposal should be kept. This should include type of waste, volume as well as disposal method/facility.
- ◆ Any complaints received regarding waste should be recorded with notes on action taken.
- ◆ All information and reporting to be included in a bi-annual report.

7.2.10 Ecosystem and Biodiversity Impact

No significant impact on the biodiversity of the area is predicted as this is an existing operation and the site is void of natural fauna and flora. Uncontained pollution may reach the nearby stream which may have detrimental effects on downstream ecosystems.

Desired Outcome: To avoid pollution of and impacts on the ecological environment.

Actions.

Mitigation:

- ◆ Report any extraordinary ecological sightings to the Ministry of Environment, Forestry and Tourism.
- ◆ Mitigation measures related to waste handling and the prevention of groundwater, surface water and soil contamination should limit ecosystem and biodiversity impacts.
- ◆ Avoid scavenging of waste by fauna.
- ◆ The establishment of habitats and nesting sites at the facility should be prevented where possible.
- ◆ Lights used at night should be kept to a minimum and should be directed downwards to the working surfaces.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ All information of extraordinary ecological sightings to be included in a bi-annual report.

7.2.11 Groundwater, Surface Water and Soil Contamination

Potential sources of groundwater, surface water or soil pollution include spilled fuel, used oils and hydraulic fluids, radiator water, battery acid, etc. Pollution of soil, surface water and groundwater is prohibited. Contaminated groundwater may spread to the local aquifer. Waste water entering sewers of the City of Windhoek is recycled for human consumption and strict constraints are in place on the quality of water entering the sewer system.

Desired Outcome: To prevent the contamination of water and soil.

Actions

Prevention:

- ◆ All handling and storage of hazardous substances should be conducted on spill proof surfaces provided for this purpose. E.g. Concrete slabs with regularly maintained seals between slabs. No sewage drain entry point may be present on such surfaces and sewerage drains should always be sealed to prevent spilled hazardous substances from entering such drains.
- ◆ The procedures followed to prevent environmental damage during service and maintenance, and compliance with these procedures, must be audited and corrections made where necessary.
- ◆ Proper training of on-site personnel must be conducted on a regular basis (handling of hazardous substances, spill control, etc.).
- ◆ Hazardous substances should not be allowed to enter the storm and waste water systems and regular inspection of these should be conducted.
- ◆ Oil water separators must regularly be inspected and it should be ensured that hydrocarbon products do not exit these separators together with the waste water stream.
- ◆ Importantly, surfactants (soaps and detergents) should not be allowed to enter any waste water stream that enters an oil water separator.
- ◆ Storm water inlets and outlets into the river must be inspected on a monthly base for signs of contamination.

Mitigation:

- ◆ Spill clean-up means must be readily available on site as per the relevant MSDS.
- ◆ Any existing or new spills must be cleaned up. This includes contaminated surface soils and water.
- ◆ All hazardous waste, such as contaminated materials, hydrocarbons and empty chemical containers should be disposed of at a suitably classified hazardous waste disposal facility.

Responsible Body:

- ◆ Proponent
- ◆ Contractors

Data Sources and Monitoring:

- ◆ Monthly waste water sampling to check compliance with City of Windhoek standards.
- ◆ Storm water inlets and outlets into the river must be inspected on a monthly basis for signs of contamination.
- ◆ A report should be compiled bi-annually of all spills or leakages. The report should contain the following information: date and duration of spill, product spilled, volume of spill, remedial action taken, comparison of pre-exposure baseline data (previous pollution conditions survey results) with post remediation data (e.g. soil/groundwater hydrocarbon concentrations).

7.2.12 Visual Impact

This is an impact that not only affects the aesthetic appearance, but also the integrity of the facility.

Desired Outcome: To minimise aesthetic impacts associated with the facility.

Actions

Mitigation:

- ◆ Regular waste disposal, good housekeeping and routine maintenance on infrastructure will ensure that the longevity of structures are maximised and a low visual impact is maintained.
- ◆ All structures and infrastructures constructed on site should be line with the visual character of the landscape as far as practically possible.

Responsible Body:

- ◆ Proponent
- ◆ Contractors

Data Sources and Monitoring:

- ◆ A bi-annual report should be compiled of all complaints received and actions taken.

7.2.13 Cumulative Impact

Possible cumulative impacts associated with the operational phase include an increase in traffic frequenting the site and noise. The increase of traffic and other noise generating activities in the area may impacts on nearby receptors.

Desired Outcome: To minimise all cumulative impacts associated with the facility.

Actions

Mitigation:

- ◆ Addressing each of the individual impacts as discussed and recommended in the EMP would reduce the cumulative impact.
- ◆ Reviewing biannual and annual reports for any new or re-occurring impacts or problems would aid in identifying cumulative impacts and help in planning if the existing mitigations are insufficient.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Annual summary report based on all other impacts must be created to give an overall assessment of the impact of the operational phase.

7.3 DECOMMISSIONING AND REHABILITATION

Decommissioning is not foreseen during the validity of the environmental clearance certificate. Decommissioning was however assessed as construction activities include modification and decommissioning. Should decommissioning occur at any stage, rehabilitation of the area may be required. Decommissioning may entail the complete removal of all infrastructure including buildings and underground infrastructure not forming part of post decommissioning use. Any pollution present on the site must be remediated. The impacts associated with this phase include noise and waste production as structures are dismantled. Noise must be kept within limits of the Health and Safety Regulations of the Labour Act and City of Windhoek guidelines for limits on noise pollution (Council Resolution 215/09/2006). Waste should be contained and disposed of at an appropriately classified and approved waste facility and not dumped in the surrounding areas. Future land use after decommissioning should be assessed prior to decommissioning and rehabilitation initiated if the land would not be used for future purposes. The EMP for the facility will have to be reviewed at the time of decommissioning to cater for changes made to the site and implement guidelines and mitigation measures.

8 CONCLUSION

The EMP should be used as an on-site reference document for all the operational activities. Parties responsible for transgression of the EMP should be held responsible for any rehabilitation that may need to be undertaken. The Proponent should use/develop their own in-house safety, health and environmental policies and standards in conjunction with the EMP. It is imperative that all personnel are taught the contents of these documents to ensure better environmental practises all round.

In particular the following aspects are highlighted as requiring special attention in terms of environmental management:

- ◆ Hydrocarbon products such as waste oil, and any other hazardous materials, should not be allowed to **pollute soil** (and thus potentially groundwater).
- ◆ Hydrocarbon products such as waste oil, and any other hazardous materials, should not be allowed to enter **sewers**.
- ◆ Hydrocarbon products such as waste oil, and any other hazardous materials, should not be allowed to enter **storm water drains** or surface **runoff**.
- ◆ **Surfactants (e.g. soap)** should not be allowed to enter oil water separators
- ◆ Hazardous waste should at all times be **separated** from domestic waste and recyclables.
- ◆ **Acid baths** should be covered/closed when not in use.
- ◆ **PPE** should be made compulsory in accordance with the various risks of the various sections of the facility.
- ◆ **Lighting and air quality** inside workshops should be sufficient/adequate to ensure safety of employees.

9 REFERENCES

Funk, C., Peterson, P., Landsfeld, M., Pedreros, D., Verdin, J., Shukla, S., Husak, G., Rowland, J., Harrison, L., Hoell, A. and Michaelsen, J., (2015) The climate hazards group infrared precipitation with stations - A new environmental record for monitoring extremes. Scientific Data, 2, 150066. <https://doi.org/10.1038/sdata.2015.66>

Kottek, M., J. Grieser, C. Beck, B. Rudolf, and F. Rubel, 2006: World Map of the Köppen-Geiger climate classification updated. Meteorol. Z., 15, 259-263. DOI: 10.1127/0941-2948/2006/0130.