

**CONSTRUCTION AND OPERATIONS OF A CONCRETE  
MANUFACTURING PLANT IN KARIBIB, ERONGO REGION**

**ENVIRONMENTAL ASSESSMENT SCOPING REPORT**



**Assessed by:**

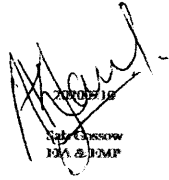


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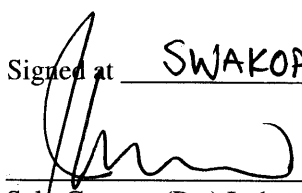
February 2020



<b>Project:</b>	<b>CONSTRUCTION AND OPERATIONS OF A CONCRETE MANUFACTURING PLANT IN KARIBIB, ERONGO REGION: ENVIRONMENTAL ASSESSMENT SCOPING REPORT</b>	
<b>Report:</b>	Final	
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<b>Report Approval</b>	 <b>André Faul</b> <b>Conservation Ecologist</b>	

I J. P. Gossow acting as representative of Salz-Gossow (Pty) Ltd, 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 SWAKOPMUND on the 18 day of FEBRUARY 2020.

  
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## **EXECUTIVE SUMMARY**

Salz-Gossow (Pty) Ltd requested Geo Pollution Technologies (Pty) Ltd to undertake an environmental assessment for the construction and operations of concrete manufacturing plant on erf 604, Karibib Extension 1, in the Erongo Region. It is proposed that the floor size of the existing concrete factory will be upgraded to accommodate the plant and equipment required for the production of Type P2 concrete rail sleepers. The development will further require the installation of a consumer fuel installation as well as additional cement silos. Operations of the factory will mainly include the receipt of raw materials such as cement on a daily basis during operations. The main operational activities will entail the mixing of concrete, casting of concrete rail sleepers and operations of the consumer fuel installation.

The environmental assessment is conducted to determine all environmental, safety, health and socio-economic impacts associated with the construction and operations of the factory. Relevant environmental data has been compiled by making use of secondary data and from a reconnaissance site visit. Potential environmental impacts and associated social impacts were identified and are addressed in this report.

The project area itself, as well as the area east of the project location, is zoned for light industrial use. The area north and further west of the project location is zoned for future high density residential use. Due to the nature and location of the facility, limited impacts are expected on the surrounding environment, see summary impacts table below. It is however recommended that environmental performance be monitored regularly to ensure regulatory compliance and that corrective measures be taken if necessary. The construction and upgrade of factory will play a positive role in contributing to employment in Karibib, as well as provide a reliable supply of concrete rail sleepers to the railway industry.

The major concerns related to the construction and operations of the factory are that of potential groundwater, surface water and soil contamination and the possibility of fire. This will however be limited by adherence to relevant South African National Standards and Material Safety Data Sheet instructions. Furthermore, noise levels should meet the minimum requirements of the World Health Organisation. By appointing local contractors and employees and by implementing educational programs the positive socio-economic impacts can be maximised while mitigating any negative impacts.

The environmental management plan included in Section 10 of this document should be used as an on-site reference document during all phases (planning, construction, operations and decommissioning) of the facility. All monitoring and records kept should be included in a report to ensure compliance with the environmental management plan. Parties responsible for transgression of the environmental management plan should be held responsible for any rehabilitation that may need to be undertaken. A Health, Safety, Environment and Quality policy could be used in conjunction with the environmental management plan. Operators and responsible personnel must be taught the contents of these documents. Local or national regulations and guidelines must be adhered to and monitored regularly as outlined in the environmental management plan.

## Impact Summary Class Values

Impact Category	Impact Type	Construction		Operations	
Positive Rating Scale: Maximum Value		5		5	
Negative Rating Scale: Maximum Value			-5		-5
EO	Skills, Technology and Development	2		2	
EO	Revenue Generation and Employment	2		2	
SC	Demographic Profile and Community Health		-1		-2
EO	Supply of Fuel to Operations				2
SC	Traffic		-1		-1
SC	Health, Safety and Security		-2		-2
PC	Fire		-2		-2
PC	Air Quality		-2		-2
PC	Noise		-2		-1
PC	Waste Production		-2		-2
BE	Ecosystem and Biodiversity Impact		-1		-1
PC/BE	Groundwater, Surface Water and Soil Contamination		-2		-3
SC	Visual Impact		-1		-1
PC/SC	Impacts on Utilities, Infrastructure and Seabed Scouring		-2		-2
PC	Cumulative Impact		-2		-2

BE = Biological/Ecological

EO = Economical/Operational

PC = Physical/Chemical

SC = Sociological/Cultural

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## **LIST OF ABBREVIATIONS**

<b>AIDS</b>	Acquired Immune Deficiency Syndrome
<b>BE</b>	Biological/Ecological
<b>DWA</b>	Department of Water Affairs
<b>EA</b>	Environmental Assessment
<b>EIA</b>	Environmental Impact Assessment
<b>EMA</b>	Environmental Management Act No 7 of 2007
<b>EMP</b>	Environmental Management Plan
<b>EMS</b>	Environmental Management System
<b>EO</b>	Economic/Operational
<b>ES</b>	Environmental Classification
<b>GPT</b>	Geo Pollution Technologies
<b>HIV</b>	Human Immunodeficiency Virus
<b>IAPs</b>	Interested and Affected Parties
<b>IUCN</b>	International Union for Conservation of Nature
<b>LNAPL</b>	Light Non-Aqueous Phase Liquids
<b>mamsl</b>	Meters Above Mean Sea Level
<b>m/s</b>	Metre per second
<b>mbs</b>	Metres below surface
<b>MET</b>	Ministry of Environment and Tourism
<b>mm/a</b>	Millimetres per annum
<b>MSDS</b>	Material Safety Data Sheet
<b>PC</b>	Physical/Chemical
<b>PPE</b>	Personal Protective Equipment
<b>ppm</b>	Parts per million
<b>SANS</b>	South African National Standards
<b>SC</b>	Sociological/Cultural
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>WHO</b>	World Health Organization



## **GLOSSARY OF TERMS**

**Alternatives** - A possible course of action, in place of another, that would meet the same purpose and need but which would avoid or minimize negative impacts or enhance project benefits. These can include alternative locations/sites, routes, layouts, processes, designs, schedules and/or inputs. The “no-go” alternative constitutes the ‘without project’ option and provides a benchmark against which to evaluate changes; development should result in net benefit to society and should avoid undesirable negative impacts.

**Assessment** - The process of collecting, organising, analysing, interpreting and communicating information relevant to decision making.

**Competent Authority** - means a body or person empowered under the local authorities act or Environmental Management Act to enforce the rule of law.

**Construction** - means the building, erection or modification of a facility, structure or infrastructure that is necessary for the undertaking of an activity, including the modification, alteration, upgrading or decommissioning of such facility, structure or infrastructure.

**Cumulative Impacts** - in relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

**Environment** - As defined in the Environmental Assessment Policy and Environmental Management Act - “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, palaeontological or social values”.

**Environmental Impact Assessment (EIA)** - process of assessment of the effects of a development on the environment.

**Environmental Management Plan (EMP)** - A working document on environmental and socio-economic mitigation measures, which must be implemented by several responsible parties during all the phases of the proposed project.

**Environmental Management System (EMS)** - An Environment Management System, or EMS, is a comprehensive approach to managing environmental issues, integrating environment-oriented thinking into every aspect of business management. An EMS ensures environmental considerations are a priority, along with other concerns such as costs, product quality, investments, PR productivity and strategic planning. An EMS generally makes a positive impact on a company’s bottom line. It increases efficiency and focuses on customer needs and marketplace conditions, improving both the company’s financial and environmental performance. By using an EMS to convert environmental problems into commercial opportunities, companies usually become more competitive.

**Evaluation** – means the process of ascertaining the relative importance or significance of information, the light of people’s values, preference and judgements in order to make a decision.

**Hazard** - Anything that has the potential to cause damage to life, property and/or the environment. The hazard of a particular material or installation is constant; that is, it would present the same hazard wherever it was present.

**Interested and Affected Party (IAP)** - any person, group of persons or organisation interested in, or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.

**Mitigate** - The implementation of practical measures to reduce adverse impacts.

**Proponent (Applicant)** - Any person who has submitted or intends to submit an application for an authorisation, as legislated by the Environmental Management Act no. 7 of 2007, to undertake an

activity or activities identified as a listed activity or listed activities; or in any other notice published by the Minister or Ministry of Environment & Tourism.

**Public** - Citizens who have diverse cultural, educational, political and socio-economic characteristics. The public is not a homogeneous and unified group of people with a set of agreed common interests and aims. There is no single public. There are a number of publics, some of whom may emerge at any time during the process depending on their particular concerns and the issues involved.

**Scoping Process** - process of identifying: issues that will be relevant for consideration of the application; the potential environmental impacts of the proposed activity; and alternatives to the proposed activity that are feasible and reasonable.

**Significant Effect/Impact** - means an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

**Stakeholder Engagement** - The process of engagement between stakeholders (the proponent, authorities and IAPs) during the planning, assessment, implementation and/or management of proposals or activities. The level of stakeholder engagement varies depending on the nature of the proposal or activity as well as the level of commitment by stakeholders to the process. Stakeholder engagement can therefore be described by a spectrum or continuum of increasing levels of engagement in the decision-making process. The term is considered to be more appropriate than the term “public participation”.

**Stakeholders** - A sub-group of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term therefore includes the proponent, authorities (both the lead authority and other authorities) and all interested and affected parties (IAPs). The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders.

**Sustainable Development** - “Development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs and aspirations” – the definition of the World Commission on Environment and Development (1987). “Improving the quality of human life while living within the carrying capacity of supporting ecosystems” – the definition given in a publication called “Caring for the Earth: A Strategy for Sustainable Living” by the International Union for Conservation of Nature (IUCN), the United Nations Environment Programme and the World Wide Fund for Nature (1991).

## 1 BACKGROUND AND INTRODUCTION

Geo Pollution Technologies (Pty) Ltd was appointed by Salz-Gossow (Pty) Ltd to undertake an environmental assessment for the proposed construction and operations of a concrete product manufacturing plant on Erf 604, Karibib Extension 1, in the Erongo Region (Figure 1). The site currently hosts a concrete manufacturing plant and it is proposed that the floor size of the existing plant be increased to accommodate the new plant and equipment required for the production of Type P2 concrete rail sleepers. Construction and upgrade of the factory will include:

- ◆ Site clearing, preparation and earthworks;
- ◆ Civil works required for new infrastructure;
- ◆ Construction of infrastructure for the factory including a factory building (1,800 m<sup>2</sup> portal steel frame shed), concrete sleeper moulds, batching plant, a consumer fuel installation and cement silos;
- ◆ Installation of associated electrical, water and sewerage utilities;
- ◆ Installation of spill control infrastructure.

Operations of the factory and related infrastructure will include:

- ◆ Receiving raw materials sourced from commercial sources;
- ◆ Production of concrete and casting of concrete rail sleepers;
- ◆ Operations of a consumer fuel installation;

A risk assessment was undertaken to determine the potential impact of the construction, operational and possible decommissioning phases of the project on the environment. The environment being defined in the Environmental Assessment Policy and 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 environmental assessment was conducted to apply for an environmental clearance certificate in compliance with Namibia’s Environmental Management Act (Act No 7 of 2007) (EMA).

**Project Justification** – The upgrade of railways in Namibia forms an integral part of the Port of Walvis Bay’s aim to become the best performing world class port in Africa, by ultimately linking the port with neighbouring land-locked countries via road and rail. More reliable and safe rail infrastructure will increase reliance on rail transport and thus reduce the volume of trucks travelling along the Namibian roads. To upgrade the railways, high quality concrete railway sleepers are required. The local production of sleepers will ensure a reliable supply during the upgrade process. This will also result in local value addition, reduce production cost, and aid in revenue and employment generation.

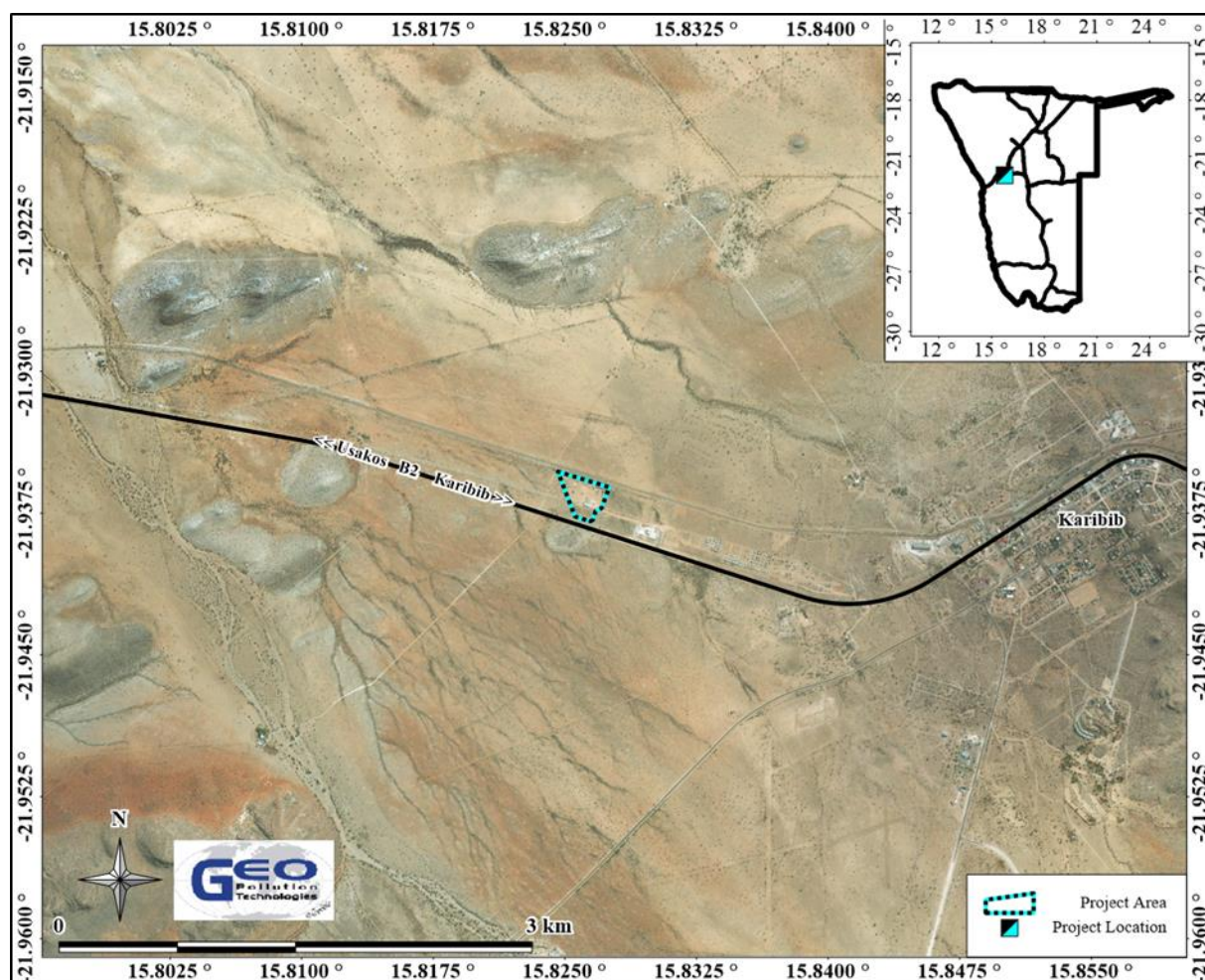
Benefits of the facility will include:

- ◆ Reliable supply of concrete rail sleeper for the upgrade of railways,
- ◆ Employment and skills development,
- ◆ Increase in economic resilience in the area through diversification of business activities and opportunities.

## 2 SCOPE

The scope of the environmental assessment is to:

1. Determine the potential environmental impacts emanating from the construction, operational and possible decommissioning activities of the factory and related infrastructure,
2. Identify a range of management actions which could mitigate the potential adverse impacts to acceptable levels,
3. Comply with the requirements of EMA,
4. Provide sufficient information to the relevant competent authority and MET to make an informed decision regarding the construction, operations and possible decommissioning of the facility.



**Figure 1. Project location**

### 3 METHODOLOGY

The following methods were used to investigate the potential impacts on the social and natural environment due to the construction and operations of the facility:

1. Baseline information about the site and its surroundings was obtained from primary information, existing secondary information as well as from a reconnaissance site visit.
2. As part of the scoping process to determine potential environmental impacts, interested and affected parties (IAPs) were consulted about their views, comments and opinions all of which are presented in this report.
3. Potential environmental impacts emanating from the construction, operations and decommissioning of the facility were determined and possible enhancement measures were listed for positive impacts while mitigation / preventative measures were provided for negative impacts.
4. As per the findings of this scoping report, an environmental management plan (EMP) was incorporated into this report to be submitted to the Ministry of Environment and Tourism (MET).

### 4 FACILITY OPERATIONS AND RELATED ACTIVITIES

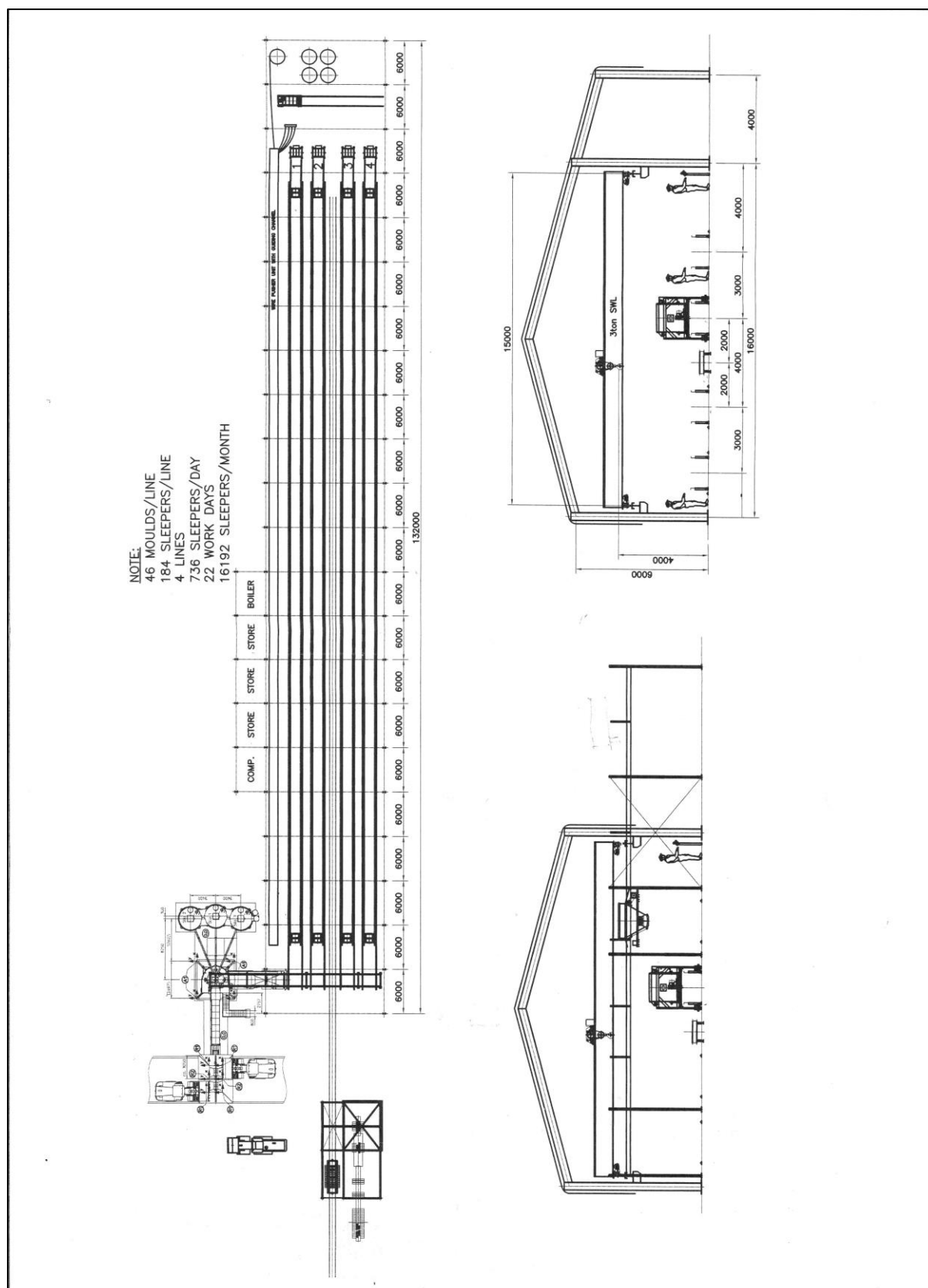
It is anticipated that the upgrades and construction of the factory will commence once an environmental clearance certificate has been issued by the MET and the various additional permits and licences, (such as per the Ministry of Mines and Energy), have been issued by the various regulatory bodies.

#### **4.1 PROJECT INFRASTRUCTURE**

The existing concrete factory is situated adjacent to the B2 trunk road. The current factory building will be upgraded from 800 m<sup>2</sup> floor size to 1,800 m<sup>2</sup>. The location is within the townlands of Karibib and is accessed from an internal road structure linking up with the B2 trunk road.

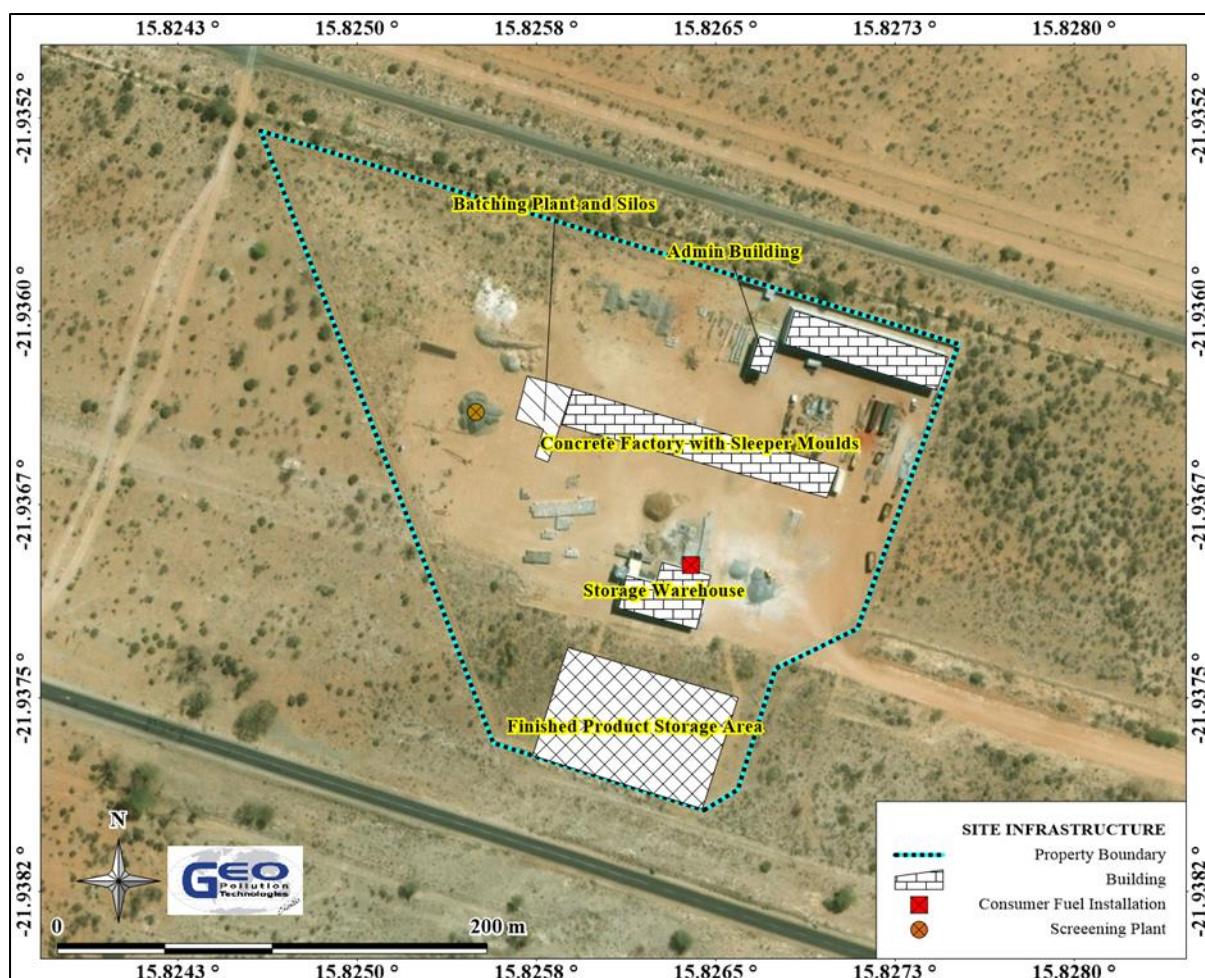
The factory will be upgraded to allow monthly casting of an estimated 2,000 m<sup>3</sup> of concrete. Concrete will mainly be used for the production of Type P2 concrete rail sleepers. The upgraded building will include a concrete batching plant, Type P2 concrete sleeper moulds and a pre-tensioning plant. Additional infrastructure required will be two cement silos with 80 ton capacity each, a screening plant where gravel will be sorted, and a consumer fuel installation consisting of three aboveground diesel tanks with a 4 m<sup>3</sup> capacity each. The cement silos will be fitted with filters on the ventilator cones to ensure dust created during the filling of the silos is effectively filtered. An example of the proposed design of the consumer fuel installation can be seen in Photo 3, minor changes may however be made during finalisation of the design. The installation will conform to the typical designs of consumer fuel installations in Namibia. It will adhere to all Namibian legislation and to relevant South African National Standards (SANS), ensuring safety and environmental protection. Fire extinguishers and emergency stops will be placed throughout the facility and within easy reach.

Existing ablution facilities will be upgraded to accommodate the increase of employment. Electricity is sourced from Erongo Red and required infrastructure is already in place. Water will be sourced from the Karibib Water Supply Scheme via the Karibib Town Council reticulation system.



**Figure 2. Proposed Factory Layout**





**Figure 3. General proposed layout**

## 4.2 OPERATIONAL ACTIVITIES

Operations of the concrete manufacturing plant mainly involves the receipt of raw materials on a daily basis (estimated fifteen 20 ton truck loads), concrete mixing and casting of concrete rail sleepers, and operations of the consumer fuel installation. Gravel will be sourced from nearby mines and sorted to size in an onsite screening plant. Any unused materials will be returned to the mine. Cement will be sourced from cement producers in Otjiwarongo. The main operational activities associated with the consumer fuel installation will include the dispensing of diesel to fleet vehicles by an attendant. Diesel will be delivered to the storage tank with fuel tanker trucks. Regular tank dips and reconciliation of fuel volumes will be performed. This will ensure early detection of a leak, if present.

Raw materials and water will be mixed and a concrete plasticiser added in the batching plant. It will then be directly casted into 110 l Type P2 concrete sleeper moulds. The moulds will then be mechanically vibrated to remove all air pockets, and then left for 8 hours to cure. Once cured, the sleepers are removed and the moulds cleaned and oiled with P2 mould release oil before the process is repeated. The rags used to apply the oil to the moulds will be disposed of as hazardous waste when no longer in use. For the estimated 2,000 m<sup>3</sup> of concrete produced per month an estimated volume of 300 m<sup>3</sup> of water is required. Of this volume of water 20% will be reused.

Additional operations include the daily activities associated with managing the facility as well as general care and maintenance of the property. Any domestic waste produced will be stored in a temporary waste storage area. From here it will be removed regularly and transported for disposal at an approved municipal waste disposal facility. Hazardous waste such as contaminated rugs, empty chemical containers etc. will be disposed of at an approved hazardous waste disposal facility. The facility will provide employment to around 20 people.



**Photo 1. Project area with current infrastructure**



**Photo 2. Current infrastructure: screen plant and warehouse**



**Photo 3. Consumer fuel installation (to be replaced)**



**Photo 4. Site entrance**

## **5 ALTERNATIVES TO THE PROPOSED FACILITY**

Proposed upgrades and expansion will be done on an existing facility on erf 604, thus no alternative location is proposed for the facility. Since the consumer fuel installation must adhere to SANS standards or better no alternatives in design parameters adhering to SANS is proposed. From an environmental perspective the environmental assessment did not find any reason why the facility may not be established at this site, on condition that the consumer fuel installation complies with SANS standards or better and the facility complies with regulations and standards prescribed by Namibian legislation. Relevant permission from the authorities on the design of the facility and its entrance / exit locations is also required.

## **6 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 1 to Table 3 govern the environmental assessment process in Namibia and/or are relevant to the factory.

**Table 1. Namibian law applicable to the factory and related infrastructure**

<b>Law</b>	<b>Key Aspects</b>
<b>The Namibian Constitution</b>	<ul style="list-style-type: none"> <li>◆ Promote the welfare of people</li> <li>◆ Incorporates a high level of environmental protection</li> <li>◆ Incorporates international agreements as part of Namibian law</li> </ul>
<b>Environmental Management Act</b> Act No. 7 of 2007, Government Notice No. 232 of 2007	<ul style="list-style-type: none"> <li>◆ Defines the environment</li> <li>◆ Promote sustainable management of the environment and the use of natural resources</li> <li>◆ Provide a process of assessment and control of activities with possible significant effects on the environment</li> </ul>
<b>Environmental Management Act Regulations</b> Government Notice No. 28-30 of 2012	<ul style="list-style-type: none"> <li>◆ Commencement of the Environmental Management Act</li> <li>◆ List activities that requires an environmental clearance certificate</li> <li>◆ Provide Environmental Impact Assessment Regulations</li> </ul>
<b>Petroleum Products and Energy Act</b> Act No. 13 of 1990, Government Notice No. 45 of 1990	<ul style="list-style-type: none"> <li>◆ Regulates petroleum industry</li> <li>◆ Makes provision for impact assessment</li> <li>◆ Petroleum Products Regulations (Government Notice No. 155 of 2000) <ul style="list-style-type: none"> <li>○ Prescribes South African National Standards (SANS) or equivalents for construction, operation and decommissioning of petroleum facilities (refer to Government Notice No. 21 of 2002)</li> </ul> </li> </ul>
<b>The Water Act</b> Act No. 54 of 1956	<ul style="list-style-type: none"> <li>◆ Remains in force until the new Water Resources Management Act comes into force</li> <li>◆ Defines the interests of the state in protecting water resources</li> <li>◆ Controls water abstraction and the disposal of effluent</li> <li>◆ Numerous amendments</li> </ul>
<b>Water Resources Management Act</b> Act No. 11 of 2013	<ul style="list-style-type: none"> <li>◆ Provide for management, protection, development, use and conservation of water resources</li> <li>◆ Prevention of water pollution and assignment of liability</li> <li>◆ Not in force yet</li> </ul>
<b>Local Authorities Act</b> Act No. 23 of 1992, Government Notice No. 116 of 1992	<ul style="list-style-type: none"> <li>◆ Define the powers, duties and functions of local authority councils</li> <li>◆ Regulates discharges into sewers</li> </ul>
<b>Public Health Act</b> Act No. 36 of 1919	<ul style="list-style-type: none"> <li>◆ Provides for the protection of health of all people</li> </ul>
<b>Public and Environmental Health Act</b> Act No. 1 of 2015, Government Notice No. 86 of 2015	<ul style="list-style-type: none"> <li>◆ Provides a framework for a structured more uniform public and environmental health system, and for incidental matters</li> <li>◆ Deals with Integrated Waste Management including waste collection disposal and recycling; waste generation and storage; and sanitation.</li> </ul>

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

**Table 2. Relevant multilateral environmental agreements for Namibia and the development**

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

**Table 3. Standards or Codes of Practise**

<b>Standard or Code</b>	<b>Key Aspects</b>
<b>South African National Standards (SANS)</b>	<ul style="list-style-type: none"> <li>The Petroleum Products and Energy Act prescribes SANS standards for the construction, operations and demolition of petroleum facilities.</li> <li>SANS 10089-3:2010 is specifically aimed at storage and distribution of petroleum products at fuel retail facilities and consumer installations. <ul style="list-style-type: none"> <li>Provide requirements for spill control infrastructure</li> </ul> </li> </ul>

The facility is listed as an activity requiring an environmental clearance certificate 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.”
- ◆ 9.2 “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.”
- ◆ 9.5 “Construction of filling stations or any other facility for the underground and aboveground storage of dangerous goods, including petrol, diesel, liquid, petroleum, gas or paraffin.”

## 7 ENVIRONMENTAL CHARACTERISTICS

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

### 7.1 LOCALITY AND SURROUNDING LAND USE

The proposed upgrades and installation of new infrastructure will remain on erf 604, Karibib Extension 1 in the Erongo Region (18.0658 °S, 13.8480 °E) (Figure 1). Access to the site is from an internal road structure, linking to the B2 Trunk Road at an official junction. Surrounding properties are sparsely developed or undeveloped and no neighbouring houses or developed areas are present directly adjacent to the erf. To the north of the site is a railway and to the south is the B2 Trunk Road. The project area itself, as well as the area east of the project location is zoned for light industrial use (Figure 4), whereas the area north and further west of the project location has been identified for possible future high density residential areas (Karibib Urban Structure Plan, 2016). The site falls under the authority of the Karibib Town Council.

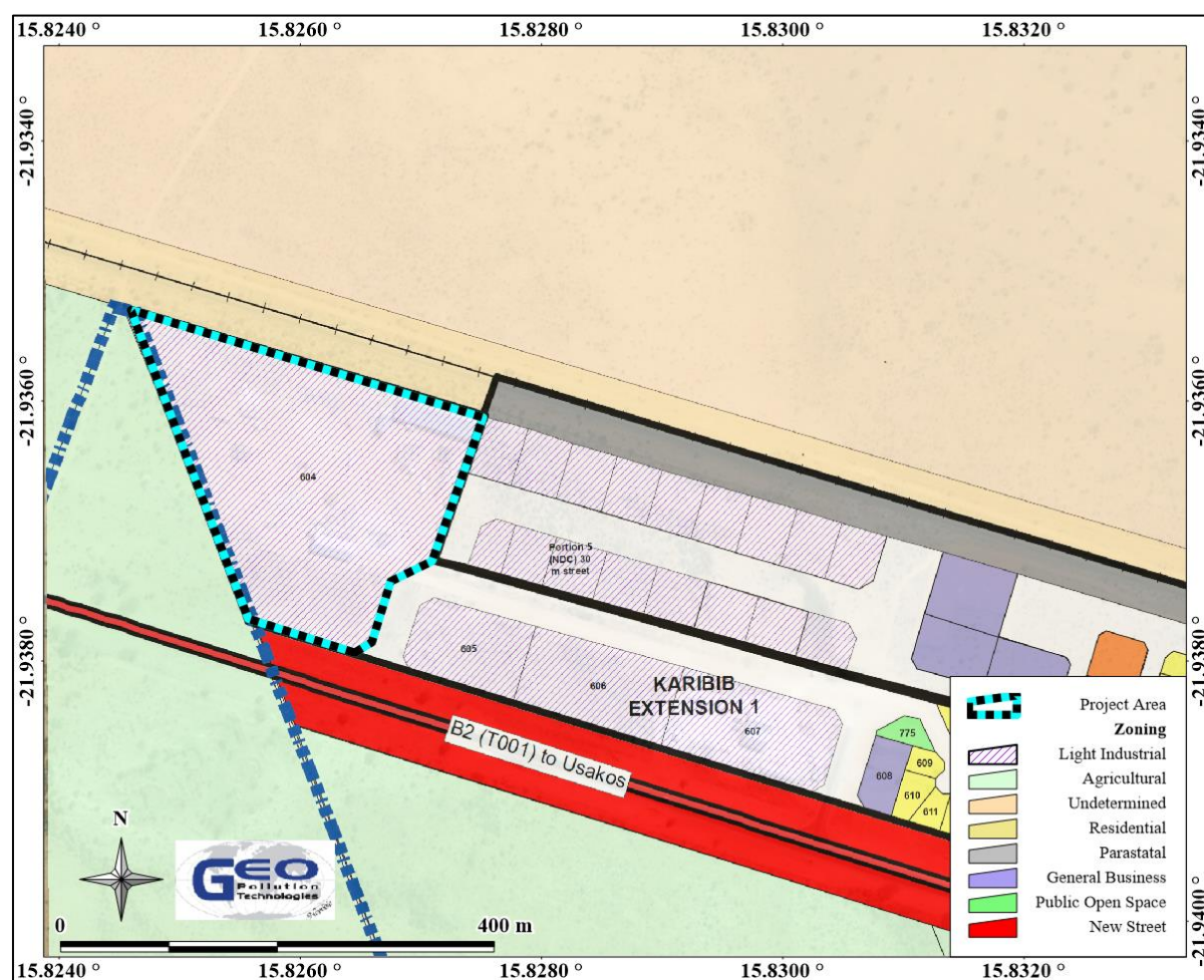


Figure 4. Surrounding land use (Stubenrauch Planning Consultants, 2017)

***Implications and Impacts***

Erf 604 is currently zoned for light industrial use. It is situated in an area with mixed land use comprising mostly of industrial use with no developed properties directly adjacent to the project area. Being a relatively low impact establishment, no significant land use impact is expected.



**Photo 5. View from the site entrance to the North**



**Photo 6. View from the site entrance to the East**



**Photo 7. View from site to the South (B2 Trunk Road)**



**Photo 8. View from the site to the West**

## **7.2 CLIMATE**

The project area is situated in the eastern outskirts of Karibib, in central Namibia. The climate for the area is dominated by frequent droughts and high temperatures in the summer. Rainfall in this region is very sparse and occur mostly between November and April, peaking mostly in January, whilst May to October have little or no rainfall (Figure 3). The rainfall has a high variability of duration and intensity, causing variable recharge in the area. There is a high net evaporation caused by the low variable rainfall and high temperatures. December to February are the hottest months, with a mean maximum temperature of 34 °C, while the coldest month is July with a mean minimum temperature of 4 °C (Meteoblue, 2019). See Table 1 for summary of climate data.

The aridity of the region causes water resources to be a scarce commodity that has to be conserved and protected from pollution. Groundwater is an important source of water in Namibia.

**Table 4. Summary of climate data for the area (Atlas of Namibia)**

Average annual rainfall (mm/a)						200 – 250					
Variation in annual rainfall (%)						50 – 60					
Average annual evaporation (mm/a)						3,200 – 3,400					
Water deficit (mm/a)						2,100 – 2,300					
Average annual temperatures (°C)						>22					
Average Monthly Rainfall (mm)											
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
0.0	0.5	1.1	4.7	11.9	11.6	50.3	52.4	59.2	17.7	1.8	1.2

Average Monthly Rainfall (mm)

Month	Rainfall (mm)
Jul	0.0
Aug	0.5
Sep	1.1
Oct	4.7
Nov	11.9
Dec	11.6
Jan	50.3
Feb	52.4
Mar	59.2
Apr	17.7
May	1.8
Jun	1.2

**Figure 5. Monthly average rainfall*****Implications and Impacts***

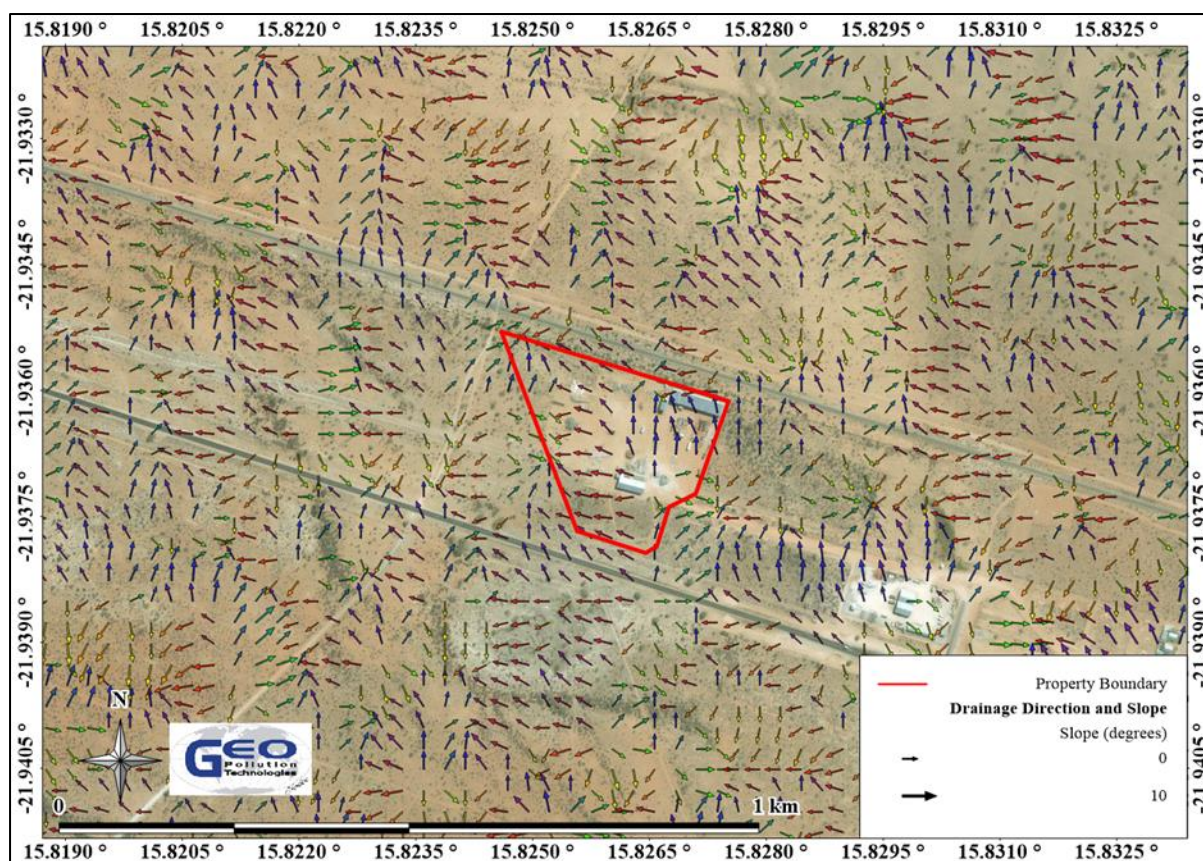
Water is a scarce and valuable resource in Namibia and the extreme variability in seasonal rainfall makes water an extremely vulnerable resource. Rainfall events are typically thunderstorms with heavy rainfall that can occur in short periods of time (cloud bursts). The consumer fuel installation must meet all prescribed SANS requirements and therefore should not pose any environmental threat due to Namibia's climatic conditions. Water resources would thus be safe under typical conditions and expected extremes.

**7.3 TOPOGRAPHY AND DRAINAGE**

The greater area's topography is described as an area of dissection and erosional cutback. Karibib is located within the catchment of the Swakop River, an ephemeral river, draining in a western direction towards the Atlantic Ocean.

The project area itself is relatively flat and slopes slightly towards the northwest. Surface runoff is expected to be in a north-western direction. A map showing surface drainage directions can be seen in Figure 6.





**Figure 6. Drainage direction and slope**

#### ***Implications and Impacts***

There are no topographical features which may impact, or be impacted by, the proposed operations. Any pollutants that are not contained and are transported via surface water flow, will flow out of the site and potentially pollute the natural environment.

#### **7.4 GEOLOGY AND HYDROGEOLOGY**

The dominant surface soil cover in the area is petric Calcisols. Geological formations in the area consist mainly of alluvium, sand, gravel and calcrete of the Quaternary Age. This is underlain by either the Karibib Formation or the Arandis Formation, both belonging to the Swakop Group. The Karibib Formation comprises of bluish-grey calcitic marbles, beige to bright white dolomitic marbles and banded calc-silicate felses of a reddish brown colour. Thin horizons of cordierite-biotite schists also occur in the formation. Two members of the Arandis Formation may be present, namely the younger Oberwasser Member and the older Okawayo Member. The Oberwasser Member comprises of dark grey biotite and biotite cordierite schists, calc-silicate felses, minor carbonate breccia horizons, including glaciomarine pelites and dropstone units of the Ghaup Formation and interbedded amphibolites of the Daheim Member in the upper parts of the unit. The Okawayo Member comprises of calcitic and dolomitic marbles and intercalated calc-silicate felses, locally intruded by mafic sills and dykes (Vietz, 2009).

The project location is situated in the Erongo Groundwater Basin. The underlying formations are classified as hard rock formations. Groundwater flow would be mostly along fractures, faults (secondary porosity) and other geological structures present within the formations, but also through primary deposits in the cover material (Figure 7). According to the borehole data of the Department of Water Affairs (DWA), as seen in Table 5, there are at least thirty-one known boreholes within a 5 km radius around the study area. The average expected depth of the groundwater is 59 m below surface, but can be as shallow as 28 m below surface. The project



location falls outside a water control area, but groundwater remains the property of the Government of Namibia.

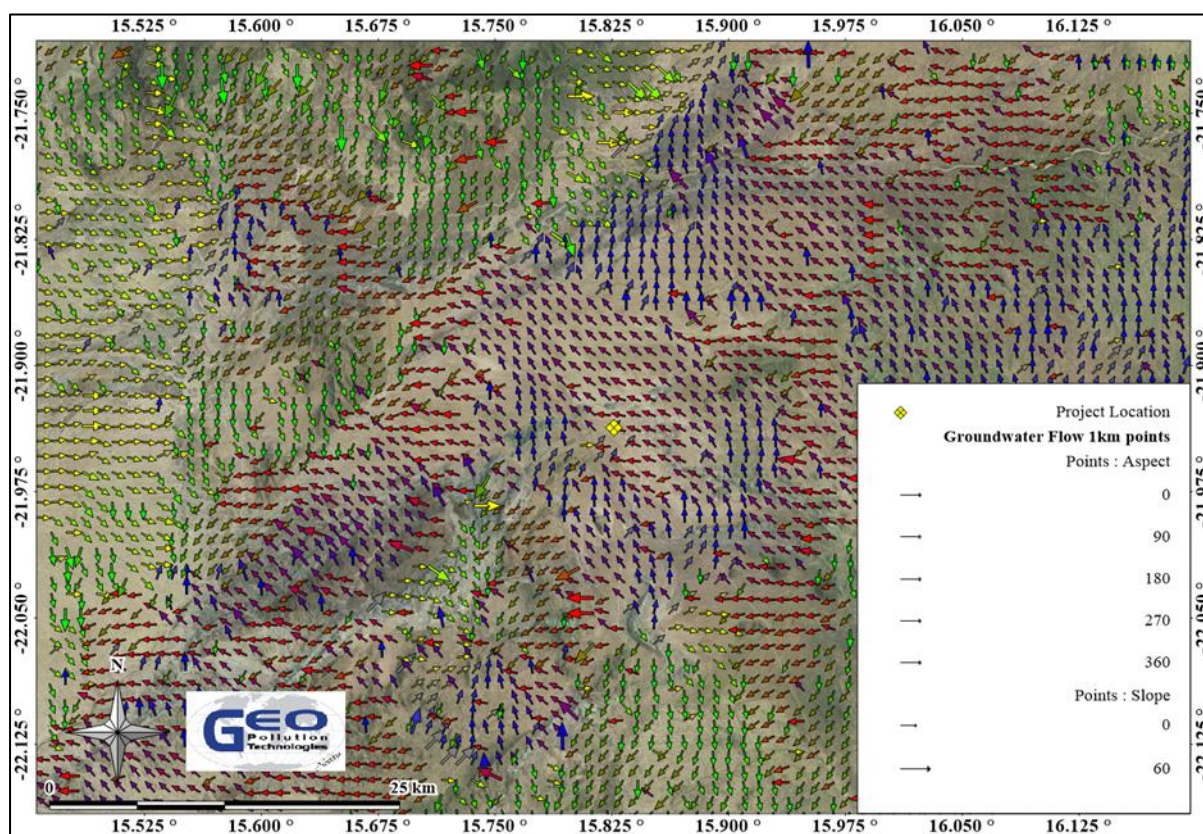


Figure 7. Inferred groundwater flow

Table 5. Groundwater borehole statistics for the area

Query Centre: Salz-Gossow Concrete Plant; -21.9367°S; 15.8262°E		Query Box Radius: 5.0km									
	NUMBER OF KNOWN BOREHOLES	LATITUDE	LONGITUDE	DEPTH (mbs)	YIELD (m <sup>3</sup> /h)	WATER LEVEL (mbs)	WATER STRIKE (mbs)	TDS (ppm)	SULPHATE (ppm)	NITRATE (ppm)	FLUORIDE (ppm)
Data points	31			21	13	5	4	2	2	2	2
Minimum		-21.891704	15.777692	28	0	18	20	945	72	17	0
Average				59	3	23	81	1268	127	25	1
Maximum		-21.981696	15.874708	92	10	35	228	1590	181	33	1
Group A				42.86%	0.00%	0.00%	0.00%	50.00%	100.00%	0.00%	100.00%
Limit				50	>10	10	10	1000	200	10	1.5
Group B				57.14%	30.77%	100.00%	75.00%	0.00%	0.00%	50.00%	0.00%
Limit				100	>5	50	50	1500	600	20	2.0
Group C				0.00%	15.38%	0.00%	0.00%	50.00%	0.00%	50.00%	0.00%
Limit				200	>0.5	100	100	2000	1200	40	3.0
Group D				0.00%	53.85%	0.00%	25.00%	0.00%	0.00%	0.00%	0.00%
Limit				>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 B: Water with acceptable quality

Group C: Water with low health risk

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

### Implications and Impacts

Groundwater in the area remains an important resource that would be at risk if fuel spills are not contained, cleaned and disposed of properly.

## 7.5 PUBLIC WATER SUPPLY

The main source of water is supplied to Karibib from the Swakoppoort reservoir. The raw water is supplied by NamWater and then treated by a water treatment plant situated in town and stored in a reservoir for further distribution. The town council is further investigating possible groundwater resources in the area, to augment current supply, should the need arise.

### *Implications and Impacts*

Groundwater remains an important resource and would be at risk if fuel spills are not contained, cleaned and disposed of properly. Water usage of the factory may impact on the water availability.

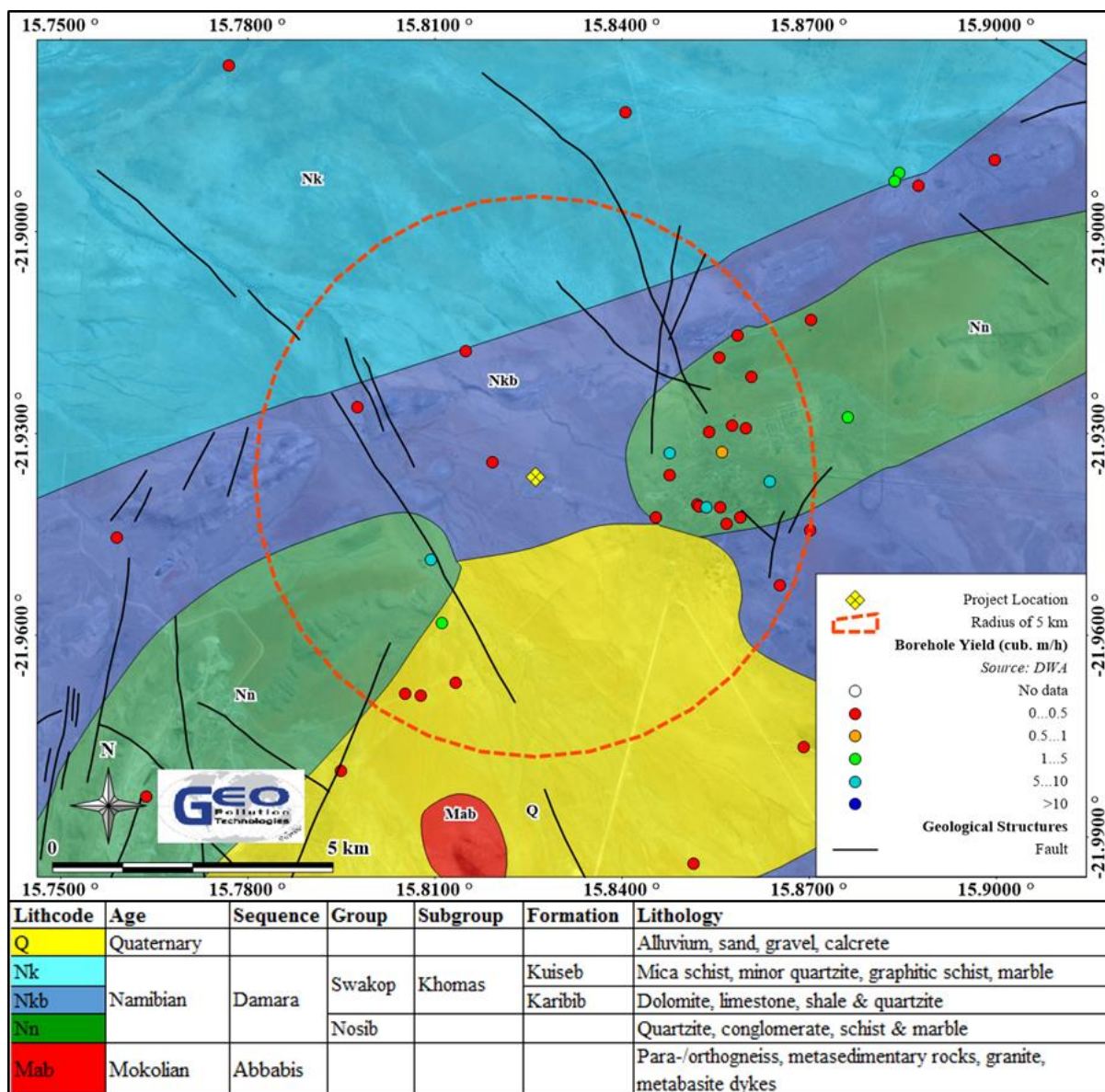


Figure 8. Geology map

## 7.6 FAUNA AND FLORA

Karibib lies in the Savanna biome with a western highlands type vegetation. Trees and plants such as *Acacia reficiens*, *Commiphora spp.*, *Euphorbia guerichiana* and a variety of other species are characteristic of this zone. Table 6 and Table 7 and present a summary of the general fauna and flora of the broader area.

The project area is an active site and has previously been cleared of all vegetation (see Photo 5). No animals of particular significance are expected on site and mostly include birds, small mammals, lizzards and arthropods. No significant impact on the fauna and flora is thus expected from the construction and future operations of the factory.

**Table 6. General flora data (Atlas of Namibia)**

<b>Biome</b>	Savanna
<b>Biome</b>	Savanna
<b>Vegetation type</b>	Western highlands
<b>Vegetation structure type</b>	Sparse shrubland
<b>Diversity of higher plants</b>	Medium (Diversity rank = 4 [1 to 7 representing highest to lowest diversity])
<b>Number of plant species</b>	150 - 300
<b>Percentage tree cover</b>	2-10
<b>Tree height (m)</b>	2-5
<b>Percentage shrub cover</b>	11-25
<b>Shrub height (m)</b>	0.5-2
<b>Percentage dwarf shrub cover</b>	2-10
<b>Dwarf shrub height (m)</b>	< 0.5
<b>Percentage grass cover</b>	2-10
<b>Grass height (m)</b>	< 0.5
<b>Dominant plant species 1</b>	<i>Acacia reficiens</i>
<b>Dominant plant species 2</b>	<i>Commiphora species</i>
<b>Dominant plant species 3</b>	<i>Euphorbia guerichiana</i>
<b>Dominant plant species 4</b>	<i>Maerua schinzii</i>
<b>Dominant plant species 5</b>	<i>Adenolobus garipensis</i>

**Table 7. General fauna data (Atlas of Namibia)**

<b>Mammal Diversity</b>	61 - 75 Species
<b>Rodent Diversity</b>	16 - 19 Species
<b>Bird Diversity</b>	171 - 200 Species
<b>Reptile Diversity</b>	71 - 80 Species
<b>Snake Diversity</b>	30 - 34 Species
<b>Lizard Diversity</b>	32 - 35 Species
<b>Frog Diversity</b>	4 - 7 Species
<b>Termite Diversity</b>	7 - 9 Genera
<b>Scorpion Diversity</b>	16 - 17 Species



***Implications and Impacts***

The proposed upgrades will be done on a site currently operated on, which is clear of all vegetation. Thus, no immediate threat to biodiversity in the area is expected. However, uncontrolled pollution may and can cause damage to any biodiversity surrounding the site.

**7.7 DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS**

The project area falls within the Erongo Region with a population of 150,809 (Namibia Statistics Agency, 2011). This increased from the 107,663 in 2001, resulting in an annual population increase of 3.4%. Employment in the Erongo Region is mainly from the fishing and agriculture industry (11.5% regionally and 2% nationally), the mining industry (11.7%) and manufacturing (11.5%). Unemployment in the Erongo region is 22.6%.

At local scale the project area falls in the town Karibib which has a population of 5,132 and a density of 49.2 people/km<sup>2</sup>.

**Table 8. Demographic characteristics of Karibib Constituency, the Erongo Region and nationally (Namibia Statistics Agency, 2011)**

	<b>Karibib Constituency</b>	<b>Erongo Region</b>	<b>Namibia</b>
<b>Population (Males)</b>	6,400	79,823	1,021,912
<b>Population (Females)</b>	6,900	70,986	1,091,165
<b>Population (Total)</b>	13,300	150,809	2,113,077
<b>Unemployment (15+ years)</b>		22.6%	33.8%
<b>Literacy (15+ years)</b>		96.7%	87.7%

***Implications and Impacts***

The facility will provide employment to people from the area. Some skills development and training also benefit employees during the operational phase.

**7.8 CULTURAL, HERITAGE AND ARCHAEOLOGICAL ASPECTS**

There are no churches, mosques or related buildings in close proximity to the site. No known archaeological resources have been noted in the vicinity since the development of the area. No other structures, sites or spheres of heritage of cultural significance was determined to be in close proximity to the site.

***Implications and Impacts***

No implications or expected impacts as the project area has previously been developed.

**8 PUBLIC CONSULTATION**

Consultation with the public forms an integral component of an environmental assessment investigation and enables interested and affected parties (IAPs) e.g. neighbouring landowners, local authorities, environmental groups, civic associations and communities, to comment on the potential environmental impacts associated with the proposed facility and to identify additional issues which they feel should be addressed in the environmental assessment.

Public participation notices were advertised twice in two weeks in the national papers The Namibian Sun and Die Republikein on the 8<sup>th</sup> and 15<sup>th</sup> of January 2020 respectively. A site notice was placed on site. As none of the neighbouring properties are currently developed, neighbouring landowners were contacted by telephone and notification letters emailed to them. The Karibib Town Council was notified by hand delivery of a notification letter. A background information document was loaded onto the MET electronic system as well as made available to commenting authorities and IAP. No one registered as IAPs and no comments or concerns were received. See Appendix A for all proof of the public participation processes.

## 9 MAJOR IDENTIFIED IMPACTS

During the scoping exercise a number of potential environmental impacts have been identified. The following section provides a brief description of the most important of these impacts.

### 9.1 HYDROCARBON POLLUTION

This section describes the most pertinent potential pollution impacts that are expected from the factory and related operations. Groundwater and soil pollution from hydrocarbon products are major issues associated with the storage and handling of hydrocarbon products. Both forms of pollution are prohibited in Namibia.

When a release of hydrocarbon products takes place to the soil, the Light Non-Aqueous Phase Liquids (LNAPL) will infiltrate into the soil and start to migrate vertically. LNAPL transport in the subsurface environment occurs in several phases, including bulk liquid, dissolved, and vapour phases. Mechanisms that influence transport include the physicochemical properties of the specific compounds present such as density, vapour pressure, viscosity, and hydrophobicity, as well as the physical and chemical properties of the subsurface environment, including geology and hydrogeology. Hydrocarbon liquids are typically complex mixtures composed of numerous compounds, each with its own individual physicochemical and, therefore, transport properties.

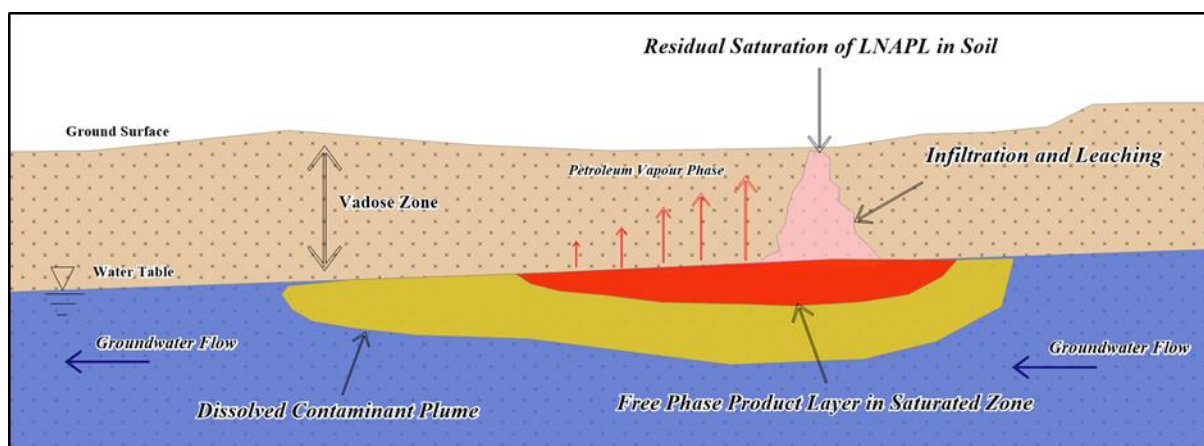
If small volumes of spilled LNAPL enter the unsaturated zone (i.e. vadose zone), the LNAPL will flow through the central portion of the unsaturated pores until residual saturation is reached. A three-phase system consisting of water, LNAPL, and air is formed within the vadose zone. Infiltrating water dissolves the components within the LNAPL (e.g., benzene, xylene, and toluene) and transports them to the water table. These dissolved contaminants form a contaminated plume radiating from the area of the residual product. Many components found in LNAPL are volatile and can partition into soil air and be transported by molecular diffusion to other parts of the aquifer. As these vapours diffuse into adjoining soil areas, they may partition back into the water phase and transfer contamination over wider areas. If the soil surface is relatively impermeable, vapours will not diffuse across the surface boundary and concentrations of contaminants in the soil atmosphere may build up to equilibrium conditions. However, if the surface is not covered with an impermeable material, vapours may diffuse into the atmosphere.

If large volumes of LNAPL are spilled, the LNAPL flows through the pore space to the top of the capillary fringe of the water table. Dissolved components of the LNAPL precede the less soluble components and may change the wetting properties of the water, causing a reduction in the residual water content and a decrease in the height of the capillary fringe.

Since LNAPL are lighter than water, it will float on top of the capillary fringe. As the head formed by the infiltrating LNAPL increases, the water table is depressed and the LNAPL accumulate in the depression. If the source of the spilled LNAPL is removed or contained, LNAPL within the vadose zone continue to flow under the force of gravity until reaching residual saturation. As the LNAPL continue to enter the water table depression, it spread laterally on top of the capillary fringe. The draining of the upper portions of the vadose zone reduces the total head at the interface between the LNAPL and the groundwater, causing the water table to rebound slightly. The rebounding water displaces only a portion of the LNAPL because the LNAPL remain at residual saturation. Groundwater passing through the area of residual saturation dissolves constituents of the residual LNAPL, forming a contaminant plume. Water infiltrating from the surface also can dissolve the residual LNAPL and add to the contaminant load of the aquifer.

Decrease in the water table level from seasonal variations may lead to dropping of the pool of LNAPL. If the water table rises again, part of the LNAPL may be pushed up, but a portion remains at residual saturation below the new water table. Variations in the water table height, therefore, can spread LNAPL over a greater thickness of the aquifer, causing larger volumes of aquifer materials to be contaminated.

Hydrocarbon products do biodegrade in the subsurface, although the effectiveness of this process depends on subsurface conditions. The type of hydrocarbon product plays a further role in the duration of biodegradation, with the longer chain components taking much longer to biodegrade.



**Figure 9. Conceptual LNAPL release to the vadose zone**

## 9.2 NOISE IMPACTS

Noise will be generated during the construction and operational phase of the factory due to large trucks and machinery working on site. Although the facility currently has no direct neighbours, future developments may include residential properties adjacent to the project area. Noise impacts may result in nuisance to possible future neighbours as well as hearing loss off personnel on site.

## 9.3 TRAFFIC IMPACTS

During construction and operations some traffic impacts can be experienced in the vicinity of the factory. Traffic flow along the B2 trunk road may be impacted by delivery trucks bringing raw materials to the site, as well as the transport of final product from the site, potentially resulting in incidents such as collisions if proper management measures are not in place. A slight increase in the cumulative use of the existing roads may be expected. Access to the site is however from an internal road structure within the industrial area, and the access to the internal road via the B2 Trunk Road is well designed to prevent traffic impacts as a result of heavy vehicles at the turn-off.

## 9.4 FIRE

Chemicals and paints used during construction may be flammable. Machinery like welders and grinders can cause sparks that can cause fires. Only diesel is currently stored on site. Diesel is not as flammable as more volatile fuels. The risk of fire is thus low if Material Safety Data Sheet instructions and SANS requirements are followed.

## 9.5 HEALTH AND SAFETY

Construction activities and working at heights have inherent health risks. Hydrocarbons are carcinogenic and dermal contact and inhalation of fumes should be prevented. Operations in the factory, such as moving machinery and heavy equipment, poses health risks to employees.

## 9.6 ECOSYSTEM AND BIODIVERSITY IMPACT

As the proposed location is void of all vegetation, impacts will mostly be related to pollution of the environment. Pollution of the environment and groundwater, especially by fuel, can deteriorate the ecosystem structure and function.

## 9.7 AIR QUALITY

Dust will be generated during the construction phase as a result of excavation and heavy vehicles accessing the site. During the operational phase, dust will be generated from delivery trucks travelling along the gravel roads, as well as from the offloading and mixing of concrete materials.

## 9.8 SOCIO-ECONOMIC IMPACTS

Construction and operational activities related to the upgrade of the factory will provide additional employment opportunities in the region. The operational phase will create permanent employment opportunities (estimated 30 additional positions) and some training and skills development will take place. Social ills including spread of disease, alcohol misuse, theft, etc. may result from construction personnel moving into the area or due to the larger workforce if employees are not sourced locally.

# 10 ASSESSMENT AND MANAGEMENT OF IMPACTS

The purpose of this section is to assess and identify the most pertinent environmental impacts that may be expected from the construction, operational, and potential decommissioning activities of the facility. An EMP based on these identified impacts is also incorporated into this section.

For each impact an environmental classification was determined based on an adapted version of the Rapid Impact Assessment Method (Pastakia, 1998). Impacts are assessed according to the following categories: Importance of condition (A1); Magnitude of Change (A2); Permanence (B1); Reversibility (B2); and Cumulative Nature (B3) (see Table 9)

Ranking formulas are then calculated as follow:

Environmental Classification =  $A1 \times A2 \times (B1 + B2 + B3)$

The environmental classification of impacts is provided in Table 10.

The probability ranking refers to the probability that a specific impact will happen following a risk event. These can be improbable (low likelihood); probable (distinct possibility); highly probable (most likely); and definite (impact will occur regardless of prevention measures).

**Table 9. Assessment criteria**

Criteria	Score
<b>Importance of condition (A1) – assessed against the spatial boundaries of human interest it will affect</b>	
Importance to national/international interest	4
Important to regional/national interest	3
Important to areas immediately outside the local condition	2
Important only to the local condition	1
No importance	0
<b>Magnitude of change/effect (A2) – measure of scale in terms of benefit / disbenefit of an impact or condition</b>	
Major positive benefit	3
Significant improvement in status quo	2
Improvement in status quo	1
No change in status quo	0
Negative change in status quo	-1
Significant negative disbenefit or change	-2
Major disbenefit or change	-3
<b>Permanence (B1) – defines whether the condition is permanent or temporary</b>	
No change/Not applicable	1
Temporary	2

Permanent	3
<b>Reversibility (B2) – defines whether the condition can be changed and is a measure of the control over the condition</b>	
No change/Not applicable	1
Reversible	2
Irreversible	3
<b>Cumulative (B3) – reflects whether the effect will be a single direct impact or will include cumulative impacts over time, or synergistic effect with other conditions. It is a means of judging the sustainability of the condition – not to be confused with the permanence criterion.</b>	
Light or No Cumulative Character/Not applicable	1
Moderate Cumulative Character	2
Strong Cumulative Character	3

**Table 10. Environmental classification (Pastakia 1998)**

Environmental Classification	Class Value	Description of Class
72 to 108	5	Extremely positive impact
36 to 71	4	Significantly positive impact
19 to 35	3	Moderately positive impact
10 to 18	2	Less positive impact
1 to 9	1	Reduced positive impact
0	-0	No alteration
-1 to -9	-1	Reduced negative impact
-10 to -18	-2	Less negative impact
-19 to -35	-3	Moderately negative impact
-36 to -71	-4	Significantly negative impact
-72 to -108	-5	Extremely Negative Impact

### 10.1 RISK ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN

The EMP provides management options to ensure impacts of the factory are minimised. An EMP is a tool used to take pro-active action by addressing potential problems before they occur. This should limit the corrective measures needed, although additional mitigation measures might be included if necessary. The environmental management measures are provided in the tables and descriptions below. These management measures should be adhered to during the various phases of the construction and operations of the facility. This section of the report can act as a stand-alone document. All personnel taking part in the operations of the facility should be made aware of the contents in this section, so as to plan the operations accordingly and in an environmentally sound manner.

The objectives of the EMP are:

- ◆ to include all components of construction activities and operations of the facility;
- ◆ to prescribe the best practicable control methods to lessen the environmental impacts associated with the project;
- ◆ to monitor and audit the performance of operational personnel in applying such controls; and
- ◆ to ensure that appropriate environmental training is provided to responsible operational personnel.

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



As depicted in the tables below, impacts related to the operational phase are expected to mostly be of medium to low significance and can mostly be mitigated to have a low significance. The extent of impacts are mostly site specific to local and are not of a permanent nature. Due to the nature of the surrounding areas, cumulative impacts are possible and include groundwater contamination and traffic impacts.

### 10.1.1 Planning

During the phases of planning for construction, future operations and decommissioning of the factory, it is the responsibility of proponent to ensure 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 activities and operations of the project are in place and remains valid. This includes the consumer installation certificate.
- ◆ 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:
  - EMP / Risk management / mitigation / 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 bi-annual reporting system to report on aspects of construction activities, operations and decommissioning as outlined in the EMP.
- ◆ Submit bi-annual reports to the MET to allow for environmental clearance certificate renewal after three years. This is a requirement by MET.
- ◆ Appoint a specialist environmental consultant to update the EA and EMP and apply for renewal of the environmental clearance certificate prior to expiry.

### 10.1.2 Skills, Technology and Development

During the construction and operations of the facility, training will be provided to a portion of the workforce to be able to construct and operate various features of the factory according to the required standards. Skills will be transferred to an unskilled workforce for general tasks. The technology required for the development of the factory may be new to the industry. Development of people and technology are key to economic development.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Employment, technological development and transfer of skills	2	1	2	3	1	12	2	Probable
Daily Operations	Employment, technological development and transfer of skills	2	1	2	3	2	14	2	Definite
Indirect Impacts	Transfer of skills and technological development	2	1	2	3	3	16	2	Definite

**Desired Outcome:** To see an increase in skills of local Namibians, as well as development and technology advancements in the concrete manufacturing industry.

#### Actions

##### **Mitigation:**

- ◆ If the skills exist locally, contractors must first be sourced from the town, 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.
- ◆ Employees to be informed about parameters and requirements for references upon employment.
- ◆ The proponent must employ local Namibians where possible. Deviations from this practise should be justified appropriately.

##### **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.
- ◆ Bi-annual summary reports on all training conducted.

### 10.1.3 Revenue Generation and Employment

Construction and upgrades of the factory is hinged on employment. Skilled and unskilled labour will be required for construction and installation of the proposed infrastructure. Unskilled labour may be sourced locally while it is expected that skilled contractors within Namibia will be used for specialised work. The construction phase will therefore contribute to employment creation in the unskilled labour sector while contributing to sustaining employment of the skilled sector during the construction phase.

The operational phase will create much needed employment opportunities in the area. Revenue generation and value addition will result from sourcing and processing local materials. The change in land use 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.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Employment and contribution to local and national economy	2	1	2	2	2	12	2	Definite
Daily Operations	Employment contribution to local economy	2	1	3	3	1	14	2	Definite
Indirect Impacts	Decrease in unemployment, contribution to local economy	3	1	3	3	3	27	3	Definite

**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.

#### 10.1.4 Demographic Profile and Community Health

The project is reliant on labour during the construction and operational phase. The scale of the project is such that it is not expected to create a change in the demographic profile of the local community. Community health may be exposed to factors such as communicable disease like HIV/AIDS as well as alcoholism/drug abuse, associated with possible foreign construction teams and delivery vehicles. An increase in foreign people in the area may potentially increase the risk of criminal and socially/culturally deviant behaviour. However, such trends are considered unlikely. The project may further contribute to cumulative demand for services for the region which includes electricity and water supply.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	In-migration and social ills related to unemployment	2	-1	1	1	2	-8	-1	Improbable
Daily Operations	In-migration and social ills related to unemployment	2	-1	1	2	2	-10	-2	Improbable
Indirect Impacts	The spread of disease	2	-1	2	2	2	-12	-2	Improbable

**Desired Outcome:** To prevent the in-migration and growth in informal settlements and to prevent the spread of diseases such as HIV/AIDS.

#### Actions:

##### **Prevention:**

- ◆ Employ only local people from the area, deviations from this practice should be justified appropriately.
- ◆ Adhere to all local authority by-laws relating to environmental health which includes, but is not limited to, sand and grease traps for the various facilities and sanitation requirements.
- ◆ Facility design to incorporate water and energy saving technologies such as low energy electrical appliances and lighting.

##### **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.

### 10.1.5 Supply of Fuel to Operations

The construction and operations of the consumer fuel installation will ensure a reliable supply of fuel for the operations. This will ensure the effective operations of the facility which will aid in securing a reliable supply of sleepers for the upgrade of railways in Namibia. The upgrade of railways may increase road safety by reducing trucks and allow for further industrial development.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Daily Operations	Contribution to economy, reliable supply of fuel	2	1	3	2	2	14	2	Definite
Indirect Impacts	Secure supply in sleepers allowing successful development of railways.	3	1	3	2	2	21	3	Definite

**Desired Outcome:** Ensure a secure supply of fuel available to the facility.

#### **Actions**

##### **Mitigation:**

- ◆ Ensure compliance to the Namibian regulations.
- ◆ Proper management to ensure constant supply.
- ◆ Record supply problems and take corrective actions.

##### **Responsible Body:**

- ◆ Proponent

##### **Data Sources and Monitoring:**

- ◆ Record supply problems and corrective actions taken and compile a bi-annual summary report.

### 10.1.6 Traffic

The facility may increase the traffic flow to the site through the provision of construction material (construction phase) and the delivery of raw material and collection of railway sleepers (operational phase). This may increase the risk of incidents and accidents.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Delivery of equipment and building supplies	1	-1	2	2	2	-6	-1	Probable
Daily Operations	Increase traffic, road wear and tear and accidents	1	-1	2	2	2	-6	-1	Probable

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

#### **Actions**

##### **Prevention:**

- ◆ Erect clear signage regarding access and exit points at the factory.

##### **Mitigation:**

- ◆ Trucks delivering raw material should not be allowed to obstruct any traffic.
- ◆ 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.
- ◆ Consultation with the town council regarding designs and traffic management if needed.

##### **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 of all incidents reported, complaints received, and action taken.

### 10.1.7 Health, Safety and Security

Every activity that will be associated with the construction and operational phase is reliant on human labour and therefore will expose them to health and safety risks. Activities such as the operation of machinery and handling of hazardous chemicals (inhalation and carcinogenic effect of some hydrocarbons), will pose the main risks to employees. Security risks will be related to unauthorized entry, theft and sabotage.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Physical injuries, exposure to chemicals and criminal activities	1	-2	3	3	1	-14	-2	Probable
Daily Operations	Physical injuries, exposure to chemicals and criminal activities	1	-2	3	3	2	-16	-2	Probable

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

#### Actions

##### **Prevention:**

- ◆ Clearly label dangerous and restricted areas as well as dangerous equipment and products.
- ◆ Equipment that will be locked away on site must be placed in a way that does not encourage criminal activities (e.g. theft).
- ◆ Provide all employees with required and adequate personal protective equipment (PPE).
- ◆ Ensure that all personnel receive adequate training on operation of equipment / handling of hazardous substances.
- ◆ All health and safety standards specified in the Labour Act should be complied with.
- ◆ Implementation of maintenance register for all equipment and fuel/hazardous substance storage areas.

##### **Mitigation:**

- ◆ Selected personnel should be trained in first aid and a first aid kit must be available on site. The contact details of all emergency services must be readily available.
- ◆ Implement and maintain an integrated health and safety management system, to act as a monitoring and mitigating tool, which includes: colour coding of pipes, operational, safe work and medical procedures, permits to work, emergency response plans, housekeeping rules, MSDS's and signage requirements (PPE, flammable etc.).
- ◆ Security procedures and proper security measures must be in place to protect workers and clients, especially during cash in transit activities.
- ◆ Strict security that prevents unauthorised entry during construction phases.

#### 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 was conducted and when safety equipment and structures were inspected and maintained.



### 10.1.8 Fire

Construction and operational activities may increase the risk of the occurrence of fires. Only diesel will be stored on site. Uncontrolled fires may spread to the surrounding open fields. Diesel is not as flammable as more volatile fuels. The risk of fire is thus low.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Fire and explosion risk	1	-2	2	2	1	-10	-2	Probable
Daily Operations	Fire and explosion risk	1	-2	2	2	1	-10	-2	Probable

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

#### Actions:

##### **Prevention:**

- ◆ Ensure all chemicals are stored according to MSDS requirements.
- ◆ Maintain regular site, mechanical and electrical inspections and maintenance.
- ◆ Clean all spills / leaks.
- ◆ Special note must be taken of the regulations stipulated in sections 47 and 48 of the Petroleum Products and Energy Act, 1990 (Act No. 13 of 1990).
- ◆ Follow SANS standards for operation and maintenance of the consumer fuel installation and the storage of all petroleum products.
- ◆ All dispensers must be equipped with devices that cut fuel supply during fires.

##### **Mitigation:**

- ◆ A holistic fire protection and prevention plan is needed. This plan must include an emergency response plan, firefighting plan and spill recovery plan.
- ◆ Maintain firefighting equipment and promote good housekeeping.
- ◆ Personnel training (firefighting, fire prevention and responsible housekeeping practices).

##### **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 report should be compiled every 6 months of all incidents reported. The report should contain dates when fire drills were conducted and when fire equipment was tested and training given.

### 10.1.9 Air Quality

During construction, earth works and general construction may increase ambient dust levels. The operational phase will generate dust from vehicles travelling along the gravel road, as well as the offloading and mixing of raw materials especially cement. Prolonged exposure to hydrocarbon vapour released at the consumer fuel installation may have carcinogenic effects.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Excessive dust generated from maintenance and upgrade activities	2	-1	2	2	1	-10	-2	Probable
Daily Operations	Fuel vapours	2	-1	2	2	2	-12	-2	Probable

**Desired Outcome:** To prevent health impacts and minimise the dust generated.

#### **Actions**

##### **Mitigation:**

- ◆ Personnel issued with appropriate masks where excessive dust or vapours are present.
- ◆ A complaints register should be kept for any dust related issues and mitigation steps taken to address complaints where necessary e.g. dust suppression.
- ◆ Employees should be coached on the dangers of fuel vapours.
- ◆ Dust suppression should be conducted where and when required.
- ◆ Cement silos should be fitted with filters on the vent cones to collect any dust generated during refilling.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ Any complaints received regarding dust or fuel vapours should be recorded with notes on action taken.
- ◆ All information and reporting to be included in a bi-annual report.

### 10.1.10 Noise

Noise pollution may be generated due to heavy and light motor vehicles accessing the site to offload material and equipment. Operations of the factory itself and related machinery will generate noise, such as mechanical vibration of sleeper moulds. There are no current nearby receptors, however adjacent properties are zoned for future industrial use as well as possible future residential use.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Excessive noise generated from construction activities – nuisance and hearing loss	1	-2	2	2	1	-10	-2	Probable
Daily Operations	Noise generated from the operational activities – nuisance	1	-1	2	2	1	-5	-1	Probable

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

#### **Actions**

##### **Prevention:**

- ◆ Follow World Health Organization (WHO) guidelines on maximum noise levels (Guidelines for Community Noise, 1999) to prevent hearing impairment.
- ◆ 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:**

- ◆ Maintain a complaints register.
- ◆ Bi-annual report on complaints and actions taken to address complaints and prevent future occurrences.

### 10.1.11 Waste production

Various waste streams will be produced during the construction and operational phase. Waste may include hazardous waste associated with the handling of hydrocarbon products etc. Construction waste may include building rubble and discarded equipment contaminated by hydrocarbon products. Contaminated soil and water is considered as a hazardous waste. Domestic waste will be generated by the facility and related operations. Waste presents a contamination risk and when not removed regularly may become a fire hazard. Unused concrete / concrete waste should be considered as building rubble and may not be dumped, but rather be disposed at an approved waste disposal facility.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Excessive waste production, littering, illegal dumping, contaminated materials	1	-2	2	2	2	-12	-2	Definite
Daily Operations	Excessive waste production, littering, contaminated materials	1	-2	2	2	2	-12	-2	Definite

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

#### Actions

##### **Prevention:**

- ◆ Waste reduction measures should be implemented and all waste that can be re-used / recycled must be kept separate.
- ◆ Ensure adequate disposal storage facilities are available.
- ◆ Ensure waste cannot be blown away by wind.
- ◆ Prevent scavenging (human and non-human) of stored waste.

##### **Mitigation:**

- ◆ Waste should be disposed of regularly and at appropriately classified disposal facilities, this includes hazardous material (empty chemical containers, contaminated rugs, paper water and soil).
- ◆ See the material safety data sheets available from suppliers for disposal of contaminated products and empty containers.
- ◆ Liaise with the town council regarding waste and handling of hazardous waste.

##### **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.

### 10.1.12 Ecosystem and Biodiversity Impact

The site is void of naturally occurring vegetation due to previous and current activities on and around the site. Impacts are thus mostly related to pollution of the environment. Construction and operations may present a pollution risk to the surrounding environment and biophysical features.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Impact on fauna and flora. Loss of biodiversity	1	-1	3	2	2	-7	-1	Improbable
Daily Operations	Impact on fauna and flora. Loss of biodiversity	1	-1	2	2	2	-6	-1	Improbable

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

#### **Actions.**

##### **Prevention:**

- ◆ Educate all contracted and permanent employees on the value of biodiversity.

##### **Mitigation:**

- ◆ Report any extraordinary animal sightings to the Ministry of Environment 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 avoided where possible.

##### **Responsible Body:**

- ◆ Contractor
- ◆ Proponent

##### **Data Sources and Monitoring:**

- ◆ All information and reporting to be included in a bi-annual report.

### 10.1.13 Groundwater, Surface Water and Soil Contamination

During construction, heavy machinery may present a contamination risk to the soil, surface and groundwater through breakdowns. Operations will entail the storage and handling of hydrocarbons (such as fuels and some lubricants) which present a contamination risk. Such material may contaminate surface water, soil and groundwater. Contamination may either result from failing storage facilities, or spills and leaks associated with fuel handling.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Contamination from hazardous material spillages and hydrocarbon leakages	2	-1	2	2	1	-10	-2	Probable
Daily Operations	Contamination from hazardous material spillages and hydrocarbon leakages	2	-2	2	2	1	-20	-3	Probable

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

#### Actions

##### **Prevention:**

- ◆ All construction machines should be maintained to be in a good working condition during operations.
- ◆ Employ drip trays and spill kits during construction when onsite servicing / repairs of equipment is needed.
- ◆ Spill control structures and procedures must be in place according to SANS standards or better for the consumer fuel installation and connection of all surfaces where fuel is handled.
- ◆ All fuelling should be conducted on surfaces provided for this purpose. E.g. Concrete slabs with regularly maintained seals between slabs.
- ◆ 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 operators must be conducted on a regular basis (Fuel handling, spill detection, spill control).

##### **Mitigation:**

- ◆ Any spillage of more than 200 litre must be reported to the relevant authority (Ministry of Mines and Energy). Any spill must be cleaned up immediately.
- ◆ Spill clean-up means must be readily available on site as per the relevant MSDS.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ A report should be compiled bi-annually of all spills or leakages reported. 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) and a copy of documentation in which spill was reported to Ministry of Mines and Energy.

**10.1.14 Visual Impact**

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

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Aesthetic appearance and integrity of the site	1	-1	2	2	2	-6	-1	Probable
Daily Operations	Aesthetic appearance and integrity of the site	1	-1	2	2	2	-6	-1	Probable

**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.
- ◆ Lights should be directed downwards and away from possible future receptors when applicable and where possible.

**Responsible Body:**

- ◆ Proponent
- ◆ Contractors

**Data Sources and Monitoring:**

- ◆ A report should be compiled every 6 months of all complaints received and actions taken.

### 10.1.15 Impacts on Utilities and Infrastructure

Any damage caused to existing infrastructure and services supply like roads, water and electricity where present.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction Phase	Disruption of services and damage to infrastructure	2	-1	2	2	1	-10	-2	Probable
Daily Operations	Disruption of services and damage to infrastructure	2	-1	2	2	1	-10	-2	Improbable

**Desired Outcome:** No impact on utilities and infrastructure.

#### **Actions**

##### **Prevention:**

- ◆ Appointing qualified and reputable contractors is essential.
- ◆ The contractor must determine exactly where amenities and pipelines are situated before construction commences (utility clearance e.g. ground penetrating radar surveys).
- ◆ Liaison with the suppliers of services is essential.

##### **Mitigation:**

- ◆ Emergency procedures for corrective action available on file.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ A report should be compiled every 6 months of all incidents that occurred and corrective action taken.



### 10.1.16 Cumulative Impact

Possible cumulative impacts associated with the construction and operational phase include increased traffic, dust and noise in the area.

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	The build-up of minor impacts to become more significant	2	-1	2	2	1	-10	-2	Improbable
Daily Operations	The build-up of minor impacts to become more significant	2	-1	2	2	1	-10	-2	Improbable

**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.

## 10.2 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 will entail the complete removal of all infrastructure including buildings and underground infrastructure. 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 WHO standards and 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 Environmental Management Plan for the facility will have to be reviewed at the time of decommissioning to cater for changes made to the site and to implement guidelines and mitigation measures.

## 10.3 ENVIRONMENTAL MANAGEMENT SYSTEM

The proponent could implement an Environmental Management System (EMS) for their operations. An EMS is an internationally recognized and certified management system that will ensure ongoing incorporation of environmental constraints. At the heart of an EMS is the concept of continual improvement of environmental performance with resulting increases in operational efficiency, financial savings and reduction in environmental, health and safety risks. An effective EMS would need to include the following elements:

- ◆ A stated environmental policy which sets the desired level of environmental performance;
- ◆ An environmental legal register;
- ◆ An institutional structure which sets out the responsibility, authority, lines of communication and resources needed to implement the EMS;
- ◆ Identification of environmental, safety and health training needs;
- ◆ An environmental program(s) stipulating environmental objectives and targets to be met, and work instructions and controls to be applied in order to achieve compliance with the environmental policy; and
- ◆ Periodic (internal and external) audits and reviews of environmental performance and the effectiveness of the EMS.
- ◆ The Environmental Management Plan

## 11 CONCLUSION

The operations of the concrete manufacturing plant will create employment opportunities and generate revenue in the vicinity and the town as a whole, see Table 11. In addition to employment and revenue generation, the factory will contribute locally to skills transfer and training which in turn develops the local workforce during operations of the facility.

Negative impacts can successfully be mitigated. SANS standards relating to the consumer fuel installation and prescribed by Namibian law must be followed during its operations. Noise pollution should at all times meet the prescribed WHO requirements to prevent hearing loss and not to cause a nuisance. Cement silo dust filters should be serviced regularly. Fire prevention should be adequate, and health and safety regulations should be adhered to in accordance with the regulations pertaining to relevant laws and internationally accepted standards of operation. Any waste produced must be removed from site and disposed of at an appropriate facility or re-used or recycled where possible. Hazardous waste must be disposed of at an approved hazardous waste disposal site.

The environmental management plan (Section 10) should be used as an on-site reference document for the operations of the factory. Parties responsible for transgressing of the environmental management plan should be held responsible for any rehabilitation that may need to be undertaken. The proponent could use an in-house Health, Safety, Security and Environment Management System in conjunction with the environmental management plan. All operational personnel must be taught the contents of these documents.

Should the Directorate of Environmental Affairs (DEA) of the MET find that the impacts and related mitigation measures, which have been proposed in this report, are acceptable, an environmental clearance certificate may be granted to the proponent. The environmental clearance certificate issued, based on this document, will render it a legally binding document which should be adhered to. Focus could be placed on Section 10, which includes an EMP for this project. It should be noted that the assessment process's aim is not to stop the proposed activity, or any of its components, but to rather determine its impact and guide sustainable and responsible development as per the spirit of the EMA.

**Table 11. Impact Summary Class Values**

Impact Category	Impact Type	Construction		Operations	
<i>Positive Rating Scale: Maximum Value</i>		5		5	
<i>Negative Rating Scale: Maximum Value</i>			-5		-5
EO	Skills, Technology and Development	2		2	
EO	Revenue Generation and Employment	2		2	
SC	Demographic Profile and Community Health		-1		-2
EO	Supply of Fuel to Operations				2
SC	Traffic		-1		-1
SC	Health, Safety and Security		-2		-2
PC	Fire		-2		-2
PC	Air Quality		-2		-2
PC	Noise		-2		-1
PC	Waste Production		-2		-2
BE	Ecosystem and Biodiversity Impact		-1		-1
PC/BE	Groundwater, Surface Water and Soil Contamination		-2		-3
SC	Visual Impact		-1		-1
PC/SC	Impacts on Utilities, Infrastructure and Seabed Scouring		-2		-2
PC	Cumulative Impact		-2		-2

BE = Biological/Ecological    EO = Economical/Operational    PC = Physical/Chemical    SC = Sociological/Cultural

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## **Appendix A: Proof of Public Consultation**



**Notified IAPs**

<b>Name / Organisation</b>
Karibib Town Council
Mr. Wilson Lungu (Alexia Properties CC) – Neighboring land owner
Mr. Mark Cioccolanti (Preferred Management Services) – Neighboring land owner
Theo Nicodemus (Namibia Industrial Development Agency) – Neighbouring land owner
Benistus Kandanga (Namibia Industrial Development Agency) – Neighbouring land owner

**Proof of Notification: Karibib Town Council**

TEL.: (+264-61) 257411 ♦ FAX.: (+264) 88626368

CELL.: (+264-81) 1220082

PO BOX 11073 ♦ WINDHOEK ♦ NAMIBIA

E-MAIL: gpt@thenamib.com

**To: Interested and Affected Parties****12 December 2019**

**Re: Environmental Scoping Assessment and Environmental Management Plan for the Construction and Operations of a Concrete Product Manufacturing Plant in Karibib, Erongo Region**

Dear Sir/Madam

In terms of the Environmental Management Act (No. 7 of 2007) and the Environmental Impact Assessment Regulations (Government Notice No. 30 of 2012), notice is hereby given to all potential interested and/or affected parties that an applications will be made to the Environmental Commissioner for an Environmental Clearance Certificate for the following project:

**Project:** Environmental Scoping Assessment and Environmental Management Plan for the Construction and Operations of a Concrete Product Manufacturing Plant in Karibib, Erongo Region.

**Proponent:** Salz-Gossow (Pty) Ltd**Environmental Assessment Practitioner:** Geo Pollution Technologies (Pty) Ltd

Salz-Gossow (Pty) Ltd plans to construct and operate a concrete product manufacturing plant on Erf 604, Karibib Extension 1, in the Erongo Region. It is proposed that the floor size of the existing concrete factory will be upgraded from 800 m<sup>2</sup> to 1,800 m<sup>2</sup> to accommodate the plant and equipment required for the production of mainly Type P2 concrete rail sleepers. The development will further require the installation of a consumer fuel installation (three x 4 m<sup>3</sup> aboveground diesel tanks) as well as additional cement silos. The project area itself, as well as the area east of the project location is zoned for light industrial use, whereas the area north and further west of the project location have been identified as possible future high density residential use.

Geo Pollution Technologies (Pty) Ltd was appointed by the proponent to conduct an Environmental Assessment for the proposed project. As part of the assessment we consult with interested and affected parties. All Interested and/or Affected Parties (IAPs) are invited to register with the environmental consultant to receive further documentation and communication regarding the project. By registering, IAPs will be provided with an opportunity to provide input that will be considered in the drafting of the environmental assessment report and its associated management plan.

Please register as an IAP and provide comments by **22 January 2019**.

To register, please contact:

Email: [salzgossow@thenamib.com](mailto:salzgossow@thenamib.com)

Fax: 088-62-6368

Should you require any additional information please contact Geo Pollution Technologies at telephone 081 145 2164 / 061-257411.

Thank you in advance.

Sincerely,

**Geo Pollution Technologies**

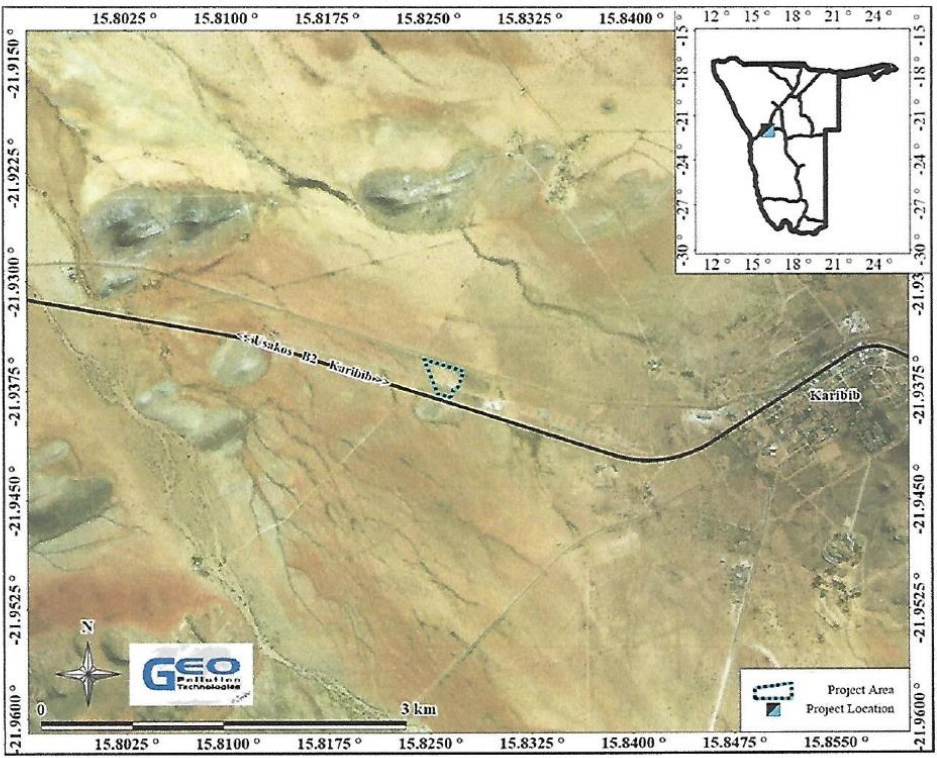
Wikus Coetzer

Environmental Assessment Practitioner

Directors:

Page 1 of 2  
P. Botha (B.Sc. Hons. Hydrogeology) (Managing)





## Advertisements: The Republikein and Namibian Sun, 08 January 2020.

Woensdag 8 Januarie 2020
Republikein
SPORT 11

Die Cheetah-stut Ox Nche en -flank Henco Venter, die Stormers-lansvoerspeeler Sikhumbuzo Notshe, die Leus-vleuel Madosh Tambwe en -lansvoerspeeler James Venter, die Blitsbok Werner Kok, die Maties-lansskakel Jordan Chait en -slot Jordan Sesink Glee en 'n stut van die Westelike Provinsie, Michael Kumbirai, is Durban toe gelok om vir hierdie verliese te vergoed.

Kok sluit hom egter eers in Augustus - ná die Olimpiese Spele - by die span aan.

Everitt het ook groentjies soos JJ van der Mescht, Sanelle Nohamba, Roeta Chamberlain en Phepsi Buthelezi, vir wie hy in die opwarmwedstryde weer op die proef sal wil stel.

Die Haiaie moet ook nog 'n kaptein aanwys.

Louis Schreuder het die span in verlede jaar se Superrugby-reeks aangevoer, terwyl Botha en Mtawara ook al daardie rol vervul het.

Schreuder het op 'n korttermyn-grondslag vir Toulon gespeel, maar het hom in November weer by die Haiaie aangesluit.

Tera Mtembu en Jeremy Ward was die gesamentlike kapteins vir die Curriebeker-reëls, maar nie een van hulle is verseker van 'n plek in die Super-span nie.

- Netwerk24



Sean Everitt, afrigter van die Haiaie.

**PUBLIC PARTICIPATION NOTICE**

**ENVIRONMENTAL ASSESSMENT FOR THE CONSTRUCTION AND OPERATIONS OF A CONCRETE PRODUCT MANUFACTURING PLANT IN KARIBIB, ERONGO REGION**

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<http://www.thenamib.com/projects/projects.html>

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It is proposed that the floor size of the **existing** concrete factory on erf 604, Karibib Extension 1 will be upgraded from 800 m<sup>2</sup> to 1,800 m<sup>2</sup> to accommodate the plant and equipment required for the production of mainly Type P2 concrete rail sleepers. The development will further require the installation of a consumer fuel installation (three x 4 m<sup>3</sup> diesel tanks) as well as additional cement silos.

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All comments and concerns should be submitted to Geo Pollution Technologies by **22 January 2020**.

**Wikus Coetzer**  
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**GEO** POLLUTION TECHNOLOGIES

**FOCUS**

**FISHING**

25 FEBRUARY 2020

Namibia Media Holdings (NMH) will once again be publishing our Focus edition on the Fisheries Sector, which will cover in-depth insights on the fisheries industry, its role players in government and private sector and its stakeholders in Namibia.

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- In addition, 2000 copies will be printed in glossy and distributed to participating businesses and their customers. NMH subscribers and selected retail outlets.
- This publication will also be available on all the social media platforms that NMH has to offer, including exposure on our Facebook pages, as well as being available on the NMH digital bookshelf (Flipper).

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WEDNESDAY JANUARY 8 2020

**PUBLIC PARTICIPATION NOTICE**

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**GEO** POLLUTION TECHNOLOGIES

## Good rainfall continues to shower north

**ILENI NANDJATO**

Good rainfall has been recorded for about seven consecutive days in the northern areas of Namibia.

Many are preparing their mahangu fields for the crop season, while those who started tilling the land as of November are already in full swing.

Paulina Mufeti, the head of the hydrology unit at the agriculture ministry, told *Namibian Sun* this week that despite the good rainfall, no signs of floods have been detected yet.

In some parts, rain has been recorded every day of the New Year, while many areas also received good rainfall in December.

According to information received from the Namibia Meteorological Service, the Ondangwa area tops the range as it recorded rainfall for 12 days in December and also recorded the highest rainfall of 65.2mm, followed by Oshakati with 51.6mm.

Ondangwa recorded its first rainfall for last month on 1 December, which was 4.5mm, followed by 65.2mm on 4 December and 18.5mm the next day.

The town also recorded high rainfall towards the end of last month, with 33.3mm, 21mm and 11.4mm on the last three days of December respectively.

Oshakati recorded its first rainfall for last month, 15.4mm, on 2 December, followed by 51.6mm on 5 December and 6.2mm the following day. Okongo in the Ohangwena Region recorded its highest rainfall of 32mm on 2 December, followed by 31mm on 6 December, 15.5mm on 17 December and 24.5mm on 18 December, while Eenhana recorded less than a millimetre on 5 and 16 December.

In the Omusati Region, Okahao recorded the highest rainfall of 27.4mm on 5 December and 10mm the following day. On 1, 2, 19 and 20 December, it recorded less than 10mm, while Outapi only recorded 0.3mm on 3 December.

Omuthiya in the Oshana Region recorded rainfall of 9mm on 6 December, 0.6mm on 19 December and 16mm on 20 December.





**IN FULL SWING:** Subsistence farmers in the north are preparing for the 2020 crop season as rain continues to pour in the area. PHOTO: ILENI NANDJATO



## Advertisements: The Republikein and Namibian Sun, 15 January 2020.

Woensdag 15 Januarie 2020

Republikein

DIE MARK 7

## Só kan tegnologie konstruksie help

Elvira Wood

Die era waar die konstruksiebedryf net met groot planne op papier sit maar waar koste en spertye dan in die praktyk oorskry word, is verby. Andrew Skudder, uitvoerende hoof van Construction Computer Software, 'n tegnologie soos hommeluie, brille wat 'n virtuele werklikheid skep 3D-tegnologie en opsporingstoestelle behoort binnekort aan die orde van die dag te wees wanneer dit by konstruksie kom.

Skudder sê twee van die grootste voordele vir konstruksie-maatskappye, wat dié tegnologie gebruik, is dat dit hul meerproduktief maak en dat hulle meer produktief gaan maak terwyl daar ook groot kostebesparings sal wees. Tiedens navorsing van deur die McKinsey Global Institute gedoen is, verbeter produktiwiteit met tussen 14% en 15%.



Tegnologie soos hommeluie kan help om konstruksieprojekte beter te bestuur. FOTO: GETTY IMAGES

en verlaag dit koste met tussen 4% en 6% wanneer tegnologie na behore ingespan word. Skudder verduidelik dat hommeluie gebruik kan word om 'n behoorlike oorsig van 'n bouperseel te kry. Hommeluie kan ook tydens die konstruksie gebruik word om behoorlik vas te stel wat die vordering is. Virtuele werklikheid sal in-

genieurs toelaat om binne 'n projek "rond te loop" nog voordat 'n enkele soot gespit is. Dit sal dit moontlik maak om enige ontwerpoute makliker en baie vroeër te identifiseer. Die gebruik van 3D-tegnologie, waar tyd ook as 'n dimensie gebruik word, sal volgens Skudder ingenieurs help om realistiese spertye te stel vir

hoe lank konstruksie gaan duur, afhangende van watter tegnieke en/of materiale gebruik gaan word. Opsporingstoestelle gaan weer die wereld baie makliker maak vir konstruksiespanne om presies te weet waar op 'n perseel 'n spesifieke stuk toerusting is. Dié toestelle kan ook byvoorbeeld wys hoe lank 'n vragmotor moet wag om 'n vrag af te laai. "Met toegang tot die regte gegewens kan konstruksie-maatskappye bepaal wanneer hulle hul begroting gaan oorskry," sê hy. Skudder sê, gegewe dat die konstruksiesektor in Suid-Afrika onder geweldige druk is, is dit te verstaan dat daar kommer is dat tegnologie tot werkverliese sal lei. "Eerder as werkverliese kan hierdie tegnologie produktiwiteit verbeter en sleurwerk uitsny. Dit gaan oor die wysigings van die werksyde eerder as om van poste ontslae te raak."

-Netwerk24

## PUBLIC PARTICIPATION NOTICE

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## People and Organisation Tip of the day



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## PwC Business School Notice

Please note that our Business School email addresses have changed!

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WEDNESDAY JANUARY 15 2020

NEWS

sun 3

## Kalahari assaults to be probed

ELLANIE SMIT

OF THE 100 teachers passing Grade 12 examinations in 2019.

This was revealed in a statement issued by the Hardap regional director for education, Jacky Rukamba, earlier this month. Rukamba failed

kicking members of the public," said Embubulu.

He said according to preliminary information, the video depicting a 33-year-old man being led from

But there is no provision for this diversity," she argues. Responding to these remarks, Steenkamp said, "Is it the quality of teachers or the quality of teaching in the classroom?

incidents should be thoroughly investigated," said Embubulu.

He said according to preliminary information, the video depicting a 33-year-old man being led from

But there is no provision for this diversity," she argues. Responding to these remarks, Steenkamp said, "Is it the quality of teachers or the quality of teaching in the classroom?

taxi, which raised suspicion.

The taxi driver and the passengers were later taken in for further questioning, and two of the passengers were confirmed to have been

said Steenkamp. Meanwhile, PwC MYL spokesperson Maximilian Katjime says the ministry must reconsider taking grade 10 dropouts back into the school system.

transgression will be dealt with.

Embubulu said operations will continue, as needed.

Police commissioner Nelius Becker said there is no law that prohibits affected learners will have to fork out huge sums of money to ensure that these students go to school, pay rent and cab fare every day," he said.

[jemima@namibiansun.com](mailto:jemima@namibiansun.com)

## Poaching arrests pile up

ELLANIE SMIT

A total of 18 people were recently arrested for wildlife-related crimes, of which 15 suspects were nabbed in connection with rhino poaching or trafficking cases.

According to statistics released by the intelligence and investigative unit of the environment ministry and the protected resource division in the safety ministry, five new wildlife crime cases were opened.

The information, from 5 to 10 January, indicates that six rhino horns and two pangolin skins were seized as well as two firearms, 17 bullets and three vehicles.

In Ondangwa, two Namibians were arrested on 5 January for being in the possession of a pan-

golin skin.

Mathius Kaandala and Joseph Hilongwa Jeremia were charged for contravention of the Controlled Wildlife Products and Trade Act.

In another incident on 6 January at Otjiwarongo, another Namibian was arrested for being in the possession of a pangolin skin. Elias Sem was also charged for contravention of the Controlled Wildlife Products and Trade Act.

At Epukiro Post 3 in the Omaheke Region, Herold Ngave Hangara was arrested on 6 January for conspiracy to hunt a rhino, while on 8 January, Tobias Murenga was arrested in connection with the same case. Both men are Namibian and were charged for contravention of the Nature Conservation Ordinance Act, illegally hunting specially protected game and for contravention of the Arms and Ammunition Act.

Meanwhile at Oshive-

lo, four Namibians were arrested on 8 January for contravening the Nature Conservation Ordinance, illegal hunting specially protected game, contravening the Controlled Wildlife products and Trade Act and conspiracy to hunt specially protected game. They were also charged with contravening the Arms and Ammunition Act, illegal possession of a firearm without a licence, entering a game park without a permit as well as theft of rhino horns.

Diognes Nambili Shivute, Moses Ekandjo, Heimo Tveuya Namweya and Seboron Shivelo Seboron were found in possession of four rhino horns, while a vehicle, one hunting rifle and six bullets were confiscated from them.

Namweya and Seboron are employees at the Oshakati Town Council and were among several people who were arrested last week at Etosha National Park for rhino poaching. They were

caught attempting to cut the horns off two rhinos they shot in the park. The same four suspects were also arrested for an old case with regards to the conspiracy to hunt a rhino and entering a game park without a permit at Omuthiya last October.

Meanwhile last Friday, two more suspects were nabbed in connection with the Etosha conspiracy case. Johannes Binias and Samuel Atundu Matias received the same charges as the other four suspects involved in the matter. The suspects are all Namibian.

At Okahao, another Namibian was arrested last Friday for contravening the Arms and Ammunition Act and illegal possession of a firearm without a licence. Sem Johannes was also charged for trespassing in a game park.

In another incident last Friday, two Namibians were arrested with two rhino horns at Katima Mulilo. Lubula

Tama Hendricks and Zambwe Matengu were charged with contravention of the Controlled Wildlife Products and Trade Act and Contravention of the Prevention of Organised Crime Act.

Also at Katima Mulilo last Friday, four Zambian nationals were arrested for conspiracy to hunt a rhino. Makalo Meki, Junior Sillio, Inonox Sibela and Sheka Vitali were also charged for contravening the Arms and Ammunition Act. A hunting rifle and 11 bullets were confiscated.

Environment ministry spokesperson Romeo Muyunda said more suspects are being arrested, which demonstrates the importance authorities according to wildlife crimes.

"We have and continue to improve on our intelligence so more and more people will continue to be arrested. We are happy that in the space of one week, 18 suspects were arrested."

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## Site Notice



## **Appendix B: Consultants' Curriculum Vitae**



**ENVIRONMENTAL SCIENTIST****André Faul**

André entered the environmental assessment profession at the beginning of 2013 and since then has worked on more than 130 Environmental Impact Assessments including assessments of the petroleum industry, harbour expansions, irrigation schemes, township establishment and power generation and transmission. André's post graduate studies focussed on zoological and ecological sciences and he holds a M.Sc. in Conservation Ecology and a Ph.D. in Medical Bioscience. His expertise is in ecotoxicological related studies focussing specifically on endocrine disrupting chemicals. His Ph.D. thesis title was The Assessment of Namibian Water Resources for Endocrine Disruptors. Before joining the environmental assessment profession he worked for 12 years in the Environmental Section of the Department of Biological Sciences at the University of Namibia, first as laboratory technician and then as lecturer in biological and ecological sciences.

**CURRICULUM VITAE ANDRÉ FAUL**

Name of Firm	:	Geo Pollution Technologies (Pty) Ltd.
Name of Staff	:	ANDRÉ FAUL
Profession	:	Environmental Scientist
Years' Experience	:	18
Nationality	:	Namibian
Position	:	Environmental Scientist
Specialisation	:	Environmental Toxicology
Languages	:	Afrikaans – speaking, reading, writing – excellent
	:	English – speaking, reading, writing – excellent

**EDUCATION AND PROFESSIONAL STATUS:**

B.Sc. Zoology	:	University of Stellenbosch, 1999
B.Sc. (Hons.) Zoology	:	University of Stellenbosch, 2000
M.Sc. (Conservation Ecology)	:	University of Stellenbosch, 2005
Ph.D. (Medical Bioscience)	:	University of the Western Cape, 2018

First Aid Class A	EMTSS, 2017
Basic Fire Fighting	EMTSS, 2017

**PROFESSIONAL SOCIETY AFFILIATION:**

Environmental Assessment Professionals of Namibia (Learner Practitioner)

**AREAS OF EXPERTISE:**

Knowledge and expertise in:

- ◆ Water Sampling, Extractions and Analysis
- ◆ Biomonitoring and Bioassays
- ◆ Biodiversity Assessment
- ◆ Toxicology
- ◆ Restoration Ecology

**EMPLOYMENT:**

2013-Date	:	Geo Pollution Technologies – Environmental Scientist
2005-2012	:	Lecturer, University of Namibia
2001-2004	:	Laboratory Technician, University of Namibia

**PUBLICATIONS:**

Publications:	5 + 1 in preparation
Contract Reports	+130
Research Reports & Manuals:	5
Conference Presentations:	1

**ENVIRONMENTAL GEOLOGIST****Wikus Coetzer**

Wikus has 4 years' experience in environmental science related fields with 2 years' experience in conducting environmental impact assessments and preparation of environmental management plans. He holds an honours degree in Environmental Sciences – Environmental Geology from the Northwest-University Potchefstroom (NWU) South Africa. He first completed a B.Sc. degree in Geology and Botany in the required time also from the Northwest University Potchefstroom, South Africa. His honours project focused on the rehabilitation and phytoremediation of various tailings types and soils.

He has working experience as an environmental monitor / assisting environmental officer at Petra Diamonds, Cullinan Diamond Mine (CDM) where he gained a proper understanding of environmental monitoring responsibilities as well as legislations, regulations and the implementation of EMS/ISO14001. He started working at Geo Pollution Technologies in 2017, and regularly conducts/assists and report on environmental impact assessments, environmental management plans and pollution surveys..

**CURRICULUM VITAE WIKUS COETZER**

Name of Firm	:	Geo Pollution Technologies (Pty) Ltd.
Name of Staff	:	WIKUS COETZER
Profession	:	Environmental Geologist
Nationality	:	South African
Position	:	Environmental Geologist
Specialisation	:	Environmental Geology/ Geochemistry
Languages	:	Afrikaans – speaking, reading, writing English – speaking, reading, writing

**EDUCATION AND PROFESSIONAL STATUS:**

B.Sc. Environmental and Biological Sciences – Geology & Botany  
B.Sc. (Hons.) Environmental Sciences – Environmental Geology

: NWU Potchefstroom 2013  
: NWU Potchefstroom 2014

First Aid Class A                    EMTSS, 2017  
Basic Fire Fighting                EMTSS, 2017

**AREAS OF EXPERTISE:**

Knowledge and expertise in:

- ◆ Phytoremediation
- ◆ Environmental Geology / Geochemistry
- ◆ Environmental Monitoring
- ◆ Environmental Compliance

**EMPLOYMENT:**

2017 -	:	Geo Pollution Technologies
2015 - 2016:		Petra Diamonds CDM – Environmental monitor / Assisting environmental officer
2015:		Petra Diamonds CDM – Graduate program: Environmental Officer
2014:		NWU Potchefstroom department of Geo and Spatial Sciences – Research assistant

**PUBLICATIONS:**

Contract Reports: +20