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# Environmental Scoping Assessment for the Proposed Fuel Station on Erf 1889, Extension 7 in Rundu, Kavango East Region

## Report

**Draft**

3 April 2017

GCS Project Number: 16-1046

Client Reference: N/A

Norton Luis Consultants cc



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7 in Rundu, Kavango East Region**

**Report**

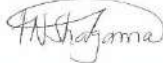


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## EXECUTIVE SUMMARY

Norton Luis Consultants cc (“The Proponent” hereafter) proposes to construct a fuel station on Erf 1889, Extension 7 (of the Kehemu location) in Rundu. The site is situated on the corner of Independence Avenue and Usivi Road and has approximate total surface area of 2.1 ha, of which 0.16 ha will be allocated to the fuel station development. The proposed is located about 4 km towards the east of the town centre and about 2 km south of the Okavango River. The fuel station will accommodate two underground fuel storage tanks (USTs) of unleaded petrol with a capacity of 23 m<sup>3</sup>. The proposed site is located within the Rundu Townlands on an area zoned as “*Business*” under the Rundu Town Planning Scheme (RTPS) and fuel / service stations are listed under “*Public garage*”. According to the RTPS definitions, *Public garage* means a business or concern where motor vehicles are provided with fuel for payment or reward and includes trading in motor vehicles, oil, tyres or motor spares, the repair or overhauling of motor vehicles, a restaurant or café, spray painting, panel beating, black smithery or body work.

Communication with I&APs about the proposed development was facilitated through the following means and in this order:

- A Background Information Document (BID) containing descriptive information about the proposed fuel station was compiled (**Appendix D**) and sent out to all identified and registered I&APs;
- Notices were placed in *The Namibian* and *New Era* newspapers dated 10<sup>th</sup> and 17<sup>th</sup> November 2016, briefly explaining the activity and its locality, inviting members of the public to register as I&APs (**Appendix E**);
- Site Notices were fixed at conspicuous locations on the northeastern and southwestern entrances of the site (Erf 1889) as well as the Kavango East Regional and Rundu Town Council in Rundu (see **Appendix F**);
- A meeting with Local Authority was arranged for the 24<sup>th</sup> November 2016 at Kavango East Regional Council (Government Hall). None of the invited members of the authorities attended the meeting. A meeting with Local Authority was arranged for the 24<sup>th</sup> November 2016 at Kavango East Regional Council (Government Hall). None of the invited members of the authorities attended the meeting. GCS Namibia then visited the offices of the relevant available representatives at the Kavango Regional Council (Mr. Shikongo, office of the Chief Development Planner) and the Rundu Town Council (Town Planning office). The aim was to briefly explain to the representatives what was supposed to be discussed in the meeting and provided them with seven days from the meeting date to submit their comments; and

- A public meeting notice (email) was sent out to all I&APs inviting them to the meeting. The meeting was arranged for the 24<sup>th</sup> November 2016 at the proposed project site (Cola Cola Supermarket taxi rank) in Rundu. On the day of the meeting, four I&APs attended.

The following points were raised during the public meeting:

- Possible flow of wastewater from the fuel station area downstream, since there is a slope on the northern side of the road (towards the north); and
- The three taxi drivers expressed their support for the proposed project. According to them, the new fuel station will enable them to fill up their car tanks at the taxi rank and take passengers from the taxi rank directly to their respective destinations such as Kayengona, Shambyu on the eastern side of the proposed site without having to go refuel their cars at the fuel stations in town and drive back to the taxi rank (site) again. The meeting minutes are attached in **Appendix G**.

The issues raised during the public meeting are further presented in the Issues and Response Trail in **Appendix H**.

Public consultation was carried out according to the Environmental Management Act's EIA Regulations. After the public meeting, the I&APs were given a week to submit their comments on the project. There were no comments received during that period (prior to the compilation of the scoping report).

The key potential biophysical impact related to the construction, operational and maintenance and decommissioning phases of the proposed project were identified and assessed. Suitable mitigation measures (where required and possible) were recommended, and the impacts can be summarised as follows:

- **Fuel station impact on surface and groundwater (during construction and operational and maintenance, during decommission phase (groundwater)):** Run-off of effluent / wastewater may end up in surface water bodies. This is unlikely to happen because the fuel station is situated on the other side of the Usivi road. Besides, there is a storm water drain built on the southern side of the road (adjacent to the proposed fuel station site) which will impede run-off to elsewhere. Improper handling, storage and disposal of hydrocarbon products and other contaminants / effluent produced on site during construction may seep into groundwater systems. Further mitigations and recommendations on this impact are presented under subchapter **7.2.1**, **7.3.1** and **7.4.1** and also management actions given in the EMP (Chapter 3).

- **Fuel Station impact on Soils (during construction and operation and maintenance phases):** Potential contaminants such as hydrocarbons and waste water / effluent that will be produced on site during construction may contaminate the surrounding soils. The impact can be adequately addressed by the recommendations given under subchapter 7.2.2 and also management actions given in the EMP (Chapter 3).
- **Fuel Station impact on health and safety (during construction and operation and maintenance phases):** Improper handling of construction materials and equipment as well petroleum products may cause health and safety risks (injuries and possible fatalities). The impact can be adequately addressed by the recommendations given under subchapter 7.2.4 and also management actions given in the EMP (Chapter 3).
- **Fuel station impact on air quality:** Dust emissions from construction vehicles and equipment and construction activities will lead to a short-term decrease in air quality. The risk is anticipated to be short-term and therefore of low significance. The impact can be adequately addressed by the recommendations given under subchapter 7.2.6 and also management actions given in the EMP (Chapter 3).
- **Fuel station construction nuisance impact (noise):** there is an inconvenient impact of noise pollution (to neighbouring locals) associated with construction activities and equipment. This may also pose a health risk to construction workers if they are too exposed to noisy areas at the site at all times. The impact can be adequately addressed by the recommendations given under subchapter 7.2.5 and also management actions given in the EMP (Chapter 3).
- **Waste generation:** Construction activities usually generates wastes of all kinds (domestic and general), which leads to environmental pollution. This may pose a health risk to the people and environment. The impact can be adequately addressed by the recommendations given under subchapter 7.2.8 and also management actions given in the EMP (Chapter 3).
- **Fuel Station construction impact on vehicular traffic safety:** Impact on traffic safety when heavy vehicles are roaming around the area during construction. Heavy construction vehicles will exert pressure on local roads and potentially result in road accidents. The impact can be adequately addressed by the recommendations given under subchapter 7.2.9 and also management actions given in the EMP (Chapter 3).
- **Fuel Station Closure impact on Employment (decommissioning phase):** Should the fuel station be decommissioned, this will lead employment loss and/or reduction i.e. the employed people at the fuel station will lose their jobs. The impact can be adequately addressed by the recommendations given under subchapter 7.4.2 and also management actions given in the EMP (Chapter 3).

Based on the information provided in this report, GCS is confident the identified risks associated with the proposed development can be reduced to acceptable levels, should the measures recommended in the EMP be implemented and monitored. It is therefore recommended that the project receive Environmental Clearance, provided that the EMP be implemented.

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## ABBREVIATIONS

|       |                                     |
|-------|-------------------------------------|
| DEA   | Department of Environmental Affairs |
| EA    | Environmental Assessment            |
| ECC   | Environmental Clearance Certificate |
| EIA   | Environmental Impact Assessment     |
| EMA   | Environmental Management Act        |
| EMP   | Environmental Management Plan       |
| GG    | Government Gazette                  |
| GN    | Government Notice                   |
| I&APs | Interested and Affected Parties     |

|        |   |
|--------|---|
| NLC cc | Norton Luis Consultants cc                |
| NORED  | Northern Regional Electricity Distributor |
| Reg    | Regulation                                |
| S      | Section                                   |

## 1 INTRODUCTION

### 1.1 Background

Norton Luis Consultants cc (“The Proponent” hereafter) proposes to construct a fuel station on Erf 1889, Extension 7 (of the Kehemu location) in Rundu. The site is situated on the corner of Independence Avenue and Usivi Road (see **Figure 1-1**) and has approximate total surface area of 2.1 ha, of which 0.16 ha will be allocated to the fuel station development. The proposed is located about 4 km towards the east of the town centre and about 2 km south of the Okavango River. The fuel station will accommodate two underground fuel storage tanks (USTs) of unleaded petrol with a capacity of 23 m<sup>3</sup> each. The land on which the proposed fuel station is to be built, is owned by the Proponent.



**Figure 1-1:** Location of the proposed fuel station in Rundu

Under the Environmental Impact Assessment (EIA) Regulations (2012) of the Environmental Management Act (7 of 2007), section 3.1 and 3.3, the proposed development is a listed activity that may not be undertaken without an Environmental Clearance Certificate (ECC):

- 9.4 The storage and handling of a dangerous goods, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic meters at any one location;

- *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; and*
- *10.1 (a) Construction of oil, water, gas and petrochemical and other bulk supply pipelines*
- *3.3 Resource extraction, manipulation, conservation and related activities.*

Consequently, GCS Water and Environmental Engineering Namibia (Pty) Ltd (*GCS Namibia* hereafter) has been appointed to conduct an Environmental Assessment (EA) (which includes public consultation) and submit the required documents as part of an application for an ECC to the Environmental Commissioner in terms of the Environmental Management Act's (7 of 2007) EIA Regulations. The findings of the EA process are incorporated into the scoping report (this report) and together with the Environmental Management Plan (EMP) (required documents), will be submitted as part of an application for an ECC to the Environmental Commissioner at the Department of Environmental Affairs (DEA), Ministry of Environment and Tourism.

Fredrika Shagama, a qualified Hydrogeologist and Linda Uulenga (Environmental Assessment Practitioner in Training) conducted this EA process under the supervision of Eloise Carstens, a qualified and experienced Environmental Assessment Practitioner (EAP) (see **Appendix A** for CV's).

## **1.2 Need and Desirability of the Project**

Namibia's Vision 2030 and National Development Plan 4 (NDP4) both recognise a need for and place significant value on economic growth and employment creation. The proposed fuel station development will contribute to these priorities at a local and regional level.

Currently there are only three fuel stations in Rundu that are all concentrated in the town centre, leaving the eastern areas of Rundu like Kehemu with no fuel station nearby. Due to the consequent increase in the number of vehicles coming to and passing through the town, there is a need for more amenities like fuel stations to meet the growing services demand.

Currently a supermarket known as Cola Cola and a taxi rank, also called Cola Cola, is located on the proposed site and both of these belong to the Proponent. The taxi rank is used by local taxi drivers (free of charge) that transport passengers from Rundu (picking and dropping them off at this taxi rank) to destinations such as Kayengona and Shambyu on the eastern side of the supermarket. The taxi drivers drive to the town centre to fuel up their cars and drive back to the taxi rank in order to transport passengers to their respective destinations which is on the opposite side of fuel stations' in town and about 4 km from town. The proposed fuel station will provide additional access to fuel to the eastern part of Rundu (Kehemu location) and for the town as a whole, while creating employment opportunities for the locals.

### 1.3 Scope of Work

This scoping study was carried out in accordance with the Environmental Management Act (EMA) (7 of 2007) and its EIA Regulations (GG No. 4878 GN No. 30).

After submitting an application for ECC to the DEA, the first stage in the EA process is to submit a scoping report. This report provides the following:

- The need and desirability of the proposed project (as described in subchapter 1.2);
- Project description (proposed fuel station development and the need for it (chapter 2));
- Alternatives considered for the proposed project in terms of project location, technology and design and No-go option (chapter 3);
- The relevant laws and guidelines pertaining to the development and associated activities (chapter 4);
- Baseline environment which will be potentially impacted by the proposed activity (fuel station development) and in chapter 5;
- Any potentially significant environmental impacts associated with the project (subchapter 5.3) and an assessment of these impacts (subchapter 7.2);
- The public consultation process followed (chapter 6 ) (as described in Regulation 7 of the EMA Act) whereby interested and affected parties (I&APs) and relevant authorities are identified, informed of the fuels station development and provided with a reasonable opportunity to give their concerns and opinions on the project;
- The impact assessment methodology (Chapter 7); and
- Mitigation measures and recommendations to avoid or minimize the potential impacts (subchapters 7.2 and 7.3). These mitigation measures are further outlined in the EMP (Appendix B).

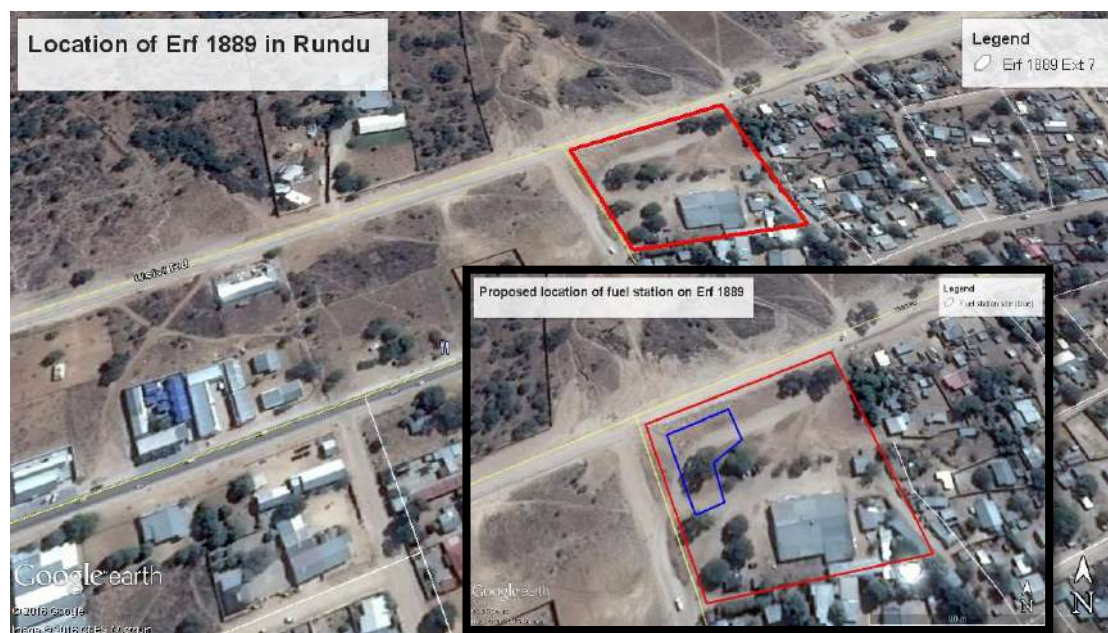
The next chapter will be focusing on the description of the proposed fuel station development and its associated activities.

## 2 PROJECT DESCRIPTION

### 2.1 Location

The proposed project site for the fuel station is located in the town of Rundu, situated in the Kavango East Region, northern part of Namibia. Rundu is located about 720 km north of Windhoek, and it is the administrative town for the two Kavango Regions; East and West.

The proposed fuel station site is located about 4 km east of the Kavango Regional Council along the Usivi Road. The approximate surface area proposed for the fuel station development within Erf 1889 is 0.16 ha out of the total erf area of 2.1 ha. The location of the proposed site for the fuel station is shown in **Figure 2-1**.



**Figure 2-1:** Location of the proposed fuel station site on Erf 1889

## 2.2 The Proposed Development

The proposed fuel station will consist of the fuel retail building with ancillary services, two underground fuel storage tanks (23 m<sup>3</sup>) of unleaded petrol, provision of additional space alongside the tank farm for the installation of additional tanks in future (if required), fuel dispensing islands inclusive of pump island servicing equipment and forecourt furniture. Furthermore, the fuel station will also comprise fuel dispensing island canopy, water/oil separator suitably located for ease of connections, high density Polyethylene (HDPE) fuel delivery pipeline system and tanks fitted with submersible pumps and ancillary equipment (automatic tank gaging etc.). The components of the fuel station will also include a dispensing islands fitted with fuel dispensers for pressure system (comparative benchmarking analysis for “suction” vs. “pressure” system to be completed) and Septic tank or connections to municipal services.

The fuel station will have a 24 hour convenience (quick) shop.

In terms of Civil and structural design and layout for site, kerb lines, concrete hard standing areas and containment slabs, layer works and appropriate forecourt and surrounding surfacing (where required), road marking, subsurface spill containment drainage system to interceptor and subsurface storm water system.

## 2.3 Services Infrastructure

The site is bordered by tarred roads to the north and west and has three existing access points, of which two (northeast and east) enable vehicle access whereas the third access point (southwest) is only suitable for people on foot.

The national water utility, NamWater supplies bulk water from the Okavango River to the Rundu Town Council, which provides the water to its customers (i.e. Rundu residents). The electricity system in the town is run by the Northern Regional Electricity Distributor (NORED).

There is a variety of business activities within the town. For security, traffic and police officers are presents 24 hours in the town and many of the shops are having their own security guards.

Rundu is connected to the rest of the national roads' network via B8, B10 and C45 main roads. There are tarred and gravel roads within the town.

Concerning the communication, Telecom Namibia and NamPost are having a shop and the cellular network is well working all over Rundu thanks to MTC (mobile network).



## 2.4 Construction Phase

During construction phase, earth works will be carried out in certain areas of the project site in order to install the necessary services infrastructure. This will require soil excavation, possible removal of the existing River Red Gum tree (*Eucalyptus Camadulesis*) within the construction site footprint and the movement of heavy construction vehicle and equipment. Electricity will be supplied by the northern regional electricity distributor (NORED). There is a power pole laying (and a Telecom box) laying on the proposed site footprint. The power pole was put there due to ongoing Usivi Road construction and the pole had to be removed from the road and put aside for safety and prevent it from being damaged by road construction works. NORED and Telecom confirmed to the Proponent that they will remove their infrastructure before construction.

Temporary employment opportunities will be created. However, the number of people to be employed during this phase is not yet known.

The construction workers are expected to be housed in the town district and not on the site.

The following activities will take place, in terms of infrastructure and service provision:

- Installation of potable water pipelines;
- Installation of wastewater disposal pipelines; and
- Installation of electrical cables for power supply.

The appointed contractor will construct a temporary boundary wall (most probably using corrugated iron sheets) to minimise air and noise (nuisance impact). The wall will also provide access control to the construction site. Construction waste will be kept on-site during construction and removed on a regular basis to Rundu Town Council solid waste management facility.

### 2.4.1 Services Infrastructure

**Table 2-1: Services Infrastructure for the construction phase**

| Services                | Requirements  | Description  | Service Point Connection  |
|-------------------------|---------------|--|---|
| <b>Resources/Inputs</b> |               |  |   |
| Water                   | Not yet known | Water is a necessity to enable construction activities | The Rundu Town Council connection from the Proponent's supermarket on site. |

| Services    | Requirements  | Description   | Service Point Connection  |
|-------------|---------------|---|---|
| Electricity | Not yet known | Power supply will be required for construction activities as well as to power up construction machinery | NORED will connect to the existing power network at the Proponent's supermarket |

The proposed site is bordered by tarred roads to the north and west. The site has three existing access points, of which two (northeast and east) enable vehicle access whereas the third access point (southwest) is only suitable for people on foot.

A parking area will be constructed on site.

## 2.5 Operational and Maintenance Phase

In order to comply with the applicable Namibian legislation and guideline and South Africa National Standards (SANS 10089-3 (2008)) and in an effort to prevent groundwater pollution, fail-safe devices will be incorporated into the design of the USTs. The fuel station will incorporate a multi-layered system to contain any potential leakage from the storage tanks and/or forecourt. For the storage tanks, these will include double-skinned tanks in a concrete vault lined with synthetic polymer membranes, and compacted clay. Similarly to the recommendation made by Botha (2014), in the event of tank leakage into the bunker, the ventilation pipes allow fuel odours to be detected during routine inspections. The automatic pipe leak detector is linked to the submersible pumping system and will shut down pumping operations in the event of a leak.

Once operational, the fuel station will provide fuel to the Kehemu location and surrounding areas. The two USTs will be filled by standard fuel tanker trucks as and when required. The Proponent will be responsible for the operation and maintenance of the fuel station. The Proponent will also be responsible for training the relevant staff members who will be responsible for:

- Filling of the USTs and dispensing of fuel;
- Monitoring fuel levels and leak detection (in tank observation wells); and
- Monitoring and maintenance of the water-oil separator.

Hazardous substances will be stored and handled and produced on-site during the operation phase these include hydrocarbons, tank sludge and waste water contaminated with hydrocarbons. The water-oil separator system will be cleaned daily to ensure optimal functioning of the system.

Emergency procedures are essential to the operation of a fuel station and a qualified occupational health and safety professional will train all the Proponent's personnel utilising the fuel station (Botha, 2014).

## **2.6 Decommissioning Phase**

It is envisaged that the proposed project will continue as long as the need for fuel exists, hence decommissioning is not anticipated. Regardless, recommendations will be provided in the EMP in the event that the proposed project needs to be decommissioned.

The following chapter (Chapter 3) will describe the alternatives and no-go option of the proposed project.

### 3 ALTERNATIVES AND THE NO-GO OPTION

Alternatives are defined as: “*different means of meeting the general purpose and requirements of the activity*” (Environmental Management Act (2007) of Namibia (and its regulations (2012))). This chapter will highlight the different ways in which the project can be undertaken and to identify the alternative that will be the most practical but least damaging to the environment.

Once the alternatives have been established, these are examined by asking the following three questions:

- What alternatives are technically and economically feasible?
- What are the environmental effects associated with the feasible alternatives?
- What is the rationale for selecting the preferred alternative?

The alternatives considered for the proposed development are discussed in following subchapters.

#### 3.1 Type of Activity to be undertaken

##### 3.1.1 The “No-go” Alternative

The “No-Go” alternative is the option of not proceeding with the activity, which typically implies a continuation of the status quo.

Should the proposed project be discontinued, none of the potential impacts (positive and negative) identified would occur. If the project is to be discontinued, there will be jobs for the people to be employed by Norton Luis Consultants during construction and operational phase of the project nor fuel convenience to the Kehemu and surrounding areas, that contributes to local and regional economic development.

In considering the proposed project, the ‘no-go’ option is not considered the preferred alternative.

#### 3.2 Location Alternatives

##### 3.2.1 Fuel Station Location

The proposed fuel station will be located within the Proponent’s erf, which is already zoned for business development. The Proponent will not have to search for or buy a new land for this development. The location of the fuel station is strategically chosen due to the lack of fuel station in this part of town, thus developing on the already existing zoned area and to cater for fuel needs in this area, the erf location is the most viable alternative option.

### 3.3 Alternative Development

The proposed site could be used for agricultural activities due to the fact that soils in Kavango East Region are rich in organic matter. The soils in Rundu has moderate content of organic matter (the light brown soil colour - **Figure 5-6**). However, the porous texture of the sandy soils in Rundu allows quick infiltration of water and quick loss, leaving little moisture in the soil and holding few nutrients. As a result, suitability for crops is generally low and crop cannot be grown on the site. Soils slightly better suited for crops occur mainly along the Kavango River, where fluvisols are derived from sediments deposited during floods and very rich in nutrients.

### 3.4 Conclusion on Weighed Alternatives

The following alternatives have been considered for the project. The preferred alternatives are:

- **No-go vs. continuation of project:** The continuation of the proposed project contribute to the local and regional economic development. The project does not only benefit people in terms of job creation but also to taxi operators that transport passengers from and to this area. Therefore the preferred alternative is to continue with the project.
- **Fuel station location:** The proposed fuel station will be located within the Proponent's erf, which is already zoned for business development. The Proponent will not have to search for or buy a new land for this development. The location of the fuel station is strategically chosen due to the lack of fuel station in this part of town, thus developing on the already existing zoned area and to cater for fuel needs in this area, the erf location is the most viable alternative option.
- **Fuel station vs. other development on site:** The erf is already zoned for business development and owned by the Proponent. The fuel station will cater for fuel station in this part of town where there is no fuel station nearby. The proposed site cannot be used for agricultural activities due to the fact that. The light-brown soils in Rundu has moderate content of organic matter and porous texture of the soils on site allows quick infiltration of water and quick loss, leaving little moisture in the soil and holding few nutrients. As a result, suitability for crops is generally low. And most importantly the area is not meant for agricultural purposes, hence fuel station is the most viable and suitable development on the erf.

For the reasons outlined above, the proposed development is the preferred alternative at the erf.

The proposed fuel station development have legal implications, and these are discussed in the next chapter.

## 4 LEGISLATION, POLICIES AND GUIDELINES

A review of applicable and relevant Namibian legislation, policies and guidelines to the proposed development are given in this chapter. This review serves to inform Norton Luis Consultants (The Proponent), Interested and Affected Parties and the decision makers at the DEA of the requirements and expectations, as laid out in terms of these instruments, to be fulfilled in order to develop the fuel station.

### 4.1 The Environmental Management Act (No. 7 of 2007)

This scoping assessment was carried out according to the Environmental Management Act (EMA) and its Environmental Impact Assessment (EIA) Regulations (GG No. 4878 GN No. 30).

The EMA has stipulated requirements to complete the required documentation in order to obtain an Environmental Clearance Certificate (ECC) for permission to undertake certain listed activities.

### 4.2 Rundu Town Planning Scheme guideline

The current zoning for the area in which the proposed site is situated is “Business”. Rundu Town Planning Scheme guideline (RTPS) was consulted. The Town Planning Scheme is a statutory document, regulating and prescribing specific land-uses that are permissible on each land unit located within the Town Council’s area of jurisdiction. According to the RTPS, Business premises and public garage are defined as follows:

***Business premises** means a site or building or structure on or in which business is done and includes shops, offices, financial institutions or restaurants or sites, buildings or structures for similar uses, but does not include places of assembly or entertainment, institutions, services stations, public garages, industries, noxious trades or bottle- stores.*

***Public garage** means a business or concern where motor vehicles are provided with fuel for payment or reward and includes trading in motor vehicles, oil, tyres or motor spares, the repair or overhauling of motor vehicles, a restaurant or café, spray painting, panel beating, black smithery or body work.*

### 4.3 Additional Relevant Regulations and Standards

The legislations that have been identified and conducted during the EA process are presented in Table 4-1.

**Table 4-1: Applicable and relevant Namibian and South African legislations, policies and guidelines conducted during the EA process**

| Legislation/Policy/<br>Guideline  | Relevant Provisions   | Implications for this project   |
|---|---|---|
| Environmental Management Act<br>EMA (No 7 of 2007)                      | Requires that projects with significant environmental impacts are subject to an environmental assessment process (Section 27).<br><br>Details principles which are to guide all EAs.  | The EMA and its regulations should inform and guide this EA process.  |
| Environmental Impact Assessment (EIA) Regulations<br>GN 28-30 (GG 4878) | Details requirements for public consultation within a given environmental assessment process (GN 30 S21).<br><br>Details the requirements for what should be included in a Scoping Report (GN 30 S8) and an Assessment Report (GN 30 S15).  |   |
| Water Act 54 of 1956  | The Water Resources Management Act 11 of 2013 is presently without regulations; therefore the Water Act No 54 of 1956 is still in force: <ul style="list-style-type: none"> <li>• Prohibits the pollution of water and implements the principle that a person disposing of effluent or waste has a duty of care to prevent pollution (S3 (k)).</li> <li>• Provides for control and protection of groundwater (S66 (1), (d (ii))).</li> </ul> Liability of clean-up costs after closure/abandonment of an activity (S3 (l)). | The protection of ground and surface water resources should be a priority. The main threats will most likely be possible spills from construction equipment, fuel spills and leakage from underground storage tanks during operation and maintenance. |
| Water Resources Management Act<br>(No 11 of 2013)                       | The act provides for the management, protection, development, use and conservation of water resources; and provides for the regulation and monitoring of water services and to provide for incidental matters. The objects of this Act are to:  |   |



| Legislation/Policy/<br>Guideline                      | Relevant Provisions   | Implications for this project   |
|---|---|---|
|   | Ensure that the water resources of Namibia are managed, developed, used, conserved and protected in a manner consistent with, or conducive to, the fundamental principles set out in Section 66 - protection of aquifers, Subsection 1 (d) (iii) provide for preventing the contamination of the aquifer and water pollution control (Section 68).                      |   |
| Soil Conservation Act (No 76 of 1969)                 | The Act makes provision for the prevention and control of soil erosion and the protection, improvement and conservation of soil, vegetation and water supply sources and resources, through directives declared by the Minister.  | Duty of care must be applied to soil conservation and management measures must be included in the EMP.  |
| Petroleum Products and Energy Act 13 of 1990          | This Act makes provision for impact assessment for new proposed fuel facilities and petroleum products known to have detrimental effects on the environment.<br><br>Furthermore, the Act prescribes the South African National Standard (SANS), as listed in section 4.12 as the criteria to which fuel installations must be constructed, operated and decommissioned. | Norton Luis Consultants should ensure that the criteria set for the construction, operation and decommissioning of fuel installations are adhered to.<br><br>Upon approval and issuing (and before construction commences) of the ECC by the Environmental Commissioner, the Proponent should apply for Petroleum Retail License from the Petroleum Affairs Division of the Ministry of Mines and Energy. |
| South African National Standard (SANS) 10089-3 (2008) | The petroleum industry Part 3: The installation, modification, and decommissioning of underground storage tanks, pumps/dispensers and pipework at service stations and consumer installations.  | The design and installation of underground tanks should comply with the requirements of SANS 10089-3.   |

| Legislation/Policy/<br>Guideline                    | Relevant Provisions   | Implications for this project  |
|---|---|--|
| Forestry Act 12 of 2001                             | <p>The Act provides for the management and use of forests and related products / resources. It offers protection to any living tree, bush or shrub growing within 100 metres of a river, stream or watercourse on land that is not a surveyed erven of a local authority area. In such instances, a licence would be required to cut and remove any such vegetation.</p> <p>These provisions are only guidelines.</p>   | <p>If there are trees within the proposed footprint of the project area that need to be removed, the proponent should notify the Town Council of the number and/or type of trees to be removed to allow construction and apply for permit to remove protected tree species.</p>                                  |
| Public Health Act 36 of 1919                        | <p>Section 119 states that “no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.”</p>  | <p>Norton Luis Consultants and all its employees should ensure compliance with the provisions of these legal instruments.</p>  |
| Health and Safety Regulations GN 156/1997 (GG 1617) | <p>Details various requirements regarding health and safety of labourers.</p>   |  |
| The Regional Councils Act (No. 22 of 1992)          | <p>This Act sets out the conditions under which Regional Councils must be elected and administer each delineated region. From a land use and project planning point of view, their duties include, as described in section 28 “to undertake the planning of the development of the region for which it has been established with a view to physical, social and economic characteristics, urbanisation patterns, natural resources, economic development potential, infrastructure, land utilisation pattern and sensitivity of the natural environment.”</p> <p>The main objective of this Act is to initiate, supervise, manage and evaluate development.</p> | <p>The relevant Regional Councils are considered to be IAPs and must be consulted during the Environmental Assessment (EA) process.</p> <p>The Rundu Town Council is the responsible Local Authority of the area in which the proposed development will be located and they should be consulted for this EA.</p> |
| Local Authorities Act (No. 23 of 1992)              |   |  |

| Legislation/Policy/<br>Guideline                                    | Relevant Provisions  | Implications for this project  |
|---|--|--|
| Atmospheric<br>Pollution<br>Prevention<br>Ordinance (11 of<br>1976) | This ordinance provides for the prevention of air pollution.   | Measures should be instituted to ensure that dust emanating from construction activities is kept at acceptable levels and operations.                          |
| Labour Act (No. 6<br>of 1992)                                       | Ministry of Labour (MOL) is aimed at ensuring harmonious labour relations through promoting social justice, occupational health and safety and enhanced labour market services for the benefit of all Namibians. This ministry insures effective implementation of the Labour Act no. 6 of 1992. | Norton Luis Consultants should ensure that construction, operation and maintenance of the fuel station, the safety and welfare of workers are not compromised. |

The next chapter (Chapter 5) presents the baseline features of the study area and the surrounding areas.

## 5 BASELINE ENVIRONMENT

The proposed project will be undertaken in a specific biophysical and social environment. The baseline conditions of these environmental features are described in the following subchapters.

### 5.1 Physical Environment

#### 5.1.1 Climate

Situated in north-eastern Namibia, the Kavango East Region generally receives more rainfall than the rest of the country to the south and west. The annual average rainfall varies between 450 and 600 mm, with a clear increasing trend from south to north with a potential annual evaporation of about 2 000 mm. Rains fall almost entirely in summer, with the months from May to September usually being dry, and the first early rains coming to the region in October and November. Highest rainfalls usually occur in January and February. The project site photos taken on the 24th November (“dry day”) and 25th November (“rainy day”) are shown **Figure 5-1** below.

The Region is usually warm to hot with average maximum temperatures above 30 °C for nine months of the year, and average minimums below 10 °C during the coolest months June, July and August. Temperatures below freezing are occasionally recorded but are rare and are usually only experienced in low-lying valleys such as found along the Kavango River and drainage lines (Omurambas) (Stubenrauch Planning Consultants *et.al*, 2015).

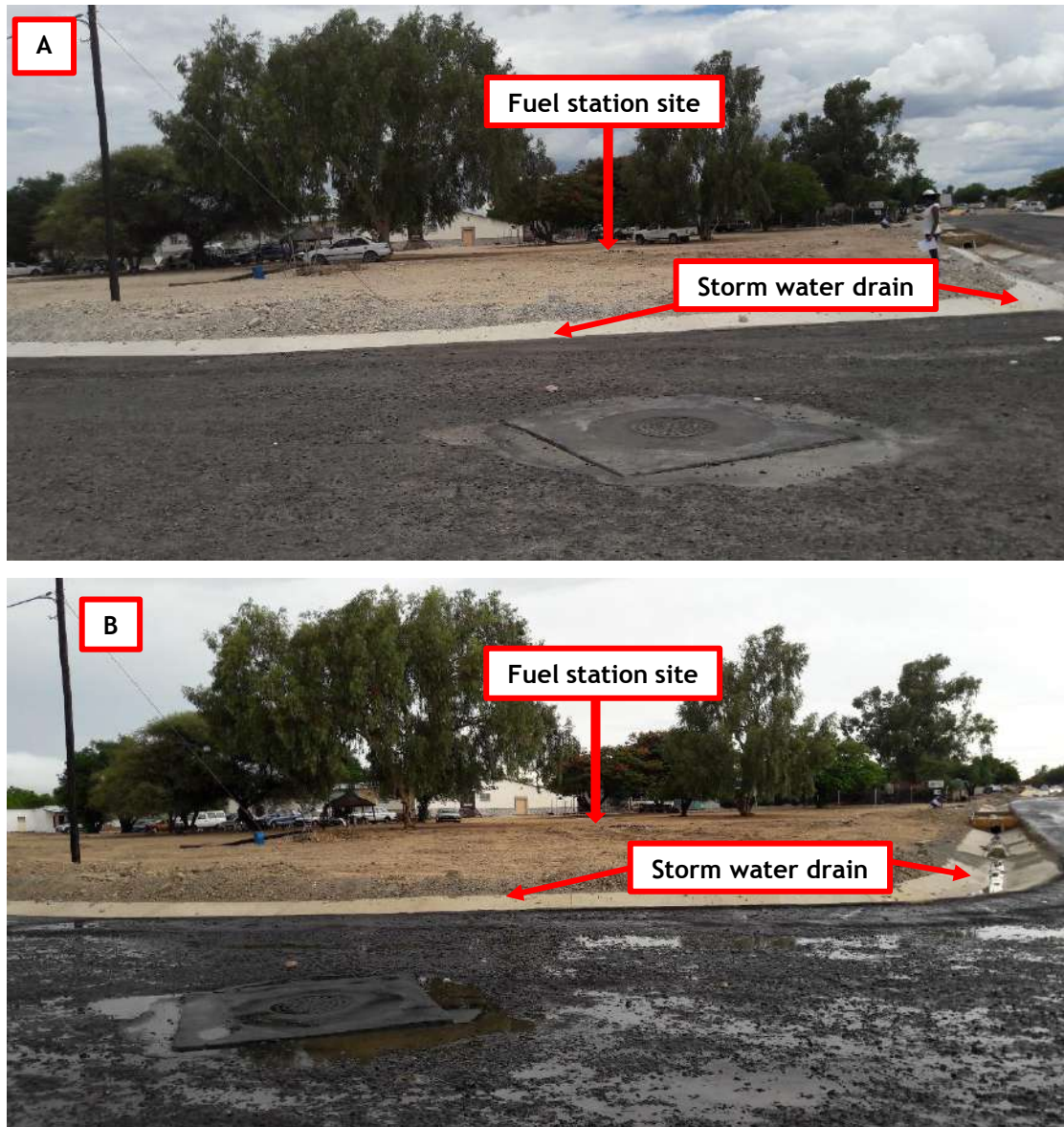


Figure 5-1: Proposed project site photos, view to the south from Usivi Road - (A) “dry day”, (B) rainy day

The climate is classified as semi-arid with a moisture deficiency throughout the year. The Kavango regions are normally frost-free and the climatic conditions are favourable for crop production (Ministry of Agriculture, Water and Forestry, 1994).

### 5.1.2 Topography

The Kavango East Region is a gently undulating plain of unconsolidated sands, sloping gradually down northwards to the Kavango River and eastwards to the lowest areas along the River before it enters Botswana. The generally flat terrain falls from about 1200 m above sea level at Mururani (Kavango West) to just below 1000 m in the east. The plains undulate from sculpting of the sand into long, low east-west oriented dunes that are rarely higher than 10 m above the adjacent valleys, and that are not conspicuous from ground level as they are low and covered in vegetation (Stubenrauch Planning Consultants *et.al*, 2015).

The sandy plain is incised by the Kavango River and other smaller ephemeral river channels, the most prominent one being the Omuramba Omatako that runs roughly northwards to meet the Kavango River east of Rundu (see **Figure 5-2** below).



**Figure 5-2:** Omuramba-Omatako (valleys or riverbeds) running northwards (Kavango River) from Usivi Road - the other side of the road from the proposed site

The elevations for Rundu range from 1 060 to 1 130 m above sea level (masl). The elevation map of Rundu is shown in **Figure 5-3** below. The elevation for the project site area ranges from 1 098 and 1 104 masl.



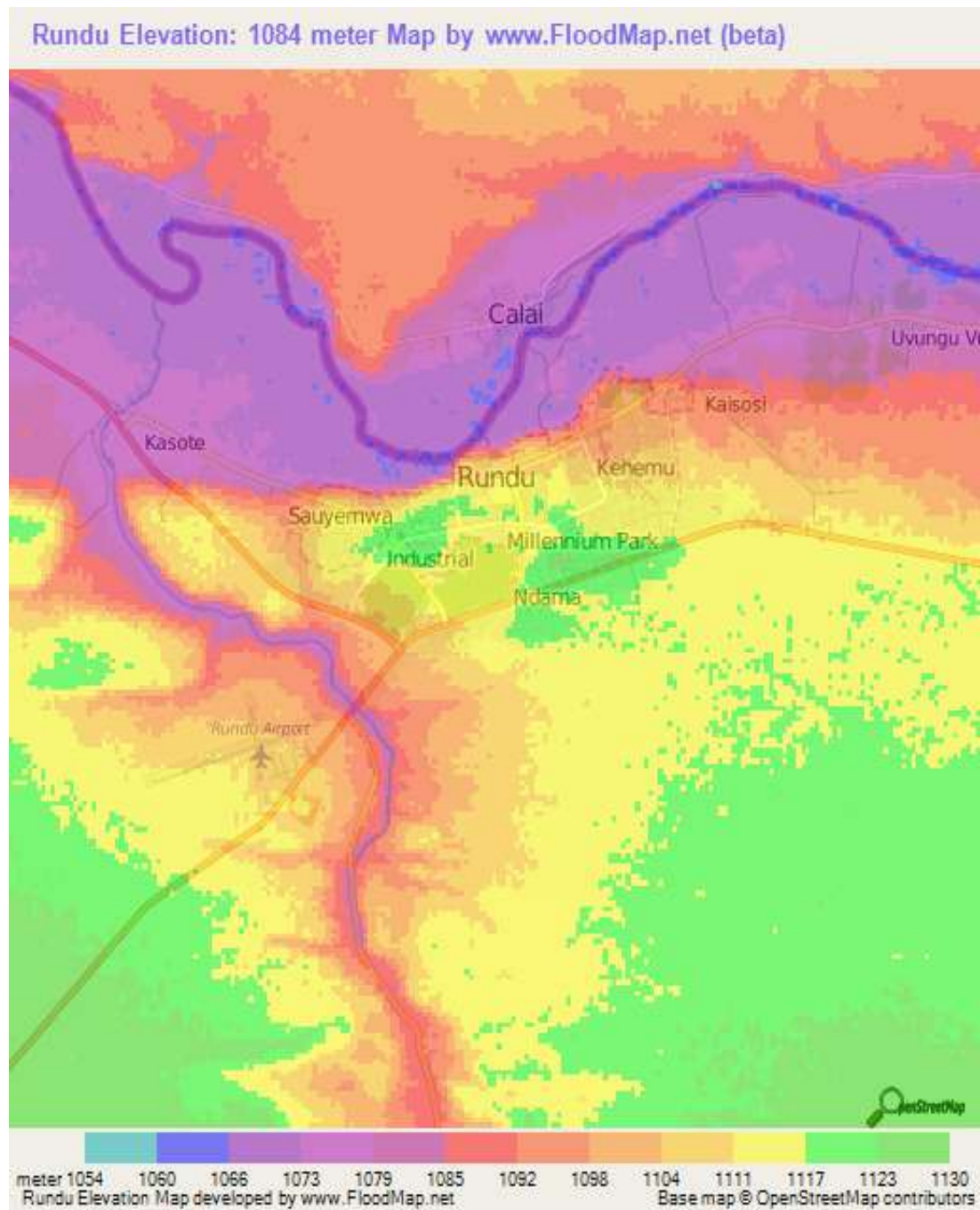


Figure 5-3: Topography and elevation map of Rundu (Burle, 2014)

### *5.1.3 Air and Wind*

The major current atmospheric dust emissions in the area are primarily generated by the vehicles travelling on gravel roads. Wind speeds are generally very low, and in most months, it is completely calm for over half the time. During November, December and January, the dominant wind direction is from the north-east, whereas during the remainder of the year, the wind blows from a predominantly south-easterly direction (Stubenrauch Planning Consultants, 2013). The knowledge of wind direction will assist in determining the direction in which dust and gas emissions from construction will travel.

### *5.1.4 Flora*

Most of the vegetation in the Kavango is fairly homogeneous Kalahari woodland, comprised of broad-leafed, deciduous woodlands that vary according to topography and the nature of the soils that support them. The typical vegetation that is common in the broader study and site area is shown in **Figure 5-4**.





**Figure 5-4: Typical vegetation Rundu and at site**

There are about ten trees within Erf 1889 i.e. eight Camel Thorn Trees (*Acacias*) and two Red Gum (*Eucalyptus camadulesis*). However, only one of the trees, Red Gum tree (**Figure 5-5**) is within the proposed site's footprint. This exotic tree is likely to be removed to enable construction works, while the rest of the trees will remain undisturbed.





**Figure 5-5: Red Gum tree on Erf 1889 (within the fuel station proposed footprint), view to the northwest**

#### **5.1.5 Soils**

Sands of the Kalahari Basin comprise the substrate of most of Kavango. The predominant soil type found along the Okavango River (where Rundu is situated) and Kavango Regions at large is arenosol: sandy, porous texture allows quick infiltration of water and quick loss, leaving little moisture in the soil and holding few nutrients. As a result, suitability for crops is generally low. Soils slightly better suited for crops occur mainly along the Kavango River, where fluvisols are derived from sediments deposited during floods (Stubenrauch *et.al*, 2015). According to Spaargaren (2004), arenosols have texture loamy sand or coarser, either to a depth of at least 100 cm from the soil surface, or to a (petro) plinthic or salic horizon between 50 and 100 cm from the soil surface; and less than 35% of coarse fragments.

The Rundu area is overlain by relatively flat light-brown sand, rocky and gravel plains of the Kalahari plains (Figure 5-6). The light brown colour in the soil indicates that the soil has a moderate organic matter content, whereas dark brown colour indicated high content of organic matter.



**Figure 5-6: Sandy soil in Rundu**

#### **5.1.6 Geology**

According to Bittner (2002), the Okavango Basin is part of the greater Kalahari Basin, which covers most of the northern and eastern parts of Namibia and extends across the Namibian border into Botswana and Angola. The bedrock underlying the basin filled with Kalahari Sequence deposits consisting of basal rocks of the Damara Sequence, followed by the Karoo Sequence sediments, overlain and intruded by volcanics of Karoo age. The unconsolidated to semi-consolidated clay, sand and gravel (aeolian and alluvial sediments) of the Kalahari Sequence fill the Okavango Sub-basin, which thickens from the northeast towards the northwest, from 0 to >400 m along the north-west trending basin axis. Sub-outcrops of volcanic rock occur at the Okavango River near Rundu and between Mukwe and Bagani. Damara Sequence rocks crop out in the southern part of the Kaudom Park within the Nhoma River drainage and at the border between the Kavango and Caprivi regions near Andara.

#### **5.1.7 Surface and Groundwater**

The most conspicuous and important feature in the region is the perennial Kavango River, making up 350 km of Namibia's northern border before crossing the Regions and flowing into Botswana. Almost the entire runoff of the Kavango basin is generated in the Angolan highlands, and the water is very clear and clean. The main Rio Cubango provides just over half the total runoff, and flows are quite variable from season to season and year to year, depending on rainfall. The Rio Cuito joins the Kavango about 100 km downstream of Rundu, and has a more even flow rate and later flood peak. The average total runoff in the river as it leaves Namibia is about 9 800 Mm<sup>3</sup>.

The Kavango River is the major source of water for rural communities that are concentrated along it. Water is also abstracted to supply Rundu and smaller towns and agricultural schemes (Stubenrauch *et.al*, 2015).

According to the hydrogeological map of Namibia (Christelis and Struckmeier, 2001), the regional groundwater potential is moderate. Groundwater within the wider area of the Kavango Regions (Kavango East and West), is hosted in two distinct aquifer systems, Kalahari aquifers and fractured bedrock aquifers. These two aquifers are treated separately in this study as they have different characteristics. Kalahari aquifers hold water in intergranular pore spaces, whereas water in fractured aquifers is held in cracks and fractures in otherwise impermeable strata. Kalahari aquifers are common in the Kavango Regions (Christelis and Struckmeier, 2001). More information on the groundwater of the study area is provided in *Desktop Groundwater Impact Assessment Report (Appendix I)*.

## 5.2 Social Environment

### 5.2.1 Introduction

Rundu was the regional capital of the Kavango Region, but after the partition of the region into Kavango East and Kavango West, Rundu has become the regional capital of the Kavango East region. As the only population centre in the sub-region Rundu operates as a regional hub for services (Stubenrauch Planning Consultants, 2013). Rundu is the second largest town in Namibia, in terms of population size.

The town of Rundu lies in an important strategic position as the gateway linking a number of important Southern Africa Development Community (SADC) countries with Namibia's port of Walvis Bay.

All road traffic from Namibia's neighbouring countries of Angola, Zambia, Zimbabwe and Botswana must route through Rundu to reach the port of Walvis Bay (Rundu Town Council, 2006).

### 5.2.2 Land Use

The proposed site falls within Erf 1889 of the Rundu Townlands zoned as “*business*”. The erf is under the ownership of the Proponent (Norton Luis Consultants). Apart from the proposed fuel station to be built on the erf, there is Cola Cola supermarket on the erf and a taxi rank in front of the supermarket (see **Figure 5-7** and **Figure 5-8**). The taxi rank is used by local taxi drivers (free of charge) that transport passengers from Rundu (picking and dropping them off at this taxi rank) to destinations such as Kayengona, Shambyu etc. on the eastern side of the site. There are also rented flats behind the supermarket that belong to Norton Luis Consultants.



**Figure 5-7:** Cola Cola supermarket (white building partially covered by trees - view to the east)



**Figure 5-8:** Cola Cola taxi rank on site (view to the northwest)



Furthermore, there is a car wash inside the erf, located on the southwestern corner of the erf (Figure 5-9). The owner of the car wash is renting the space from the Proponent



Figure 5-9: Car wash (Bolly's Auto Wash) on Erf 1889

### 5.2.3 Population Density

According to the Population and Housing Census conducted in 2011, the population of Kavango East Region was 136 823, out of which 63 431 made the population of Rundu. The population density both Kavango Regions (East and West) was 4.6 persons per km<sup>2</sup> (Namibia Statistics Agency, 2011).

### 5.2.4 Economy

The Kavango region is the poorest region in Namibia with a Human Development Index (HDI). The HDI concentrates in the three essential factors of human life; longevity, knowledge, and a decent standard of living. The HDI of the region is 0.4, but the town is geographically located at a strategic crossroad and has, since peace and stability returned to Angola, potential to develop to a significant border town.

The Kavango East Region is located within the heart of the conservation, tourism and trade potential. The tourism options are mainly concentrated along the Okavango River, where privately-owned lodges cater for self-drive tourists, in the community-based conservancies (mainly Joseph Mbambangandu, George, Mukoya and Muduva Nyangana) and in the Khaudum National Park (Stubenrauch Planning Consultants, 2013). The biggest attraction of Rundu, however, lies in the Towns strategic position with regard to the Kavango - Zambezi Transfrontier Conservation Area (KAZA). Not only is the region strategically located within one of the largest conservation areas (KAZA), but also it is well located in terms of trade opportunities with Angola and trade via the Trans-Caprivi Highway to other African countries (Stubenrauch Planning Consultants et.al, 2015).

The information provided above is important because the proposed development will be able to cater to the fuel needs to the many vehicles and potential vehicles (especially tourist) passing through Rundu via Usivi Road on the eastern side of town to the tourist destinations such as KAZA conservation area and possibly Bwabwata National Park in the Zambezi Region.

### 5.3 Identified Potential Impacts

The following potential impacts have been identified and are summarized in **Table 5-1**. The assessments of the negative impacts are presented in **subchapter 7.2, 7.3 and 7.4**.

**Table 5-1: Summary of the Identified Potential Impacts**

| Feature                    | Description of Project Activity  | Potential Impact   |
|----------------------------|--|--|
| POSITIVE                   |  |  |
| Construction Phase         |  |  |
| Employment                 | The construction of the fuel station will create jobs and improve economic development of the Region.  | Sustaining of employment opportunities to locals.                        |
| Local and regional economy |  | Positive contribution to Rundu town and the Kavango East Region economy. |
| NEGATIVE                   |  |  |
| Soil                       | Improper handling and disposal of construction substances like hydrocarbons and other potential pollutants may lead to the contamination of surrounding soils on site. | Soil contamination   |

| Feature                          | Description of Project Activity  | Potential Impact   |
|----------------------------------|--|--|
| Ground and surface water         | <p>Improper handling and disposal of construction substances like hydrocarbons and other potential pollutants may lead to groundwater contamination or run-off may end up in surface water bodies.</p> <p>Run-off is unlikely to happen because the fuel station is situated on the other side (south) of the Usivi road and there is a storm water drain built on road side the fuel station site which will impede water off to elsewhere.</p> | Ground and surface water contamination                                       |
| Biodiversity                     | Removal of one tree within the proposed fuel station footprint area.   | Loss of biodiversity.  |
| **Noise                          | Temporary noise generated by construction machinery and vehicles during this phase may lead to noise to the local.   | Short-term nuisance impact (during construction)                             |
| **Air                            | Potential dust and gas emissions from construction vehicles, like heavy trucks and equipment.  | Short-term decrease in air quality due to dust generated during construction |
| **Vehicular traffic              | Potential increase in traffic due to construction activities on site.  | Impact on traffic safety.  |
| **Car wash and taxi rank on site | <p>The car wash will potentially close during construction period</p> <p>The taxi rank will potentially close to enable free movement of construction vehicles and works.</p>  | Temporary loss of income   |
| **Waste generation               | Construction activities usually generates wastes of all kinds (domestic and general), which leads to environmental pollution.  | Environmental pollution  |



| Feature                             | Description of Project Activity  | Potential Impact                                    |
|-------------------------------------|--|---|
| Health and Safety                   | Improper handling of construction materials and equipment may cause health and safety risks.   | Health and safety                                   |
| Operational Phase                   |  |   |
| Positive                            |  |   |
| Employment                          | The operation of the fuel station will positively contribute to the social environment through job creation and economic development of the town and Kavango Regions at large.   | Creation of employment opportunities to some locals |
| Fuel access                         | Provision of fuel convenience to local residents and businesses in Kehemu and surrounding locations without having to travel to the town centre.<br><br>Taxi drivers that pick and drop off passengers at Cola Cola taxi rank will not be travelling back and forth for fuel in town.  | Fuel convenience                                    |
| 24 hour Quick shop (amenity access) | The Quick shop will create social and economic benefits for the local community. Although there is already the Proponent's supermarket (which opens daily from 07h00 to 19h00, with the exception of public holidays) on the erf, the 24 hour Quick shop at the fuel station will provide convenient access to the main amenities at all times (even after the supermarket's opening hours). | Social and economic benefits to locals              |
| Negative                            |  |   |

| Feature               | Description of Project Activity   | Potential Impact                   |
|-----------------------|---|------------------------------------|
| Groundwater and soil  | Improper handling, storage and disposal of hydrocarbons products and other potential pollutants may lead to soil and groundwater contamination.   | Groundwater and soil contamination |
| Health and Safety     | Handling and storage of flammable goods may cause health and safety risks.  | Health and safety                  |
| Decommissioning Phase |   |                                    |
| Negative              |   |                                    |
| Groundwater           | Should the fuel station be decommissioned, the improper decoupling and removal of pipes and fuel tanks could lead to contamination of groundwater loss of jobs to the people employed at the fuel station and quick shop. | Groundwater pollution              |
| Employment            | People that were employed by the fuel station and its associated facilities will lose their jobs.   | Loss of jobs                       |

\*\* - Temporary impacts

The following chapter will discuss the public consultation process undertaken for this EA process.

## 6 PUBLIC CONSULTATION

Public consultation forms an important component of an Environmental Assessment (EA) process. Public consultation provides potential Interested and Affected Parties (I&APs) with an opportunity to comment on and raise any issues relevant to the project for consideration as part of the assessment process. Public consultation has been done in accordance with both the EMA and its EIA Regulations.

The public consultation process assists the Environmental Assessment Practitioner (EAP) in identifying all potential impacts and to what extent further investigations are needed. Public consultation can also aid in the process of identifying possible mitigations measures.

### 6.1 Interested and Affected Parties (I&APs)

GCS identified specific I&APs, whom were considered interested in and/or affected by the existing operations. The I&APs identified include; applicable organs of state (national, regional and local) and other interested members of the public. These I&APs were contacted directly and registered as I&APs. In addition, notices regarding the project were placed in widely circulated national newspapers for two consecutive weeks inviting members of the public to register as I&APs. A summary of the I&APs identified are presented in **Table 6-1**. The complete list of I&APs is provided in **Appendix C**.

**Table 6-1: Summary of Identified I&APs**

| List of I&APs | Description  |
|---------------|--|
|               | Ministry of Environment and Tourism                              |
|               | Ministry of Agriculture, Water and Forestry                      |
|               | Ministry of Mines and Energy                                     |
|               | Ministry of Labour, Industrial Relations and Employment Creation |
|               | Ministry of Health and Social Services                           |
|               | State Parastatals (NORED, NamWater and Roads Authority)          |
|               | Kavango East Regional Council                                    |
|               | Rundu Town Council   |
|               | Interested members of the public                                 |

## 6.2 Communication with I&APs

Regulation 21 of the EIA Regulations details steps to be taken during a given public consultation process and these have been used in guiding this process.

Communication with I&APs about the proposed development was facilitated through the following means and in this order:

- A Background Information Document (BID) containing descriptive information about the proposed fuel station was compiled (**Appendix D**) and sent out to all identified and registered I&APs;
- Notices were placed in *The Namibian* and *New Era* newspapers dated 10<sup>th</sup> and 17<sup>th</sup> November 2016, briefly explaining the activity and its locality, inviting members of the public to register as I&APs (**Appendix E**);
- Site Notices were fixed at conspicuous locations on the northeastern and southwestern entrances of the site (Erf 1889) as well as the Kavango East Regional and Rundu Town Council in Rundu (see **Appendix F**);
- A meeting with Local Authority was arranged for the 24<sup>th</sup> November 2016 at Kavango East Regional Council (Government Hall). None of the invited members of the authorities attended the meeting. GCS Namibia then visited the offices of the relevant available representatives at the Kavango Regional Council (Mr. Shikongo, office of the Chief Development Planner) and the Rundu Town Council (Town Planning office). The aim was to briefly explain to the representatives what was supposed to be discussed in the meeting and provided them with seven days from the meeting date to submit their comments.
- A public meeting notice (email) was sent out to all I&APs inviting them to the meeting. The meeting was arranged for the 24<sup>th</sup> November 2016 at the proposed project site (Cola Cola Supermarket taxi rank) in Rundu. On the day of the meeting, four I&APs attended.

The following points were raised during the public meeting:

- Possible flow of wastewater from the fuel station area downstream, since there is a slope on the northern side of the road (towards the north); and

- The three taxi drivers expressed their support for the proposed project. According to them, the new fuel station will enable them to fill up their car tanks at the taxi rank and take passengers from the taxi rank directly to their respective destinations such as Kayengona and Shambyu on the eastern side of the proposed site without having to go refuel their cars at the fuel stations in town and drive back to the taxi rank (site) again. The meeting minutes are attached in **Appendix G**.

The issues raised during the public meeting are further presented in the Issues and Response Trail in **Appendix H**.

Public consultation was carried out according to the Environmental Management Act's EIA Regulations. After the public meeting, the I&APs were given a week to submit their comments on the project. There were no comments received during that period (prior to the compilation of the scoping report).

## 7 IMPACT ASSESSMENT

### 7.1 Impact Assessment Methodology

The proposed fuel station development have impacts on certain biophysical and social features. The identified impacts were assessed in terms of probability (likelihood of occurring), scale/extent (spatial scale), magnitude (severity) and duration (temporal scale) as presented in **Table 7-1**, **Table 7-2**, **Table 7-3** and **Table 7-4**. To enable a scientific approach to the determination of the environmental significance, a numerical value is linked to each rating scale. This methodology ensures uniformity and that potential impacts can be addressed in a standard manner so that a wide range of impacts are comparable.

It is assumed that an assessment of the significance of a potential impact is a good indicator of the risk associated with such an impact. The following process will be applied to each potential impact:

- Provision of a brief explanation of the impact;
- Assessment of the pre-mitigation significance of the impact; and
- Description of recommended mitigation measures.

The recommended mitigation measures prescribed for each of the potential impacts contribute towards the attainment of environmentally sustainable operational conditions of the project for various features of the biophysical and social environment.

The following criteria was applied in this impact assessment:

#### 7.1.1 Extent (spatial scale)

Extent is an indication of the physical and spatial scale of the impact. **Table 7-1** shows rating of impact in terms of extent of spatial scale.

**Table 7-1: Extent or spatial impact rating**

| Low (1)   | Low/Medium (2)                            | Medium (3)   | Medium/High (4)                                      | High (5)  |
|---|---|--|--|---|
| Impact is localised within the site boundary: Site only | Impact is beyond the site boundary: Local | Impacts felt within adjacent biophysical and social environments: Regional | Impact widespread far beyond site boundary: Regional | Impact extend National or over international boundaries |

#### 7.1.2 Duration

Duration refers to the timeframe over which the impact is expected to occur, measured in relation to the lifetime of the project. **Table 7-2** shows the rating of impact in terms of duration.

**Table 7-2: Duration impact rating**

| Low (1)   | Low/Medium (2)   | Medium (3)                                     | Medium/High (4)     | High (5)   |
|---|--|--|---------------------|--|
| Immediate mitigating measures, immediate progress | Impact is quickly reversible, short term impacts (0-5 years) | Reversible over time; medium term (5-15 years) | Impact is long-term | Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources |

### 7.1.3 Intensity, Magnitude / severity

Intensity refers to the degree or magnitude to which the impact alters the functioning of an element of the environment. The magnitude of alteration can either be positive or negative. These were also taken into consideration during the assessment of severity. Table 7-3 shows the rating of impact in terms of intensity, magnitude or severity.

**Table 7-3: Intensity, magnitude or severity impact rating**

| Type of criteria | Negative  |   |   |   |  |
|------------------|---|---|---|---|--|
|                  | H-(10)  | M/H-(8)   | M-(6)   | M/L-(4)   | L-(2)  |
| Qualitative      | Very high deterioration, high quantity of deaths, injury of illness / total loss of habitat, total alteration of ecological processes, extinction of rare species | Substantial deterioration, death, illness or injury, loss of habitat / diversity or resource, severe alteration or disturbance of important processes | Moderate deterioration, discomfort, partial loss of habitat / biodiversity or resource, moderate alteration | Low deterioration, slight noticeable alteration in habitat and biodiversity. Little loss in species numbers | Minor deterioration, nuisance or irritation, minor change in species / habitat / diversity or resource, no or very little quality deterioration. |

### 7.1.4 Probability of occurrence

Probability describes the likelihood of the impacts actually occurring. This determination is based on previous experience with similar projects and/or based on professional judgment. See Table 7-4 for impact rating in terms of probability of occurrence.

**Table 7-4: Probability of occurrence impact rating**

| Low (1)   | Medium/Low (2)   | Medium (3)   | Medium/High (4)  | High (5)   |
|---|--|--|--|--|
| Improbable; low likelihood; seldom. No known risk or vulnerability to natural or induced hazards. | Likely to occur from time to time. Low risk or vulnerability to natural or induced hazards | Possible, distinct possibility, frequent. Low to medium risk or vulnerability to natural or induced hazards. | Probable if mitigating measures are not implemented. Medium risk of vulnerability to natural or induced hazards. | Definite (regardless of preventative measures), highly likely, continuous. High risk or vulnerability to natural or induced hazards. |

### 7.1.5 Significance

Impact significance is determined through a synthesis of the above impact characteristics. The significance of the impact “without mitigation” is the main determinant of the nature and degree of mitigation required. As stated in the introduction to this chapter, for this assessment, the significance of the impact without prescribed mitigation actions was measured.

Once the above factors (Table 7-1, Table 7-2, Table 7-3 and Table 7-4) have been ranked for each potential impact, the impact significance of each is assessed using the following formula:

$$SP = (\text{magnitude} + \text{duration} + \text{scale}) \times \text{probability}$$

The maximum value per potential impact is 100 significance points (SP). Potential impacts were rated as high, moderate or low significance, based on the following significance rating scale (Table 7-5).

**Table 7-5: Significance rating scale**

| <i>SIGNIFICANCE</i> | <i>ENVIRONMENTAL SIGNIFICANCE POINTS</i> | <i>COLOUR CODE</i> |
|---------------------|--|--------------------|
| High (positive)     | >60                                      | H                  |
| Medium (positive)   | 30 to 60                                 | M                  |
| Low (positive)      | <30                                      | L                  |
| Neutral             | 0  | N                  |
| Low (negative)      | >-30                                     | L                  |
| Medium (negative)   | -30 to -60                               | M                  |
| High (negative)     | >-60                                     | H                  |

For an impact with a significance rating of high, mitigation measures are recommended to reduce the impact to a low or medium significance rating, provided that the impact with a medium significance rating can be sufficiently controlled with the recommended mitigation measures. To maintain a low or medium significance rating, monitoring is recommended for a period of time to enable the confirmation of the significance of the impact as low or medium and under control.

The impact assessment for the proposed fuel station development is given in subchapter 7.2 7.3 and 7.4.



## 7.2 Construction Phase Impact Assessment

The potential impacts associated with the construction phase of the fuel station have been identified and assessed in this subchapter. The main impacts identified are; soil contamination, surface and groundwater contamination, loss of biodiversity and health and safety. **Temporary potential impacts** identified include: noise, air pollution, vehicular traffic safety and loss of income for car wash owner and taxi rank operators.

### 7.2.1 Impact Assessment of Surface and Groundwater Contamination

Run- off of effluent / wastewater may end up in surface water bodies. This is unlikely to happen because the fuel station is situated on the other side of the Usivi road and there is a storm water drain built on the southern side of the road (adjacent to the proposed fuel station site) which will impede run-off to elsewhere. Improper handling, storage and disposal of hydrocarbon products and other contaminants / effluent produced on site during construction may seep into groundwater systems. The assessment of this impact is presented in **Table 7-6**.

**Table 7-6: Assessment of the impacts of the fuel station on groundwater**

| Extent  | Duration | Intensity | Probability | Significance |
|---------|----------|-----------|-------------|--------------|
| L/M - 2 | M - 3    | L - 2     | L/M - 2     | L - 14       |

#### 7.2.1.1 Mitigations and recommendation to surface and groundwater contamination

- All run off materials such as hydrocarbons, waste water and other potential contaminants should be contained on site and disposed of in accordance to municipal waste water discharge standards, so that they do not reach to groundwater systems.
- At least three tank observation wells (TOWs) to a depth of 10 m should be drilled and installed around the fuel station. These wells will be used to detect possible pollution from the tanks in groundwater.
- Regular maintenance and monitoring of underground storage tanks should be done to detect early spills or leakages.
- Groundwater impact awareness training should be provided to the employees involved in this phase.
- An emergency plan should be available for major / minor spills at the service station during construction activities (with consideration of air, groundwater, soil and surface water) and during the transportation of the product(s) to the construction site.

### 7.2.2 Impact Assessment of Soil Contamination

Potential contaminants such as hydrocarbons and waste water / effluent that will be produced on site during construction may contaminate the surrounding soils. The assessment of this impact is presented in Table 7-7.

**Table 7-7: Assessment of the impacts of the fuel station on surrounding soils**

| Extent | Duration | Intensity | Probability | Significance |
|--------|----------|-----------|-------------|--------------|
| L - 1  | L - 1    | L - 2     | L/M - 2     | L - 8        |

#### 7.2.2.1 Mitigations and recommendation to soil contamination

- Spill control preventative measures should be put in place to manage soil contamination.
- An impermeable liner should be laid down on the site area in order to prevent contaminants from reaching to surrounding soils and eventually groundwater systems.
- Potential contaminants such as hydrocarbons and waste water should be contained on site and disposed of in accordance to municipal wastewater discharge standards so that they do not contaminate surrounding soils and eventually groundwater.
- All waste generated during construction should either be kept for recycling or disposed at the local landfill site.
- The proponent should appoint an Environmental officer to monitor soil contamination on site.

### 7.2.3 Impact Assessment of Biodiversity Loss

The existing Red River gum Tree within the proposed site's footprint is one of the exotic tree species in this Region (Lela, 2014). The tree however, is likely to be removed to enable construction works and this will result in the loss of biodiversity. This is a small scale destruction and impact is minimal, as it is only one tree. The envisaged impact at the project site, is thus not of such magnitude and/ or significance that it will have irreversible impacts on the biodiversity and endemism of the area and Namibia at large. The assessment of this impact is presented in Table 7-8.

**Table 7-8: Assessment of the impacts of the fuel station development on biodiversity**

| Extent | Duration | Intensity | Probability | Significance |
|--------|----------|-----------|-------------|--------------|
| L - 1  | L/M - 2  | L - 2     | M - 3       | L - 15       |

#### 7.2.3.1 Mitigations and recommendation to biodiversity

- The Proponent should only remove trees within the actual footprint of the proposed facility' structures to be erected. Trees that are not within the footprint should be left to preserve biodiversity in the area.
- Trees that have not been registered and surveyed and will be removed, the Proponent should apply for the licence to remove these trees from the Forestry department (Ministry of Agriculture, water and Forestry) in Rundu.
- Large indigenous trees on site need to be identified, marked and surveyed.
- Trees with a trunk size of 150 mm and bigger should be surveyed, marked with paint (readily visible) and protected.

#### 7.2.4 Impact Assessment of Health and Safety

Improper handling of construction materials and equipment may cause health and safety risks (injuries and possible fatalities). The assessment of this impact is presented in Table 7-9.

**Table 7-9: Assessment of the impacts of the fuel station on health and safety**

| Extent  | Duration | Intensity | Probability | Significance |
|---------|----------|-----------|-------------|--------------|
| L/M - 2 | L/M- 2   | L- 2      | L/M - 2     | L - 12       |

##### 7.2.4.1 Mitigations and recommendation to health and safety

- The contractor(s) should ensure that all personnel are provided with personal protective equipment (PPE), such as coveralls, gloves, safety boots, safety glasses and hard hats at all times during construction hours and when on site.
- No workers should be allowed to drink alcohol during working hours.
- No workers should be allowed on site if under the influence of alcohol.
- An appropriate location should be indicated on the site for the parking of construction vehicles.
- The proponent should put up a boundary wall around the construction site to limit public access to the site during construction.
- Guidelines should be painted for all access and exit movements, including for the right turning movement form and to the site (fuel station)

### 7.2.5 Impact Assessment of Noise

There is an inconvenient impact of noise pollution (to neighbouring locals) associated with construction activities and equipment. This may also pose a health risk to construction workers if they are too exposed to noisy areas at the site. The assessment of this impact is presented in Table 7-10.

**Table 7-10: Assessment of the noise impact from the construction of the fuel station**

| Extent  | Duration | Intensity | Probability | Significance |
|---------|----------|-----------|-------------|--------------|
| L/M - 2 | L/M - 2  | L - 2     | M - 3       | L - 18       |

#### 7.2.5.1 Mitigations and recommendation to noise

- Noise from construction vehicles and equipment should be reduced to an acceptable level.
- Noisy equipment should be shut down when are not in use (when not needed) to avoid unnecessary noise on site.
- Workers performing noisy tasks should be rotated regularly (work on shifts) to avoid exposing them to excessive noise for a long period of time in a day.
- Workers should be equipped with personal protective equipment (PPE) such as earplugs to reduce noise exposure. Workers should ensure that they put on PPE at all times on work sites.

### 7.2.6 Impact Assessment of Air Quality

Dust emissions from construction vehicles and equipment and construction activities will lead to a short-term decrease in air quality. The assessment of this impact is presented in Table 7-11.

**Table 7-11: Assessment of the impacts of the fuel station on air quality**

| Extent  | Duration | Intensity | Probability | Significance |
|---------|----------|-----------|-------------|--------------|
| L/M - 2 | L/M - 2  | L - 2     | L/M - 2     | L - 12       |

#### 7.2.6.1 Mitigations and recommendation to air quality

- Dust generation should be kept at an acceptable level. If feasible, municipal wastewater should be treated to an acceptable water quality level, so that it can be used for construction purposes (which includes dust suppression).

### 7.2.7 Impact Assessment of Income Loss

The taxi rank on the site will potentially be closed for the period of construction. The car wash is likely to be closed too, due to the fact that it will not be able to co-exist with construction works, where dust is generated the entire period of construction. These two small businesses will temporary lose income, should there be no an alternative location to continue with their activities during fuel station construction period. The assessment of this impact is presented in Table 7-12.

**Table 7-12: Assessment of the impacts of the fuel station construction on the income of local small businesses**

| Extent | Duration | Intensity | Probability | Significance |
|--------|----------|-----------|-------------|--------------|
| M - 3  | L/M - 2  | L - 2     | M - 3       | L - 21       |

#### 7.2.7.1 Mitigations and recommendation to temporary income loss

- The Proponent should inform (and if possible assist) the taxi drivers and the car wash owner timely, so that they can start looking at possible and suitable temporary locations in order to continue with their activities during construction.

### 7.2.8 Impact Assessment of Waste Generation

Construction activities usually generates wastes of all kinds (domestic and general), which leads to environmental pollution. This may pose a health risk to the people and environment. The assessment of this impact is presented in Table 7-13.

**Table 7-13: Assessment of the waste generation from the construction of the fuel station**

| Extent  | Duration | Intensity | Probability | Significance |
|---------|----------|-----------|-------------|--------------|
| L/M - 2 | L/M - 2  | L - 2     | M - 3       | L - 18       |

#### 7.2.8.1 Mitigations and recommendation to waste generation

- The construction site should be kept tidy at all times.
- All domestic and general construction waste produced on a daily basis should be cleaned and contained daily.
- No waste may be buried or burned on site or anywhere else.
- Waste containers (bins) should be emptied regularly and removed from site to the municipal waste disposal site.
- All recyclable waste needs to be taken to the nearest recycling depot.
- A sufficient number of separate waste containers (bins) for hazardous and domestic / general waste must be provided on site.
- Construction labourers should be sensitised to dispose of waste in a responsible manner and not to litter.

- No waste may remain on site after the completion of the project.

### 7.2.9 Impact Assessment of Vehicular Traffic Safety

Impact on traffic safety when heavy vehicles are roaming around the area during construction. Heavy construction vehicles will exert pressure on local roads and potentially result in road accidents. The assessment of this impact is presented in Table 7-14.

**Table 7-14: Assessment of the impacts of the fuel station on traffic (vehicular) safety**

| Extent  | Duration | Intensity | Probability | Significance |
|---------|----------|-----------|-------------|--------------|
| L/M - 2 | L/M - 2  | L/M - 4   | L/M - 2     | L - 16       |

#### 7.2.9.1 Mitigations and recommendation to traffic safety

- Construction vehicles should have a scheduled time for loading and offloading materials at the site so that they do not interfere with daily traffic in the area whenever.
- Construction vehicles should not park outside the site boundary wall.

## 7.3 Operational and Maintenance Phase Impact Assessment

The main potential impacts associated with operational and maintenance phases identified are; groundwater and soil contamination and health and safety.

### 7.3.1 Impact assessment of Soil and Groundwater Contamination

Improper handling, storage and disposal of hydrocarbon products and other contaminants at the fuel station may lead to soil and groundwater contamination, in case of spills and leakages. The assessment of this impact is presented in Table 7-15.

**Table 7-15: Assessment of the impacts of the fuel station on soil and groundwater**

| Extent  | Duration | Intensity | Probability | Significance |
|---------|----------|-----------|-------------|--------------|
| L/M - 2 | L - 1    | L - 2     | L/M - 2     | L - 10       |

#### 7.3.1.1 Mitigations and recommendation to soil and groundwater contamination

- Spill control preventative measures should be put in place to manage soil contamination.
- Potential contaminants such as hydrocarbons and waste water should be contained on site and disposed of in accordance to municipal wastewater discharge standards so that they do not contaminate surrounding soils and eventually groundwater.

- An emergency plan should be available for major / minor spills at the service station during operation activities (with consideration of air, groundwater, soil and surface water) and during the transportation of the product(s) to the fuel station.

### 7.3.2 Impact of the Fuel Station on Health and Safety

The handling and storage of flammable goods such as fuel at the facility may cause health and safety risks to people and the environment at large. The assessment of this impact is presented in **Table 7-16**.

**Table 7-16: Assessment of the impacts of fuel station on health and safety**

| Extent | Duration | Intensity | Probability | Significance |
|--------|----------|-----------|-------------|--------------|
| L - 1  | L/M- 2   | L/M - 4   | L/M- 2      | L - 14       |

#### 7.3.2.1 Mitigations and recommendation on health and safety

- Fuel station workers should be provided with an awareness training about the risks associated with fuel handling and storage.
- During maintenance, workers should be properly equipped with personal protective equipment (PPE) such as coveralls, gloves, safety boots, safety glasses etc.
- The fuel station facility should be equipped with fire extinguishers.

## 7.4 Decommissioning Phase

Should the fuel station be decommissioned, the main potential impacts are; groundwater pollution and loss of jobs to the people employed at the fuel station and quick shop.

### 7.4.1 Impact of the Fuel Station Closure on Groundwater

Should the fuel station decommissioned and the facility pipelines and fuel storage tanks are not drained and emptied before decoupling and removing, groundwater will be polluted. The assessment of this impact is presented in **Table 7-17**.

**Table 7-17: Assessment of the impacts of fuel station closure on groundwater**

| Extent | Duration | Intensity | Probability | Significance |
|--------|----------|-----------|-------------|--------------|
| L - 1  | L/M- 2   | L/M - 4   | L/M- 2      | L - 14       |

#### 7.4.1.1 Mitigations and recommendation on groundwater

- Fuel pipelines and tanks should be properly drained and emptied before decoupling and removing.

#### 7.4.2 Impact of the Fuel Station Closure on Employment

Should the fuel station be decommissioned, this will lead employment loss and/or reduction i.e. the employed people at the fuel station will lose their jobs. The assessment of this impact is presented in **Table 7-18**.

**Table 7-18: Assessment of the impacts of fuel station closure on employment**

| Extent | Duration | Intensity | Probability | Significance |
|--------|----------|-----------|-------------|--------------|
| L - 1  | L/M- 2   | L/M - 4   | L/M- 2      | L - 14       |

##### 7.4.2.1 Mitigations and recommendation on loss of employment

- The Proponent should inform the employees, of its intentions to close the fuel station, and the expected date of such closure.
- The Proponent should raise awareness of the possibilities for work in other industrial sectors.



## 8 CONCLUSIONS AND RECOMMENDATIONS

The key potential biophysical impact related to the construction, operational and maintenance and decommissioning phases of the proposed project were identified and assessed. Suitable mitigation measures (where required and possible) were recommended, and the impacts can be summarised as follows:

- **Fuel station impact on surface and groundwater (during construction and operational and maintenance, during decommission phase (groundwater)):** Run-off of effluent / wastewater may end up in surface water bodies. This is unlikely to happen because the fuel station is situated on the other side of the Usivi road and there is a storm water drain built on the southern side of the road (adjacent to the proposed fuel station site) which will impede run-off to elsewhere. Improper handling, storage and disposal of hydrocarbon products and other contaminants / effluent produced on site during construction may seep into groundwater systems. Further mitigations and recommendations on this impact are presented under subchapter 7.2.1, 7.3.1 and 7.4.1 and also management actions given in the EMP (Chapter 3).
- **Fuel Station impact on Soils (during construction and operation and maintenance phases):** Potential contaminants such as hydrocarbons and waste water / effluent that will be produced on site during construction may contaminate the surrounding soils. The impact can be adequately addressed by the recommendations given under subchapter 7.2.2 and also management actions given in the EMP (Chapter 3).
- **Fuel Station impact on health and safety (during construction and operation and maintenance phases):** Improper handling of construction materials and equipment as well petroleum products may cause health and safety risks (injuries and possible fatalities). The impact can be adequately addressed by the recommendations given under subchapter 7.2.4 and also management actions given in the EMP (Chapter 3).
- **Fuel station impact on air quality:** Dust emissions from construction vehicles and equipment and construction activities will lead to a short-term decrease in air quality. The risk is anticipated to be short-term and therefore of low significance. The impact can be adequately addressed by the recommendations given under subchapter 7.2.6 and also management actions given in the EMP (Chapter 3).

- **Fuel station construction nuisance impact (noise):** there is an inconvenient impact of noise pollution (to neighbouring locals) associated with construction activities and equipment. This may also pose a health risk to construction workers if they are too exposed to noisy areas at the site at all times. The impact can be adequately addressed by the recommendations given under subchapter 7.2.5 and also management actions given in the EMP (Chapter 3).
- **Waste generation:** Construction activities usually generates wastes of all kinds (domestic and general), which leads to environmental pollution. This may pose a health risk to the people and environment. The impact can be adequately addressed by the recommendations given under subchapter 7.2.8 and also management actions given in the EMP (Chapter 3).
- **Fuel Station construction impact on vehicular traffic safety:** Impact on traffic safety when heavy vehicles are roaming around the area during construction. Heavy construction vehicles will exert pressure on local roads and potentially result in road accidents. The impact can be adequately addressed by the recommendations given under subchapter 7.2.9 and also management actions given in the EMP (Chapter 3).
- **Fuel Station Closure impact on Employment (decommissioning phase):** Should the fuel station be decommissioned, this will lead employment loss and/or reduction i.e. the employed people at the fuel station will lose their jobs. The impact can be adequately addressed by the recommendations given under subchapter 7.4.2 and also management actions given in the EMP (Chapter 3).

Based on the information provided in this report, GCS is confident the identified risks associated with the proposed development can be reduced to acceptable levels, should the measures recommended in the EMP be implemented and monitored. It is therefore recommended that the project receive Environmental Clearance, provided that the EMP be implemented.

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**APPENDIX A**

**CV'S - ELOISE CARSTENS AND FREDRIKA SHAGAMA**

## Eloise Carstens - Namibia Country Manager

### CORE SKILLS

- Project planning and management: proposal writing,
- Technical report writing.
- Project and staff management.

### Details

#### Qualifications

MEM (Masters in Environmental Management)

B.Sc. Hons. (Entomology), 2006

B.Sc. (Zoology), 2002 – 2005

#### Memberships

IAIASA

EAPAN

#### Languages

English – fluent

Afrikaans – fluent

#### Countries worked in

South Africa, Namibia

### PROFILE

Eloise is a positive and proactive professional with seven years' experience in Environmental Management and Public Participation and Facilitation (Environmental Assessment, Environmental Management Plans, Environmental Education, Environmental Monitoring and Evaluation and Project Co-ordination).

She has been involved in or acted as the principle consultant for a number of environmental and social assessments in the following sectors:

*Eloise has specialist skills in the following areas:*

- Mine Closure
- Infrastructure including roads, railway lines, power lines, and water supply networks
- Tourism including lodges
- Telecommunication;
- Rezoning applications and township establishments;
- Mining, processing and manufacturing projects;
- Agriculture.

## Key project experience

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**2017 - Shaw River Manganese Ltd (Otjozonde Mining Pty Ltd):** Otjozonde Mine Air Quality Monitoring

**2017 – AGA Technical Services:** Environmental Assessment for the Establishment of MTC Cellular Antenna in Windhoek, Fransfontein and Rehoboth

**2017 - Aqua Services & Engineering O.B.O NamWater:** Environmental Assessment for Opuwo Wastewater Treatment Facility

**2017- South East Atlantic Mining Company (SEAMCO):** Environmental Assessment for the Proposed Construction of a Copper Processing Facility near Omaso Village in Kunene Region

**2016- Norton Luis Consultants cc:** Environmental Assessment for the Proposed Construction of a Fuel Station in Rundu Extension 7 in Kavango East Region

**2016 - Veiinatobias Organisational & Sustainable Development Planners (Pty) Ltd:** Okakarara Fuel Station Groundwater Impact Assessment.

**2016 – GIZ:** Draft Sustainable Transport Master Plan for the Northern Regions.

**2016 – Urban Green:** Scoping Assessment for the Proposed Establishment of Three Townships in Leonardville Omaheke Region.

**2016 – Urban Green:** Scoping Assessment Study for the Proposed Rehabilitation of TR7/1 between Karibib and Usakos, Erongo Region.

**2016 - The Atlantic Guano Syndicate (Pty) Ltd:** Scoping Assessment for the Existing Guano Harvesting Operations and Associated Activities on Mining Licenses 56 A & B near Cape Cross in Erongo Region.

**2016 – Urban Green:** Scoping Assessment Study for the Proposed Construction of DR3424 between Mungunda and Shakambu, Kavango East Region.

**2016 – BEE Biofuel Manufacturing (Pty) Ltd:** Scoping Assessment Study for the Processing of Biofuel in Swakopmund.

**2016 – Okatji Marble:** Scoping Assessment Study for the Renewal of Mining Claims 65425 and 65426 and Associated Existing Mining Operations.

**2015 - 2016 – Skorpion Zinc (Pty) Ltd:** Final Mine Closure, Rehabilitation and Financial Provision Report for the Skorpion Zinc Mine and NamZinc Refinery.

**2015 – Otjozondu Mining (Pty) Ltd:** ECC Amendment Application and Report: Proposed Changes to Scope of Work for Existing Otjozondu Mining Operation.

**2015 – Planet Rose Properties:** Environmental Management Plan for the Township Establishments of Tsandi Extensions 2, 4, 5, and 6, in Tsandi.

**2015 – Planet Rose Properties:** Scoping Assessment Study for the Rezoning of Erf 688 from Public Open Space to Business.

**2015 – Africa Planning Forum:** Environmental Management Plan for the Township Establishments of Engela Omafo Extensions 1- 9, in Helao Nafidi.

**2015 – Skorpion Zinc (Pty) Ltd:** Design Study for the Closure Plan of the Waste Rock Facilities at Skorpion Zinc Mine.

**2015 – Skorpion Zinc (Pty) Ltd:** Refinery Sulphide Conversion Amendment to EIA Report.

**2015 – Greenam Electricity (Pty) Ltd:** Hardap and Karas Photovoltaic Power Project Environmental Scoping Report.

**2015 – Xaris Energy Namibia (Pty) Ltd:** Proposed Xaris Walvis Bay Power Plant and Gas Supply facility

**2014 – Eros Valley Development Consortium (EVDC):** Environmental Impact Assessment for the proposed construction of the Eros Golf Estate.

**2014 - MTC Namibia:** Environmental Assessment and Management Plan for the Proposed Construction of Nine Mini Cellular Structures in Windhoek

**2014 – Stubenrauch Planning Consultants:** Proposed Closure and Rezoning of Erf 232a from Public Open Space to Business.

**2014: Dundee Precious Metals Tsumeb (DPMT):** Biodiversity Action Plan for Dundee Precious Metals Tsumeb.

**2014: Nampower:** Environmental Impact Assessment for the Proposed 400 kV Transmission Line from Kunene to Omatando (Portion 1)

**2013 - 2014: Gecko Graphite:** Environmental Assessment and Environmental Management Plan for the proposed development of the Okanjande Graphite Mine and Associated Infrastructure near Otjiwarongo, Otjozondjupa Region.

**2013: Oshakati Premier Electric (OPE):** Environmental Assessment and Environmental Management Plan for the proposed development of a 10 MVA solar plant in Oshakati, Oshana Region.

**2013: MTC:** Environmental Assessment and Environmental Management Plan for the proposed construction of fibre optic lines in the north-eastern regions of Namibia.

**2012: Gecko Namibia:** Environmental Assessment and Environmental Management Plan for the proposed salt mining and soap production at the Otjivalunda Salt pans, northern regions of Namibia.

**2012: MTC:** Environmental Assessment and Environmental Management Plan for the proposed construction of fibre optic lines in the northern regions of Namibia.

**2012: MTC:** Environmental Assessment and Environmental Management Plan for the proposed construction of five mini BTS sites in Ludwigsdorf, Windhoek.

**2012: NamWater:** Environmental Assessment and Environmental Management Plan for the proposed construction of the Divundu Bulk Water Supply Scheme.

**2012: Nampower:** Environmental Assessment and Management Plan for the proposed construction of power lines between the Walmund substation and Walvis Bay.

**2012: Nampower:** Environmental Assessment and Management Plan for the proposed construction of the West Coast Transmission Line Servitudes at Arandis, Erongo Region.

**2012: Element Consulting Engineers:** Environmental Management Plan for the proposed construction of three bridges in Ovitoto, Otjizondjupa Region.

**2011: AGA Technical Services:** Environmental Assessment and Environmental Management Plan for the proposed construction of three MTC Base Stations in Windhoek.

**2011: Namibia Marine Phosphate:** Assisting with the writing of the Environmental Assessment Report for the Sandpiper Marine Phosphate – terrestrial component.



**2011: NBC:** Environmental Assessment and associated Environmental Management Plans for the proposed construction of NBC towers in the Karas Region in Namibia.

**2011: City of Windhoek:** Environmental Assessment and associated Environmental Management Plan for the Klein Windhoek Extension 4 residential area.

**2011: Feedmaster:** Environmental Assessment and associated Environmental Management Plan for the proposed development of a feedmill in the northern periphery of Windhoek.

**2011: Nampower:** Scoping and Environmental Assessment as well as the associated Environmental Management Plan for the proposed replacement of the existing 220kV Rössing – Walmund transmission line.

**2011: Roads Authority:** Scoping Report and Environmental Management Plan: MR120 (Okatana – Endola– Onuno) to bituminous standards.

**2010: Kalahari Holdings:** Environmental Assessment and associated Environmental Management Plan for the proposed rezoning of Portion 76 of the Farm Brakwater No. 48 to Industrial.

**2010: Rent-a-Drum :** Environmental Assessment and associated Environmental Management Plan for the operation of a Waste Management Station on Portion S of the Windhoek Town and Townlands No. 31.

**2010: Roads Authority:** Upgrading to Bitumen Standards of DR3608 from Onandjaba to Epako and Construction of New Road to Bitumen Standard from Epako to Wakashamane Border Post.

**2010: Roads Authority:** Monitoring Reports and Community Meetings: Proposed construction of DR 3660 from the existing MR 92 to Omagongati in the Oshana Region.

**2010: Roads Authority** Scoping Reports and Environmental Management Plan, Community Meetings and Inception Reports: Proposed construction of Gravel Road D3653 from Oshikuku to Ekangolinene.

**2009 - 2014: Millennium Challenge Account:** Environmental & Social Assessment Framework for 47 Schools in 9 Regions across Namibia.

**2009: Roads Authority:** Monitoring Reports and Community Meetings: Road DR3427 from Tendoro to Kamapupu and Road DR3428 from Rupara/Muveve to Gcangcu.

**2009: Roads Authority:** Environmental Management Plans, Monitoring Reports and Community Meetings: Road TR1/10 from Rundu to Nkurenkuru.

**2009: Roads Authority:** Scoping Reports, Community Meetings and Inception Reports: Road DR3615 from Onamutuku to Oshikuku; Road DR3603 from Onyena to Okankolo and Road MR121 from Oshigambo to Eenhana (Upgrading to Bitumen standards)

**2009: Roads Authority:** Monitoring Reports and Community Meetings: Road DR3611 from Oshikuku to Okalongo; Road DR3642 from Okahao to Outapi; Road DR3643 from Ekambo to Onkani

**2009: Roads Authority:** Proposed Construction of Gravel Road DR3643 from Ekamba to Onkani by Labour Based Construction Methods.

**2009: LIH Demeter Agribusiness (Pty) Ltd:** Environmental Baseline Study for Kavango Irrigation.

**2009: Department of Rural Water Supply:** Environmental Baseline Study for the Preparation of the Water Rural Water Supply Development Plan for the Otjozondjupa Region.

**2009: City of Windhoek:** Inventory – Baseline Report: Windhoek Biodiversity.

**2009: Namibia Country Lodges:** Environmental Assessment for Uukwaluudhi Hunting & Safari Camp in the Omusati Region.

**2009: Kunene Tours & Safaris:** Environmental Assessment for Khowarib Lodge and Safaris in the Kunene Region.

**2009: Nokia & Siemens Network:** Environmental Scoping: Proposed BTS Site in Ludwigsdorf, Windhoek.

## **PUBLICATIONS & PRESENTATIONS**

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- Public perception and the EIA process. Presented at the annual IAIASA conference in Bloemfontein, South Africa (2013).
- Guest speaker at the Botanical Society in Windhoek: “The EIA process explained” (2013).
- Guest speaker for Environmental Education at the Botanical Gardens in Bloemfontein: “The importance of water conservation in South Africa” (2008).
- Data extrapolation from macro invertebrate communities in the Upper Orange River Catchment Area, South Africa. Is it viable? (2008)
- Measurement of Arthropod diversity in grasslands in South-East Namibia, using the SAGraSS model. (2006)



## Fredrika Shagama - Hydrogeologist

### CORE SKILLS

- Hydrogeology
- Geology
- Groundwater Investigations
- Groundwater Monitoring
- Well Logging & Sampling
- Geological Mapping
- Structural Geology
- Geochemistry
- Mining
- Environmental Assessment

### Details

#### Qualifications

MSc. Geological Engineering  
(Hydrogeology) *Cum Laude*  
(Technical University of Ostrava)

BSc. Geological Engineering  
(Technical University of Ostrava)

#### Memberships

Namibian Hydrogeological  
Association

#### Languages

English – fluent

Czech – fluent

Oshiwambo – fluent/Native

#### Countries worked in

Namibia

South Africa

### PROFILE

Fredrika is a Hydrogeologist with a Master's degree in Geological Engineering *Cum Laude* from the Technical University of Ostrava in the Czech Republic. Her Masters primary focus was in Hydrogeology. Since starting her professional career with GCS in 2015, she has been involved in hydrogeological, geological and geotechnical studies as well as groundwater monitoring. She has also been involved in Environmental Assessments (EAs) and data collection, compilation of Environmental Assessment reports, Environmental Management Plans and Mine Closure Plan reports. She has been involved in adding inputs to groundwater specialist reports and integrating specialists' inputs in EIAs.

Fredrika has specialist skills in the following areas:

- Geological & hydrogeological studies
- Geotechnical investigations
- Geological Mapping
- Mining
- Hydrogeology
- Groundwater Monitoring and Sampling
- Groundwater Impact Assessment
- Borehole logging
- Hydrocarbon Impact Assessment Phase 1
- Mine Closure Plan
- Environmental Impacts Assessments (EIAs) reports & Environmental Management Plans compilation
- Input to Groundwater reports in EIAs



## Key project experience

| YEAR | PROJECT  | RESPONSIBILITY   |
|------|--|--|
| 2017 | Otjonzondu Mine Air Quality Monitoring (Current)   | Air quality monitoring, Data Collection and Training of Mine Personnel   |
| 2017 | Environmental Assessment for Opuwo Wastewater Treatment Facility (Current)<br><b>Client: Aqua Services &amp; Engineering O.B.O NamWater</b>  | Site Investigation<br>Hydrogeological and Hydrogeochemical component<br>Report Compilation   |
| 2017 | Environmental Assessment for the Proposed Construction of a Copper Processing Facility near Omaso Village in Kunene Region<br><b>Client: South East Atlantic Mining Company (SEAMCO)</b>                                   | Public Meetings Facilitation<br>Site Investigation<br>Geological and Hydrogeological components of the project<br>Report Compilation               |
| 2016 | Otjonzondu Manganese Mine Water Use License Application: Technical Report (Hydrogeological)<br><b>Client: Shaw River Manganese Ltd (Otjonzondu Mining)</b>   | Data Collection and Analysis<br>Project Management<br>Technical Report Compilation   |
| 2016 | Geohydrological Investigation of the Groundwater Resources at Outjo and the Possible Impact of the Development of 60 New Residential Plots<br><b>Client: Municipality of Outjo</b>   | Field Investigation<br>Project Management<br>Data collection and Analysis<br>Database Management<br>Technical Report Compilation<br>Client Liaison |
| 2016 | Environmental Impact Assessment for the for the Renewal of Mining Claims 65425 and 65426 and Associated Existing Mining Operations for Okatji Marble Mine near Karibib in Erongo Region<br><b>Client: Okatji Marble cc</b> | Report Compilation (contributor)<br>Data Collection<br>Groundwater input   |
| 2016 | Desktop Groundwater Impact Assessment for the Proposed Fuel Station in Extension 7, Rundu<br><b>Client: Norton Luis Consultants cc</b>   | Data collection and analysis,<br>Report Compilation and Project Management   |
| 2016 | Environmental Assessment for the Proposed Fuel Station in Extension 7, Rundu<br><b>Client: Norton Luis Consultants cc</b>  | Site Visit<br>Public Participation<br>Project Management<br>Data Collection and Report Compilation   |
| 2016 | Environmental Assessment for the Proposed Fuel Station in Okakarara and Desktop Groundwater Impact Assessment<br><b>Client: Eco Village Developments (Pty) Ltd</b>   | Report Compilation<br>Project Administration<br>Data Collection and Analysis   |
| 2016 | Oranjemund Water Sustainability Study<br><b>Client: Freedthinkers</b>  | Report Compilation   |

| YEAR         | PROJECT   | RESPONSIBILITY   |
|--------------|---|--|
| 2016         | Groundwater Reserve Availability and Determination for the Proposed Rehabilitation of TR7/1 between Karibib and Usakos<br><b>Client: Urban Green Town and Environmental Planning Consultants</b>                      | Groundwater section compilation<br>Groundwater data analysis   |
| 2016         | Geotechnical Investigation of the proposed new Tsumeb Mine waste and Tailings Facility<br><b>Client: Dundee Precious Metals Tsumeb (DPMT) Namibia</b>   | Borehole and Test pit Logging<br>Geological Mapping<br>Co-supervision of borehole drilling and test pit excavation |
| 2016         | Environmental Assessment for the Existing Guano Harvesting operations and Associated Activities on Mining Licenses 56 A & B near Cape Cross in Erongo Region<br><b>Client: The Atlantic Guano Syndicate (Pty) Ltd</b> | Report Compilation<br>Site visit and Public Participation<br>Project Management                                    |
| 2016         | Environmental Assessment for the Proposed Rezoning of Erf 688 from Public Open Space to Business in Rundu<br><b>Client: Planet Rose Properties</b>  | Compilation of Scoping Report and EMP  |
| 2016         | Hydrogeological Investigation (Phase 1) for Dassiesfontein Farm near Mariental<br><b>Client: Africa Safari Lodge</b>  | Desktop study<br>Report compilation  |
| 2016         | Okatji Marble Mine Water Use Application and Technical Report<br><b>Client: Okatji Marble cc</b>  | Project Management<br>Report Compilation<br>Water Use Application  |
| 2016         | Groundwater Monitoring and Sampling for the De Brochen Project in Limpopo (South Africa)<br><b>Client: Anglo American Platinum</b>  | Groundwater Level measurement<br>Surface water sampling  |
| 2016         | Environmental Hydrocarbon Contamination Assessment Phase 1 for Interchain Logistics and Nulaid Fuel Stations in Johannesburg (South Africa)<br><b>Client: SASOL</b>   | Site Inspection<br>Measurement of water levels in tank observation wells<br>Soil Augering and sampling             |
| 2015 to date | Groundwater Monitoring and Sampling for Dundee Precious Metals in Tsumeb<br><b>Client: Dundee Precious Metals Tsumeb (DPMT)</b>   | Hydrocensus<br>Borehole profiling<br>Data analysis   |
| 2015         | Skorpion Zinc Mine Closure Plan<br><b>Client: Skorpion Zinc (Pty) Ltd</b>   | Compilation of Mine Closure Report, Groundwater input<br>Integrating specialists' inputs in EIA report             |
| 2015         | Environmental Assessment for the proposed Processing of Biofuel in Swakopmund<br><b>Client: BEE Biofuel Manufacturing (Pty) Ltd</b>   | Assisted with the facilitation of Public Consultation<br>Report Compilation  |

**APPENDIX B**

**ENVIRONMENTAL MANAGEMENT PLAN (EMP)**



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# Environmental Management Plan (EMP) for the Proposed Fuel Station on Erf 1889, Extension 7 in Rundu, Kavango East Region

## Report

**Draft**

3 April 2017

GCS Project Number: 16-1046

Client Reference: N/A

Norton Luis Consultants cc



**Environmental Management Plan (EMP) for the Proposed Fuel Station on Erf 1889,  
Extension 7 in Rundu, Kavango East Region**

**Report**




**Draft**

**3 April 2017**

Norton Luis Consultants cc

16-1046

**DOCUMENT ISSUE STATUS**

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|                             | <b>Name</b>  | <b>Signature</b>   | <b>Date</b> |
| <b>Author</b>               | Fredrika Shagama   |  | April 2017  |
| <b>Document Reviewer</b>    | Eloise Carstens  |  | April 2017  |
| <b>Unit Manager</b>         | Eloise Carstens  |  | April 2017  |

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## 1 OVERVIEW

### 1.1 Project Background

In line with the Environmental Management Act (Act 7 of 2007) an Environmental Assessment (EA) has been conducted for the proposed development of a fuel station on Erf 1889, Extension 7 (of the Kehemu location) in Rundu (see Figure 1-1).

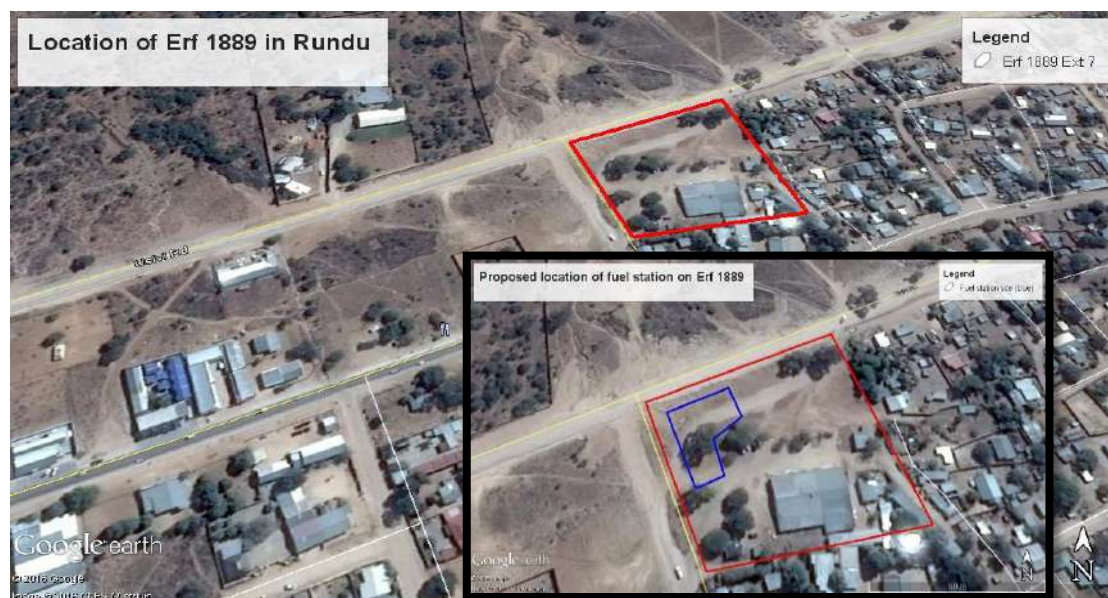


Figure 1-1: Location of the proposed fuel station in Rundu

### 1.2 Purpose of the EMP

Regulation 8 of the Environmental Management Act's (EMA) (7 of 2007) Environmental Impact Assessment Regulations (2012) requires that a draft Environmental Management Plan (EMP) be included as part of the scoping Environmental Assessment (EA) process. A 'management plan' is defined as:

*"...a plan that describes how activities that may have significant environments effects on the environment are to be mitigated, controlled and monitored."*

An EMP is one of the most important outputs of the EA process as it synthesises all of the proposed mitigation and monitoring actions, set to a timeline and with specific assigned responsibilities. It provides a link between the impacts identified in the EIA Process and the required environmental management on the ground during project implementation and operation. It is important to note that an EMP is a legally binding document and a person who contravenes the provisions of this EMP may face imprisonment and/or a fine. This EMP is a living document and should be amended to adapt to address project changes and/or environmental conditions and feedback from compliance monitoring.

The purpose of this document is therefore to guide environmental management throughout the following life-cycle stages of the proposed development, namely planning and design, pre-construction and construction, and operation.

The following phases are addressed in this EMP:

- **Planning and design** - the period, prior to the construction phase, during which preliminary legislative and administrative arrangements are carried out in preparation of construction activities;
- **Construction phase** - during this phase, the fuel station and its related infrastructure will be constructed;
- **Operation** - the period during which the fuel station and its related infrastructure will be operational.
- **Decommissioning** - Should the development be closed down, this phase will be implemented.

### 1.3 Environmental Assessment Practitioner (EAP)

GCS Water Environmental Engineering Namibia (Pty) Ltd (“GCS Namibia” hereafter) have been appointed by Norton Luis Consultants cc as independent environmental consultants to conduct the required Environmental Assessment (EA) which includes compiling an EMP for the proposed development. The EMP is to be submitted with the scoping EA report as supporting documents to the application for an Environmental Clearance Certificate (ECC) to the Environmental Commissioner at the Department of Environmental Affairs (DEA) of the Ministry of Environment and Tourism. The EMP will also be used by Contractors and Engineers as well as the Proponent in guiding them during the construction and operation of the fuel station to ensure that impacts on the environment are limited or avoided altogether.

### 1.4 Legal Requirements

The contents of the EMP must meet the requirements Section 8 (j) of the EIA Regulations. The EMP must address the potential environmental impacts of the proposed activity on the environment throughout the project life-cycle. It must also include a system for assessment of the effectiveness of monitoring and management arrangements after implementation. Norton Luis Consultants therefore has the responsibility to ensure that the proposed activity as well as the EIA process conforms to the principles of EMA and must ensure that any contractors appointed by them also comply with such principles.

**Table 1-1** below lists the requirements of an EMP as stipulated by Section 8 (j) of the EIA Regulations.

**Table 1-1: Applicable and relevant Namibian legislations and guidelines for the EA process**

| Legislation   | Permit/Approval/Requirement   | Contact Details   |
|---|---|---|
| Environmental Management Act 2007<br>Environmental Impact Assessment (EIA) Regulations (EIAR) (GG No. 4878) | Amendments (required every 3 years) to this EMP will require an amendment of the ECC for these developments.<br><br>Activities listed in Government Notice (GN) No. 29 of GG No. 4878 require an ECC.   | Mr Damian Nchindo<br>Tel: 061 284 2701<br><br>Department of Environmental Affairs, Ministry of Environment and Tourism  |
| Water Act 54 of 1956  | Prohibits the pollution of underground and surface water bodies (S23 (1)).<br><br>Liability of clean-up costs after closure/abandonment of an activity (S23 (2)).   | Mr Witbooi (Department of Water Affairs):<br><br>Tel: (061) 208 7226  |
| Petroleum Products and Energy Act 13 of 1990  | This Act makes provision for impact assessment for new proposed fuel facilities and petroleum products known to have detrimental effects on the environment.<br><br>Furthermore, the Act prescribes the South African National Standard (SANS), as listed in section 4.12 as the criteria to which fuel installations must be constructed, operated and decommissioned. | Norton Luis Consultants should ensure that the criteria set for the construction, operation and decommissioning of fuel installations are adhered to.<br><br>Upon approval and issuing (and before construction commences) of the ECC by the Environmental Commissioner, the Proponent should apply for <b>Petroleum Retail License from the Petroleum Affairs Division of the Ministry of Mines and Energy</b><br><br>Mr. T. Iyambo (Chief Petroleum Inspector)<br><br>Tel: 061 284 8300 |

| Legislation             | Permit/Approval/Requirement  | Contact Details  |
|-------------------------|--|--|
| Forestry Act 12 of 2001 | The Act provides for the management and use of forests and related products / resources. It offers protection to any living tree, bush or shrub growing within 100 metres of a river, stream or watercourse on land that is not a surveyed erven of a local authority area. In such instances, a licence would be required to cut and remove any such vegetation.<br><br>These provisions are only guidelines. | If there are trees within the proposed footprint of the project area that need to be removed, the proponent should notify the Forestry Department in Rundu of the number and/or type of trees to be removed to allow construction and apply for permit to remove protected tree species. |

### 1.5 Assumptions and Limitations

This EMP has been drafted with the acknowledgment of the following assumptions and limitations:

- This EMP has been drafted based on the scoping-level Environmental Assessment (EA) conducted for the proposed development on Erf 1889, Extension 7 in Rundu. A desktop groundwater impact assessment (see **Appendix H** of the Scoping Report) was conducted prior to the compilation of the Scoping Report and this EMP - no other specialist studies were included as part of the assessment; and
- The mitigation measures recommended in this EMP document is based on the risks/impacts in the scoping report which were identified based on the provided project description and site investigation. Should the scope of the project change, the risks will have to be reassessed and mitigation measures provided accordingly.

### 1.6 Report Structure

This EMP lays out the management actions for the proposed fuel station development on Erf 1889, Rundu Extension 7. The EMP addresses the following phases:

- **Planning and design** - the period, prior to construction, operation and maintenance, during which preliminary legislative and administrative arrangements are carried out in preparation for the construction of the facility;
- **Construction phase** - during this phase the services infrastructure and fuel station facility related infrastructure will be constructed;

- **Operation and maintenance phase** - the period during which the constructed fuel station and its facilities will be operational and maintained by Norton Luis Consultants; and
- **Decommissioning phase:** the period during which the Proponent may decide to discontinue the operations of the fuel station and its associated activities. However, the decommissioning of the fuel station is not anticipated at this stage.

## 2 ROLES AND RESPONSIBILITIES

Norton Luis Consultants (the Proponent) is ultimately responsible for the implementation of the EMP. The Proponent may delegate this responsibility at any time, as they deem necessary, from planning and design to operation and maintenance phase and decommissioning phase (if considered). The delegated responsibility for the effective implementation of this EMP will rest on the following key individuals which may be fulfilled by the same person:

- Proponent's Representative
- Environmental Control Officer

### 2.1 Proponent's Representative

If the Proponent does not personally manage all aspects of the planning and design, construction and operation and maintenance phase activities and decommissioning, referred to in this EMP, they should assign this responsibility to a suitably qualified individual referred to in this plan as the Proponent's Representative (PR). The Proponent may decide to assign the role of a PR to one person for both phases. Alternatively, the Proponent may decide to assign a separate PR for each component i.e. planning and design, construction, operation and maintenance and decommissioning phase. The PR's responsibilities, included in **Table 2-1** Error! Reference source not found. are as follows:

**Table 2-1: Responsibilities assigned to the Proponent's Representative for planning and design, construction, operation and maintenance and decommissioning phases**

| Responsibility   | Project Phase                          |
|--|--|
| Managing the implementation of this EMP and updating and maintaining it when necessary                 | Throughout the lifetime of the project |
| Management and monitoring of individuals and/or equipment on-site in terms of compliance with this EMP | Throughout the lifetime of the project |
| Issuing fines for contravening EMP provisions  | Throughout the lifetime of the project |

## 2.2 Environmental Control Officer

The Proponent should assign the responsibility of overseeing the implementation of the whole EMP on the ground from the planning and design phase to operation and maintenance and decommissioning phase to a designated member of staff, referred to in this EMP as the Environmental Control Officer (ECO). The Proponent may decide to assign this role to one person for both phases or may assign separate individual ECOs to oversee EMP implementation during each phase. The ECOs will have the following responsibilities:

- Management and facilitation of communication between the Proponent, PR and Interested and Affected Parties (I&APs) with regard to this EMP;
- Conducting site inspections (recommended minimum frequency is monthly during construction period and bi-annually during the operation and maintenance and decommissioning) of all areas with respect to the implementation of this EMP (monitor and audit the implementation of the EMP);
- Advising the PR on the removal of person(s) and/or equipment not complying with the provisions of this EMP;
- Making recommendations to the PR with respect to the issuing of fines for contraventions of the EMP; and
- Undertaking an annual review of the EMP and recommending additions and/or changes to this document.

## 3 ENVIRONMENTAL MANAGEMENT PLAN ACTIONS

### 3.1 Key Potential environmental impacts to be managed

From the EA, the following key potential impacts have been identified per project phase and are summarised in **Table 3-1** below. The full impact description is presented in the tables under subchapter 3.2 to 3.5 as well as in the Scoping Report.

**Table 3-1: Summary of key potential environmental impacts per project phase**

|   | Project Phase             | Potential impacts identified in the EA                 |
|---|---------------------------|--|
| 1 | Planning and Design       | Design and planning failures                           |
| 2 | Construction              | Groundwater and soil contamination, health and safety  |
| 3 | Operation and maintenance | Health and safety, groundwater contamination and waste |
| 4 | Decommissioning           | Loss of employment and groundwater contamination       |

The aim of the management actions of the EMP is to avoid potential impacts where possible. Where impacts cannot be avoided, measures are provided to reduce the significance of these impacts.

Management actions recommended to manage the potential impacts rated in the EA carried out for the proposed fuel station development are presented in the following tables. The management actions were compiled based on the four project phases:

- Planning and design phase (**Table 3-2**);
- Construction phase (**Table 3-3**);
- Operation and maintenance phase management actions (Error! Reference source not found.); and
- Decommissioning phase (**Table 3-5**)

The responsible persons at Norton Luis Consultants should assess these commitments in detail and should acknowledge their commitment to the specific management actions detailed in the table of the next subchapters.

### 3.2 Phase 1: Planning and Design Management Actions

The management requirements detailed in **Table 3-2** need to be carried out before any tenders are drafted for the construction of services infrastructure while necessary preliminary legislative and administrative arrangements are made in preparation for the operation of the proposed development. These management requirements are also applicable for the period during which engineering designs/drawings are carried out.

**Table 3-2: Planning and design management actions**

| Aspect   | Management Requirement   |
|--|--|
| <b>Planning layout of future business activities</b> | <p>The building plans of any future business activities submitted to the RTC for approval should include the following:</p> <ul style="list-style-type: none"> <li>• Layout of traffic calming measures</li> <li>• Sufficient parking to be provided for vehicles.</li> <li>• Concrete hard standing areas and containment slabs</li> <li>• Road markings</li> <li>• Layer works and appropriate forecourt and surrounding surfacing where required</li> <li>• Subsurface storm water system</li> </ul> <p>Off-loading facilities to be well located so as to prevent trucks from interfering with traffic flow.</p> |



| Aspect               | Management Requirement  |
|----------------------|---|
| Architectural design | <ul style="list-style-type: none"> <li>• Architect need to incorporate sustainable architecture as part of the development</li> <li>• The layout and building design should incorporate large indigenous trees as far as possible. Removal of trees from the erf should be limited as far as possible.</li> </ul>   |
| Labour Recruitment   | <p>Provisions designed to maximise the use of local labour should be included within tenders concerning the:</p> <ul style="list-style-type: none"> <li>• Provision stating that all unskilled labour should be sourced from local communities should be included within tenders concerning the construction.</li> <li>• Specific recruitment procedures ensuring local firms enjoy preference during tender adjudication should be included within tenders concerning the construction.</li> <li>• Provisions promoting gender equality pertaining to recruitment should be included within tenders concerning the construction</li> </ul>   |
| Run-off              | <p>Storm water Management Plan should be developed by the Proponent for all planned development and include as a minimum the following:</p> <ul style="list-style-type: none"> <li>• Storm water channels should be accommodated next to roads in the reserve.</li> <li>• Minimise paved or impermeable areas.</li> </ul>   |
| Biodiversity         | <p>All trees (a “tree” is defined here as an indigenous woody perennial plant with a trunk diameter <math>\geq 150</math> mm) that occur within the erf, which have not been officially surveyed by a registered land surveyor, should be surveyed and incorporated into the erf diagram of Erf 1889. In addition this data should be incorporated in the RTC’s town planning. In this way these trees will form part of the Town Planning Scheme and their preservation can thus receive legal force.</p> <ul style="list-style-type: none"> <li>• Trees that have not been registered and surveyed and will be removed, the Proponent should apply for the licence to remove these trees from the Forestry department (Ministry of Agriculture, water and Forestry) in Rundu.</li> <li>• Large indigenous trees and protected tree species like the Camel Thorn Trees (<i>Acacia erioloba</i>) within the site should be surveyed and marked with red paint.</li> </ul> |

| Aspect                   | Management Requirement  |
|--------------------------|---|
| EMP Implementation       | <ul style="list-style-type: none"> <li>Norton Luis Consultants need to appoint a Proponent's Representative (PR) that will act as their on-site implementing agent. This person should be responsible to ensure that the Proponent's responsibilities are executed in compliance with relevant legislation and this EMP.</li> </ul> |
| Petroleum Retail License | The Proponent should apply for Petroleum Retail License from the Petroleum Affairs Division of the Ministry of Mines and Energy prior to construction activities. This application can be submitted while the Environmental Assessment process is ongoing.  |

### 3.3 Phase 2: Construction Phase Management Actions

The management actions for the construction phase are listed in Table 3-3.

**Table 3-3: Construction phase management actions**

| Environmental Feature | Impact   | Management Actions  |
|-----------------------|--|---|
| EMP training          | Lack of EMP awareness and the implications thereof | <ul style="list-style-type: none"> <li>Employees appointed for construction work on respective infrastructure must ensure that all personnel are aware of necessary health, safety and environmental considerations applicable to their respective work.</li> </ul>   |
| Monitoring            | EMP non-compliance                                 | <ul style="list-style-type: none"> <li>The ECO or the Proponent should monitor the implementation of this EMP.</li> <li>The ECO(s) should inspect the site throughout the construction at least on a weekly basis.</li> </ul>   |
| Waste Management      |  | <ul style="list-style-type: none"> <li>The construction site should be kept tidy at all times.</li> <li>All domestic and general construction waste produced on a daily basis should be cleaned and contained daily.</li> <li>No waste may be buried or burned.</li> <li>Waste containers (bins) should be emptied regularly and removed from site to the municipal waste disposal site.</li> <li>All recyclable waste needs to be taken to the nearest recycling depot.</li> </ul> |

| Environmental Feature | Impact                    | Management Actions  |
|-----------------------|---------------------------|---|
|                       |                           | <ul style="list-style-type: none"> <li>• A sufficient number of separate waste containers (bins) for hazardous and domestic / general waste must be provided on site.</li> <li>• Construction labourers should be sensitised to dispose of waste in a responsible manner and not to litter.</li> <li>• No waste may remain on site after the completion of the project.</li> </ul>  |
| Waste water           | Groundwater contamination | <ul style="list-style-type: none"> <li>• Wastewater collected in catch pits should be reused for cleaning equipment.</li> <li>• All run off materials such as hydrocarbons, waste water and other potential contaminants should be contained on site and disposed of in accordance to municipal waste water discharge standards, so that they do not reach to groundwater systems.</li> <li>• Wastewater (excluding sewage) should be drained into lined / impermeable catch pits, big enough for daily / weekly usage without overflowing. Water from these catch pits should be removed from site to the nearest wastewater treatment facility by an approved wastewater removal company</li> <li>• Groundwater impact awareness training should be provided to the employees involved in this project phase.</li> <li>• An emergency plan should be available for major / minor spills and firefighting at the service station during construction activities (with consideration of air, groundwater, soil and surface water).</li> </ul> |
| Soil                  | Soil contamination        | <ul style="list-style-type: none"> <li>• Spill control preventative measures should be put in place to manage soil contamination.</li> <li>• An impermeable liner should be laid down on the site area in order to prevent contaminants from reaching to surrounding soils and eventually groundwater systems.</li> </ul>   |

| Environmental Feature | Impact               | Management Actions   |
|-----------------------|----------------------|--|
|                       |                      | <ul style="list-style-type: none"> <li>• Potential contaminants such as hydrocarbons and waste water should be contained on site and disposed of in accordance to municipal wastewater discharge standards so that they do not contaminate surrounding soils.</li> <li>• The proponent should appoint an Environmental officer to monitor soil contamination on site.</li> <li>• ECO(s) should ensure that a sufficient number of drip trays are available on-site and that these are utilised in the event of leakage from construction trucks or vehicles.</li> <li>• Contaminated soils onsite that may have resulted from leakage/spillage construction vehicles or equipment should be removed to a depth dependent on the size of the spill and replaced with clean soil.</li> </ul> |
| Air                   | Air quality          | <ul style="list-style-type: none"> <li>• Construction vehicles like trucks should not be allowed to stand idling during loading of waste and off-loading of construction materials.</li> <li>• Potential dust that may be generated during construction should be suppressed by using a reasonable amount of water.</li> </ul>   |
| Biodiversity          | Loss of Biodiversity | <ul style="list-style-type: none"> <li>• Large indigenous trees on site need to be identified, marked and surveyed.</li> <li>• Trees with a trunk size of 150 mm and bigger should be surveyed, marked with paint (readily visible) and protected.</li> <li>• Trees with a trunk size of 150 mm and bigger, which are impossible to conserve, need to be identified and their location recorded on a map.</li> <li>• The Proponent should only remove trees within the actual footprint of the proposed facility' structures to be erected. Trees that are not within the footprint should be left to preserve biodiversity in the area.</li> </ul>  |

| Environmental Feature | Impact                    | Management Actions  |
|-----------------------|---------------------------|---|
| Dust and noise        | Nuisance impacts          | <ul style="list-style-type: none"> <li>• The contractor(s) should suppress dust associated with construction by using a reasonable amount of water.</li> <li>• If feasible, municipal wastewater should be treated to an acceptable water quality level, so that it can be used for construction purposes (dust suppression).</li> <li>• Noise levels during construction should be kept within the allowable standards for urban areas.</li> <li>• Work hours should be restricted to between 08h00 and 17h00 if construction involves the use of heavy equipment, power tools and the movement of heavy vehicles.</li> <li>• Noisy equipment should be shut down when not in use (when not needed) to avoid unnecessary noise on site.</li> <li>• Workers performing noisy tasks should be rotated regularly (work on shifts) to avoid exposing them to excessive noise for a long period of time in a day.</li> <li>• Workers should be equipped with personal protective equipment (PPE) such as earplugs to reduce noise exposure. Workers should ensure that they put on PPE at all times on work sites.</li> </ul> |
| Vehicular Traffic     | Traffic safety            | <ul style="list-style-type: none"> <li>• Construction vehicles should have a scheduled time for loading and offloading materials at the site so that they do not interfere with daily traffic in the area whenever.</li> <li>• Construction vehicles should not park outside the site boundary wall.</li> </ul>   |
| Health and Safety     | Health and safety impacts | <ul style="list-style-type: none"> <li>• The contractor(s) should ensure that all personnel are provided with personal protective equipment (PPE), such as coveralls, gloves, safety boots, safety glasses and hard hats at all times.</li> <li>• No workers should be allowed to drink alcohol during working hours.</li> </ul>  |

| Environmental Feature  | Impact | Management Actions   |
|------------------------|--------|--|
|                        |        | <ul style="list-style-type: none"> <li>• No workers should be allowed on site if under the influence of alcohol.</li> <li>• An appropriate location should be indicated on the site for the parking of construction vehicles.</li> <li>• The proponent should put up a boundary wall around the construction site to limit public access to the site during construction.</li> <li>• Guidelines should be painted for all access and exit movements, including for the right turning movement form and to the site (fuel station)</li> </ul>   |
| Construction labourers |        | <ul style="list-style-type: none"> <li>• The Proponent should ensure that locals (from Rundu area) are employed for any unskilled labour.</li> <li>• Construction labourers should not be recruited on-site.</li> <li>• Construction labourers will be transported, in a bus (or similar suitable passenger vehicle) to and from site daily.</li> <li>• Portable toilets (i.e. easily transportable) should be available:</li> <li>• Separate ablutions should be available for men and women and should clearly be indicated as such. Sewage waste needs to be removed on a regular basis to the Rundu sewage disposal site.</li> <li>• Workers responsible for cleaning the toilets should be provided with latex gloves and masks.</li> <li>• No workers may reside on-site for the entire duration of the construction period. Only a security guard will be allowed to sleep on-site (if there will be any).</li> </ul> <p>The Proponent or contractor should draft a Communication Plan, which should outline as a minimum the following:</p> <ul style="list-style-type: none"> <li>• How stakeholders, who require ongoing communication for the duration of the construction period, will be identified and recorded and who will manage and update these records;</li> </ul> |

| Environmental Feature | Impact | Management Actions  |
|-----------------------|--------|---|
|                       |        | <ul style="list-style-type: none"> <li>How these stakeholders will be consulted on an ongoing basis.</li> </ul> |

### 3.4 Phase 3: Operation and Maintenance Management Actions

The table below (Table 3-4) presents the management action for the operation and maintenance phase.

**Table 3-4: Operation and maintenance phase management actions**

| Environmental Feature | Impact   | Management Actions  |
|-----------------------|--|---|
| EMP training          | Lack of EMP awareness and the implications thereof | <ul style="list-style-type: none"> <li>Employees appointed for operation and maintenance on respective site infrastructure and services must ensure that all personnel are aware of necessary health, safety and environmental considerations applicable to their respective work.</li> </ul>   |
| Monitoring            | EMP non-compliance                                 | <ul style="list-style-type: none"> <li>The ECO or the Proponent should monitor the implementation of this EMP.</li> <li>The ECO(s) should inspect the site operation throughout the operation on a biannual basis.</li> </ul>   |
| Water                 | Groundwater contamination                          | <ul style="list-style-type: none"> <li>All business facilities should be connected to municipal sewage systems and waste water discharge systems and be in good working condition to avoid groundwater contamination in the case of leakages from sewage systems..</li> <li>No wastewater / effluent should be allowed to leave the site premises without proper control. These should be disposed of in accordance with municipal waste water discharge standards.</li> <li>At least three tank observation wells (TOWs) to a depth of 10 m should be drilled and installed around the fuel station. These wells will be used to detect possible pollution from the tanks in groundwater.</li> <li>Regular maintenance and monitoring of underground storage tanks should be done to detect early spills or leakages.</li> </ul> |

| Environmental Feature | Impact | Management Actions  |
|-----------------------|--------|---|
|                       |        | <ul style="list-style-type: none"> <li>An emergency plan should be available for major / minor spills at the service station during operation activities (with consideration of air, groundwater, soil and surface water)</li> <li>Groundwater impact awareness training should be provided to the employees involved in this phase.</li> </ul>   |
| Health and Safety     |        | <ul style="list-style-type: none"> <li>Fuel station workers should be provided with an awareness training about the risks associated with fuel handling and storage.</li> <li>The fuel station facility should be equipped with fire extinguishers.</li> <li>During maintenance, workers should be properly equipped with personal protective equipment (PPE) such as coveralls, gloves, safety boots, safety glasses etc.</li> </ul> |

### 3.5 Phase 4: Decommissioning Management Actions

The table below (Table 3-5) presents the management action for decommissioning phase.

**Table 3-5: Decommissioning phase management actions**

| Environmental Feature | Impact                | Management Actions  |
|-----------------------|-----------------------|---|
| Groundwater           | Groundwater pollution | <ul style="list-style-type: none"> <li>Fuel pipelines and tanks should be properly drained and emptied before decoupling and removing.</li> </ul>   |
| Employment            | Loss of employment    | <ul style="list-style-type: none"> <li>The Proponent should inform the employees, of its intentions to close the fuel station, and the expected date of such closure.</li> <li>The Proponent should raise awareness of the possibilities for work in other industrial sectors.</li> </ul> |

### 3.6 Recommendations for Monitoring

In order to prevent and minimize the above-mentioned environmental impacts, the following site monitoring measures need to be done:



- Air quality monitoring should be carried out on a weekly basis during construction;
- Surrounding soils should be monitored on a daily basis to ensure that no spills on the soils and to clean up (remove and replace) the contamination timely.
- The water-oil separator must be inspected and cleaned daily;
- The soak away must be inspected daily for signs of staining;
- Fuel tanks should be inspected daily;
- Groundwater monitoring in the tank observation wells (TOWs) at the fuel station should be conducted on a monthly basis; and
- Tank volume reconciliation should be conducted twice a day.

#### **4 CONCLUSIONS**

Based on the recommendation given in this EMP, GCS is confident that the proposed development of a fuel station, as described in **Chapter 2** of the scoping report may be granted an Environmental Clearance Certificate, provided that the EMP is implemented and that all the legal requirements pertaining to this development are complied with.



**APPENDIX C**

**LIST OF INTERESTED AND AFFECTED PARTIES**

## Proposed Rundu Fuel Station in Extension 7

### List of Interested and Affected Parties (I&APs)

| Name                           | Organisation  | Position   |
|--------------------------------|---|--|
| <b>National Government</b>     |   |  |
| Dr M. Lindeque                 | Ministry of Environment and Tourism                           | Permanent Secretary  |
| Mr Teofilus Nghitila           | Ministry of Environment and Tourism-DEA                       | Environmental Commissioner   |
| Ms. Saima Angula               | Ministry of Environment and Tourism -DEA                      | Deputy Director: Environmental Assessment, Waste Management, Pollution Control and Inspections |
| Mr. Simeon Negumbo             | Ministry of Mines and Energy                                  | Permanent Secretary  |
| Mr. Abraham Nehemia            | Ministry of Agriculture, Water and Forestry                   | Permanent Secretary  |
| Mr. Bro-Mathew Shinguadja      | Ministry of Labour Industrial Relations & Employment Creation | Permanent Secretary  |
| Dr. Andreas Mwoombola          | Ministry of Health and Social Services                        | Permanent Secretary  |
| Mr. Tupa Iyambo                | Ministry of Mines and Energy                                  | Chief Petroleum Inspector  |
| Mr. Carlo Mcloed               | Ministry of Mines and Energy                                  | Acting Director Petroleum Affairs  |
| Mr. Immanuel Gaingob           | Ministry of Mines and Energy                                  | Petroleum Affairs  |
| Mr. Immanuel Nghishoonge       | Ministry of Mines and Energy                                  | Deputy Director: Petroleum Supply and Distribution   |
| Mr. P Gowaseb                  | Ministry of Health and Social Services                        | Chief Public Hygiene: Public and Environment Health  |
| <b>Regional Government</b>     |   |  |
| Hon. Samuel Mbambo             | Kavango East Regional Council                                 | Governor   |
| Mr L Thikusho                  | Kavango East Regional Council                                 | Acting Chief Regional Officer  |
| Mr. R. Nairenge                | Kavango East Regional Council                                 |  |
| Maureen Dikuwa                 | Kavango East Regional Council                                 |  |
| Mr Mangundu                    | Kavango East Regional Council                                 | Chief Development Planner  |
| <b>Local Government</b>        |   |  |
| Mr. Romanus N Haironga         | Rundu Town Council  | Chief Executive Officer  |
| Mr. Adriano Abrahamama         | Rundu Town Council  | Town Planner   |
| <b>State Owned Enterprises</b> |   |  |
| Mr E. Imalwa                   | Nored   | Area Superintendent  |

|                     |                              |                                |
|---------------------|------------------------------|--------------------------------|
| Mr. J. Muremi       | NamWater                     | Water Supply Area Manager      |
| Conrad Lutombi      | Roads Authority              | Chief Executive Officer        |
|                     |                              |                                |
| <b>I&amp;APs</b>    |                              |                                |
| Josef N Macai       | Ministry of Education        | Teacher                        |
| Aldronica S Musindo | Ministry of Veterans Affairs | Chief Community Liason Officer |

**APPENDIX D**

**BACKGROUND INFORMATION DOCUMENT**

# Background Information Document (BID)

## Environmental Assessment for the proposed construction of a Fuel Station in Rundu Extension 7, Kavango East Region

### 1 INTRODUCTION

Norton Luis Consultants cc proposes to construct a fuel station on Erf 1889 on the corner of Independence Avenue and Usivi Road in Rundu Extension 7 (see site location in **Figure 3-1** below). The approximate total surface area of the site is ± 1.63 ha. The proposed site is located within the Rundu Townlands on an area zoned as “Business” under the Rundu Town Planning Scheme.

The following activities require an Environmental Clearance Certificate (ECC) under the Environmental Management Act (2007):

- *9.4 The storage and handling of a dangerous goods, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic meters at any one location;*
- *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; and*
- *10.1 (a) Construction of oil, water, gas and petrochemical and other bulk supply pipelines.*

Consequently, GCS Water and Environmental Engineering Namibia (Pty) Ltd (GCS Namibia hereafter) has been appointed to conduct an EA and submit the required documents as part of an application for an ECC to the Environmental Commissioner in terms of the Environmental Management Act's (7 of 2007) EIA Regulations.

### 2 NEED AND DESIRABILITY OF THE ACTIVITY

Namibia's Vision 2030 and National Development Plan 4 (NDP4) both recognise a need for and place significant value on economic growth and employment creation. The proposed fuel station development will contribute to these priorities at a local and regional level.

Currently there are three fuel stations in Rundu. Due to increased development in town and the consequent increase in the number of vehicles coming to and passing through the town, there is a need for more amenities like fuel stations to meet the growing services demand. The proposed fuel station will provide additional access to fuel in town while creating employment opportunities for locals.

### 3 DESCRIPTION OF ACTIVITY

The proposed fuel station will consist of the following:

- Fuel retail building with ancillary services;

- Two underground fuel storage tanks (23 m<sup>3</sup>) of unleaded petrol ;
- Provision of additional space alongside the tank farm for the installation of additional tanks in future (if required);
- Fuel dispensing islands inclusive of pump island servicing equipment and forecourt furniture;
- Fuel dispensing island canopy;
- Water/oil separator suitably located for ease of connections
- High density Polyethylene (HDPE) fuel delivery pipeline system;
- Tanks fitted with submersible pumps and ancillary equipment (automatic tank gaging etc.)
- Dispensing islands fitted with fuel dispensers for pressure system (comparative benchmarking analysis for “suction” vs. “pressure” system to be completed); and
- Septic tank or connections to municipal services.

Civil and structural design and layout for site will include:

- Kerb lines;
- Concrete hard standing areas and containment slabs;

- Layer works and appropriate forecourt and surrounding surfacing where required;
- Road marking;
- Subsurface spill containment drainage system to interceptor; and
- Subsurface storm water system.

Detailed information on the tanks and design will be provided in the Scoping Report.





**Figure 3-1: Approximate site location of the proposed fuel station (Erf 1889) in Rundu**

## 4 ENVIRONMENTAL ASSESSMENT

This EA process is being conducted according to the provisions laid out in the Environmental Management Act (No 7 of 2007) and its Environmental Impact Assessment Regulations (2012).

The main objectives of this EA are as follows:

- Comply with Namibia's Environmental Management Act (2007) and its regulations (2012);
- To identify potential impacts associated with the proposed development area;
- To inform Interested and Affected Parties (I&APs) and relevant authorities about the proposed development and to provide them with a reasonable opportunity to participate during this EA process;
- To assess the significance of issues and concerns raised;
- To compile a scoping report addressing all identified issues and potential impacts related to various aspects of the proposed development; and
- To compile an Environmental Management Plan (EMP) which includes impact mitigation and monitoring measures.

### 4.1 Potential Impacts

The following potential impacts have been identified so far:

#### Positive:

- Fuel convenience to local residents and businesses (the fuel station in the area will meet the local needs);
- Social and economic benefits for the local community (the 24 hour quick shop will provide convenient access to the main amenities).
- Creation of temporary jobs during construction phase and operational phase of the fuel station.

#### Negative:

- Health and safety risks associated with handling and storage of flammable goods;
- Potential soil and groundwater pollution from hydrocarbon spills; and
- Potential surface water pollution - due to run-off.

### 4.2 Public Consultation

Public consultation is an important part of EA process. During the consultation process, you as an interested or affected member of the public are given an opportunity to find out more about the proposed development as well as an opportunity to raise any issues or concerns.

I&APs are encouraged to submit their comments (see contact details below) before the closing date for the comments period for this EA, which is **Tuesday, the 22<sup>nd</sup> of November 2016**.

All those who register as I&APs for this EA process will be notified when the Scoping stage (and Scoping Report) for this EA is complete and will receive an opportunity to comment on the Scoping Report.

All I&APs are invited to attend a public meeting to be held in Rundu:

**Date: Thursday, 24 November 2016**

**Time: 18h00**

**Venue: Erf No 1889, Extension 7, Rundu**

**Please find our contact details below should you require more information or if you would like to register as an I&AP:**

**Fredrika Shagama:**

**Tel:** (061) 248 614

**Fax:** (061) 238 586

**Email:** [fredrikas@gcs-na.biz](mailto:fredrikas@gcs-na.biz)



**APPENDIX E**

**NEWSPAPER ADVERTS**



to 'General Residential' with a Density of 1:150

- Consent of the Establishment of a Bed and Breakfast consisting of 12 rooms
- Consent to operate the business activities while the rezoning is in process.

It is my intention that after the rezoning of Erf 2527, I would like to operate a Bed and Breakfast with related activities. In order to accommodate a bed and breakfast establishment in the City of Windhoek, a rezoning is required.

Parking will be provided on site and as per the requirements of the Windhoek Town Planning Scheme.

Further take notice that the locality plan of the Erf lies for inspection on the Town Planning Notice Board in the Customer Care Centre, municipal Offices, Rev Michael Scott Street, Windhoek.

Further, take notice that any person objecting to the proposed use of land, as set-out above, may lodge such objection with grounds thereof with the City Council and the applicant in writing within 14 days of the last publication of this notice (final day 9 December 2016).

**Applicant:**  
**Micheal Fangda Fangda**  
 P O Box 11749  
 Klein Windhoek  
 Cell: 081-128 2217

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### ENVIRONMENTAL ASSESSMENT PROCESS FOR THE PROPOSED CONSTRUCTION OF A FUEL STATION IN RUNDU EXTENSION 7, KAVANGO EAST REGION

Norton Luis Consultants cc proposed to construct a fuel station on Erf 1889, corner of Independence Avenue and Usivi Road in Rundu Extension 7.

The proposed site is located within the Rundu Townlands on an area zoned as "Business" under the Rundu Town Planning Scheme. The site covers an approximate surface area of 1.63 ha.

Under the Environmental Management Act (2007) and its Regulations, the proposed activity requires an Environmental Clearance Certificate from the Department of Environmental Affairs (DEA). GCS Water Environmental Engineering Namibia (Pty) Ltd has been appointed to conduct the process and submit the application to the Environmental Commissioner on behalf of the proponent.

To comment or receive further information on the project and the upcoming public meeting, please register with GCS (contact details below) as an Interested and Affected Party (I&AP) before **22 November 2016**.

Contact: Fredrika Shagama  
 Tel: +264 61 248 614  
 Fax: +264 61 238 586  
 E-mail: [fredrikas@gcs-na.biz](mailto:fredrikas@gcs-na.biz)





**ENVIRONMENTAL ASSESSMENT PROCESS FOR THE PROPOSED CONSTRUCTION OF A FUEL STATION IN RUNDU EXTENSION 7, KAVANGO EAST REGION**

Norton Luis Consultants cc proposed to construct a fuel station on Erf 1889, corner of Independence Avenue and Usivi Road in Rundu Extension 7.

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Tel: +264 61 248 614  
Fax: +264 61 238 586  
E-mail: [fredrikas@gcs-na.biz](mailto:fredrikas@gcs-na.biz)



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**REQUEST FOR EXPRESSION OF INTEREST**  
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**The Namibian College of Open Learning (NAMCOL) is an educational institution, established by an Act of Parliament, which provides courses for adults and out of school youth.**

NAMCOL invites suitably qualified and credible service providers to conduct a study for NAMCOL Campus Radio to broadcast on FM Frequency in and around the surroundings of Windhoek.

The full Terms of Reference containing background and rationale, key responsibilities of the consultant, modalities for the study, profile of consultant and our request can be obtained from the NAMCOL Finance department at a cost of N\$ 150.00.

For further information kindly contact Mr. Jan Nitschke or Mr. Manfred Isaacks at the following numbers:  
 Tel: 320 5111, e-mail: nitschwa@namcol.edu.na or isaacks@namcol.edu.na

Delivery address for Expression of Interest:  
 Attention: Mr. Jan Nitschke, NAMCOL,  
 Yeku Yama, 2031 Independence Avenue, Katutura

**Closing date: 30 November 2016.**

TAKE EDUCATION TO THE PEOPLE

**ENVIRONMENTAL ASSESSMENT PROCESS FOR THE PROPOSED CONSTRUCTION OF A FUEL STATION IN RUNDU EXTENSION 7, KAVANGO EAST REGION**


Notice: GCS Consultants is proposed to construct a fuel station on Erf 1802, corner of Independence Avenue and Univ Road in Rundu Extension 7.

The proposed site is located within the Rundu Townlands on an area zoned as "Business" under the Rundu Town Planning Scheme. The site covers an approximate surface area of 3.63 ha.

Under the Environmental Management Act (2007) and its Regulations, the proposed activity requires an Environmental Clearance Certificate from the Department of Environmental Affairs (DEA). GCS Water Environmental Engineering Namibia (Pty) Ltd has been appointed to conduct the process and submit the application to the Environmental Commissioner on behalf of the proponent.

To comment or receive further information on the project and the upcoming public meeting, please register with GCS (contact details below) as an interested and Affected Party (I&AP) before 22 November 2016.

Contact: Fredrika Shagema  
 Tel: +264 61 248 614  
 Fax: +264 61 238 586  
 E-mail: fredrika@gcs-na.biz



**Notice**

Take note that IDC TOWN & REGIONAL PLANNING, on behalf of the owners of Erf 807, Klein Windhoek, intends to apply to the Windhoek City Council for:


- The rezoning of Erf 807, Klein Windhoek from "Residential" with a density of 1 in 900m<sup>2</sup> to "General Residential" with a density of 1 in 450m<sup>2</sup>.
- Consent to use the erf for "General Residential" with a density of 1 in 450m<sup>2</sup> purposes while the rezoning is in process.

Erf 807 Gusinde Street, Klein Windhoek, is zoned "Residential" with a density of 1 dwelling unit per 900m<sup>2</sup> and is 913m<sup>2</sup> in extent. It is the intention of the owner to build two dwelling units which will be used for residential purposes.

Further take note that the locality plan of the erf lies for inspection on the Town Planning Notice Board at Customer Care Centre, Municipality Offices, Rev Michael Scott Street, Windhoek.

Further take note that any person objecting to the proposed rezoning as set out above may lodge such objection together with grounds thereof with the City Council and the applicant within 14 days of the last publication of this notice (final date of objection 1 December 2016).

**APPLICANT:**  
 IDC TOWN & REGIONAL PLANNERS  
 PO BOX 2325  
 WINDHOEK  
 Tel: 061 - 304 344  
 Fax: 061 - 304 343



**NOTICE**

Take note that Mr. Michael Fangda Fangda intend to apply to the Windhoek City Council for:

- The rezoning of Erf 2527, No 1 Otjikero Street, Wanaheha from "Residential" with a Density of 1:500 m<sup>2</sup> to "General Residential" with a Density of 1:150
- Consent of the Establishment of a Bed and Breakfast consisting of 12 rooms
- Consent to operate the business activities while the rezoning is in process.

It is my intention that after the rezoning of Erf 2527, I would like to operate a Bed and Breakfast with related activities, in order to accommodate a bed and breakfast establishment in the City of Windhoek, a rezoning is required.

Parking will be provided on site and as per the requirements of the Windhoek Town Planning Scheme.

Further take notice that the locality plan of the Erf lies for inspection on the Town Planning Notice Board in the Customer Care Centre, municipal Offices, Rev Michael Scott Street, Windhoek.

Further, take notice that any person objecting to the proposed use of land, as set out above, may lodge such objection with grounds thereof with the City Council and the applicant in writing within 14 days of the last publication of this notice (final day 9 December 2016).

**Applicant:**  
 Michael Fangda Fangda  
 P O Box 11749  
 Klein Windhoek  
 Cell: 061-120 2217

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|---|-------------|
| Centre Tai Street                       | 07:00-16:00 |
| United House Centre                     | 08:30-16:00 |
| Standard Bank Town Square               | 09:00-14:30 |
| Mehowath (caravan)                      | 09:00-14:30 |
| Holland Insurance Company               | 09:00-14:30 |
| Swakopmund Town (Ferdinand Stich Str 4) | 10:00-18:00 |

| Tuesday, 15 November 2016                        |             |
|--|-------------|
| Centre Tai Street                                | 07:00-16:00 |
| United House Centre                              | 08:30-16:00 |
| Esse Airport (caravan)                           | 10:00-15:00 |
| NTA  | 09:00-14:30 |
| BDO  | 09:00-14:30 |
| Welvis Bay NAMBTS (Behind Welwitschia Medi-park) | 13:00-18:00 |

| Wednesday, 16 November 2016 |             |
|-----------------------------|-------------|
| Centre Tai Street           | 07:00-16:00 |
| United House Centre         | 08:30-16:00 |
| Pierson Pains (caravan)     | 09:00-15:00 |
| De Boers Group              | 09:00-14:30 |
| Nampop (Walvis Bay)         | 10:00-16:00 |

| Thursday, 17 November 2016       |             |
|----------------------------------|-------------|
| Centre Tai Street                | 07:00-16:00 |
| United House Centre              | 08:30-16:00 |
| One Africa TV (caravan)          | 09:00-14:30 |
| Min of Health and Social Service | 09:00-14:30 |
| LN House                         | 09:00-14:30 |
| Uranium Mine (Swakopmund)        | 10:00-15:00 |

| Friday, 18 November 2016                 |             |
|--|-------------|
| Centre Tai Street 1                      | 07:00-16:00 |
| United House Centre                      | 08:30-16:00 |
| Shoppers Kakara (in front of Pep Stores) | 09:00-14:30 |
| Pick 'n Pay (Swakopmund)                 | 10:00-15:00 |

| Saturday, 19 November 2016          |             |
|-------------------------------------|-------------|
| Auss Valley (Ground Floor Entrance) | 09:00-14:30 |
| The Grove Mall                      | 09:00-14:30 |

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**STANDARD NOTICE**

Take notice that the owner, **Mr/Mrs H.**

**CITY OF WINDHOEK**

**PUBLIC NOTICE**

Take note that Mr. Micheal Fangda Fangda intend to apply to the Windhoek City Council for:

- The rezoning of Erf 2527, No 1 Otjikere Street, Wanaheda from 'Residential' with a Density of 1:500 m2 to 'General Residential' with a Density of 1:150
- Consent for the Establishment of a Bed and Breakfast consisting of 12 rooms
- Consent to operate the business activities while the rezoning is in process.

It is my intention that after the rezoning of Erf 2527, I would like to operate a Bed and Breakfast with related activities. In order to accommodate a bed and breakfast establishment in the City of Windhoek, a rezoning is required.

Parking will be provided on site and as per the requirements of the Windhoek Town Planning Scheme.

Further take notice that the locality plan of the Erf lies for inspection on the Town Planning Notice Board in the Customer Care Centre, Municipal Offices, Rev Michael Scott Street Windhoek.

Further, take notice that any person objecting to the proposed use of land, as set out above, may lodge such objection with grounds thereof with the City Council and the applicant in writing within 14 days of the last publication of this notice (final day 9 December 2016)

**Applicant:**

**Micheal Fangda Fangda**

P.O. Box 11749  
Klein Windhoek  
Cell: 081 128 2217

**ENVIRONMENTAL ASSESSMENT PROCESS FOR THE PROPOSED CONSTRUCTION OF A FUEL STATION IN RUNDU EXTENSION 7, KAVANGO EAST REGION**

Norton Luis Consultants cc proposed to construct a fuel station on Erf 1889, corner of Independence Avenue and Usivi Road in Rundu Extension 7.

The proposed site is located within the Rundu Townlands on an area zoned as "Business" under the Rundu Town Planning Scheme. The site covers an approximate surface area of 1.63 ha.

Under the Environmental Management Act (2007) and its Regulations, the proposed activity requires an Environmental Clearance Certificate from the Department of Environmental Affairs (DEA). GCS Water Environmental Engineering Namibia (Pty) Ltd has been appointed to conduct the process and submit the application to the Environmental Commissioner on behalf of the proponent.

To comment or receive further information on the project and the upcoming public meeting, please register with GCS (contact details below) as an Interested and Affected Party (I&AP) before 22 November 2016.

Contact: Fredrika Shagama  
Tel: +264 61 248 614  
Fax: +264 61 238 586  
E-mail: [fredrikas@gcs-na.biz](mailto:fredrikas@gcs-na.biz)



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## APPENDIX F

### SITE NOTICES

# Kavango East Regional Council notice




# Rundu Town Council Notice

**PLEASE CONTACT:**

**081 151 1105**  
**081 320 9756**  
**066 266 455**


**MALARIA CAN KILL.**



**ASSESSMENT OF PROSPECTS FOR THE INVESTMENT OPPORTUNITIES IN AGRICULTURE**

**SECTION 1: EXECUTIVE SUMMARY**

AGRICULTURE is considered to be one of the main sources of income for the people of Rundu. The agricultural sector is still one of the main sources of income for the people of Rundu. The agricultural sector is still one of the main sources of income for the people of Rundu.



**GCS**

Project: ...  
Client: ...  
Date: ...

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Once you receive the questionnaire, check your knowledge of the course that you studied (or your institution) to see if you are eligible to take the survey. The survey will be conducted in your institution.

Should you not have access to internet facilities, you can complete a hard-copy questionnaire at your institution's Registrar/Examinations/Computer/Educational Support Office.


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to  
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## Notices at the Project Site





**ENVIRONMENTAL ASSESSMENT PROCESS FOR THE PROPOSED CONSTRUCTION OF A FUEL STORAGE DEPOT  
EXTENSION 7, KAVANGA KREE REGION**

Notice is published in order to conduct a fuel storage on G4 100, corner of Indipendence road and G4  
Road in the Kavanga Kree Region (see site location below).  
The approximate total surface area of the site is 4  
1.1 ha. The proposed site is located within the  
Kavanga Kree Region in an area zoned as "Business"  
under the Kavanga Kree Planning Scheme.

GCS Water Environmental Engineering handles (plus  
M.A. Environmental) have been appointed to conduct  
the required Environmental Assessment (EA) and  
submit an application for an Environmental  
Clearance Certificate (ECC) to the Environmental  
Commissioner in terms of the Environmental  
Assessment Act (1971) (EA Regulations).

Please contact GCS handle as the details below for  
more information and to register as an interested and affected Party (IAP) on the proposed project, before Friday  
13 November 2014.



**GCS**  
Water Environmental Engineering

Contact: Fredrick Dzingira  
Tel: 081 1 248 614  
Fax: 081 1 248 586  
Email: f.dzingira@gcs.co.za




**APPENDIX G**

**PUBLIC MEETING MINUTES**

**APPENDIX H**

Our Reference GCS Ref- 16-1046

## Public Meeting Minutes

|                      |   |
|----------------------|---|
| <b>Subject:</b>      | Meeting Regarding the EA for the Proposed Fuel Station in Rundu Extension 7                               |
| <b>Venue:</b>        | Cola Cola Taxi rank, Erf 1889, Maria Mwengere Road, Kehemu, Rundu   |
| <b>Date:</b>         | 24 November 2016  |
| <b>Time:</b>         | 18:00   |
| <b>Attendance:</b>   | Fredrika Shagama; Linda Uulenga; Josef Macai, three taxi drivers (who did not want to give their details) |
| <b>Distribution:</b> | Fredrika Shagama; Linda Uulenga; Josef Macai, 3 taxi drivers  |

### 1 PROCEEDINGS

Ms. Fredrika Shagama welcomed those who attended and explained the purpose of the meeting. The Environmental Assessment process and description of the proposed fuel station project was provided by both Ms. Shagama and Ms. Uulenga. The meeting was attended by Mr. Macai (an interested party) and three taxi drivers that operate from the Cola Cola taxi rank, located within Erf 1889 (on site) in Extension 7 of Kehemu, Rundu. Comments were then invited from those in attendance.

The following points were raised during the meeting:

- As an interested party, Mr. Macai raised a concern about the possible flow of wastewater from the fuel station area downstream, since there is a slope on the northern side of the road (towards the north).
- The three taxi drivers expressed their support for the proposed project. According to them, the new fuel station will enable them to fill up their car tanks at the taxi rank and take passengers from the taxi rank directly to their respective destinations (Kayengona, Shambyu and other places) on the eastern side of the proposed site without having to go refuel their cars at the fuel stations in town and drive back to the taxi rank (site) again.

The meeting was adjourned at 19h00.

**APPENDIX H**

**ISSUES AND RESPONSE TRAIL**



**Proposed Rundu Fuel Station - Issues and Response Trail**  
**(received during the public meeting)**

| Issue   | GCS Response   |
|---|--|
| Possible flow of wastewater from the fuel station area downstream, since there is a slope on the northern side of the road (towards the north). | Run-off is unlikely to happen because the fuel station is situated on the other side (south) of the Usivi road and there is a storm water drain built on road side the fuel station site which will impede water off to elsewhere (se Figure 5-1 of the Scoping Report). Mitigation measures are also presented under subchapter 7.2.1 as well management measures in the EMP (Chapter 3). |

**APPENDIX I**

**DESKTOP GROUNDWATER IMPACT ASSESSMENT**



94 Mandela Avenue, Klein Windhoek, Namibia  
PO Box 81808, Windhoek, Namibia  
Tel: (+264) 61 248 614 Fax: (+264) 61 238 586 Web: [www.gcs-na.biz](http://www.gcs-na.biz)

# Desktop Groundwater Impact Assessment for the Proposed Development of a Fuel Station on Erf 1889, Rundu Extension 7

## Report

Version - Final  
16 September 2016

Norton Luis Consultants  
GCS Project Number: 16-1046  
Client Reference: N/A

Desktop Groundwater Impact Assessment for the Proposed Development of a Fuel Station on  
Erf 1889, Rundu Extension 7



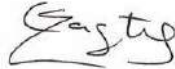
**Report  
Version - Final**

**16 September 2016**

Norton Luis Consultants

16-1046

**DOCUMENT ISSUE STATUS**

|                             |   |  |             |
|-----------------------------|---|--|-------------|
| <b>Report Issue</b>         | Final   |  |             |
| <b>GCS Reference Number</b> | GCS Ref - 16-1046   |  |             |
| <b>Client Reference</b>     | N/A   |  |             |
| <b>Title</b>                | Desktop Groundwater Impact Assessment for the Proposed Development of a Fuel Station on Erf 1889, Rundu Extension 7 |  |             |
|                             | <b>Name</b>   | <b>Signature</b>   | <b>Date</b> |
| <b>Author</b>               | Fredrika Shagama  |  | 16/09/2016  |
| <b>Document Reviewer</b>    | Katie Baker   |  | 16/09/2016  |
| <b>Unit Manager</b>         | Eloise Carstens   |  | 16/09/2016  |

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## EXECUTIVE SUMMARY

Norton Luis Consultants proposes to develop a fuel station on Erf 1889 of Rundu's Extension 7 in the Kavango East Region. Rundu is located approximately 730 km north of Windhoek and within 2 km of the Angola - Namibian border. The proposed fuel station site is located 800 m from the Okavango River.

Fuel products are one of the major contaminants of groundwater and the wider environment in the vicinity of fuel stations worldwide. The pollution of groundwater resources results from poor handling of fuel dispensing facilities and underground fuel storage tanks. This pollution does not only affect groundwater, but surrounding soils too. Fuel leakage and spills from broken fuel pipes and underground storage tanks (USTs) poses a threat to groundwater quality for the surrounding water users that rely on the groundwater resource. Potential impacts on groundwater need to be identified, assessed and adequately mitigated if they cannot be avoided.

Subsequently, Norton Luis Consultants have requested GCS Water Environmental Engineering Namibia (Pty) Ltd (GCS Namibia hereafter) to conduct a desktop groundwater impact assessment of the proposed fuel station.

This report covers the findings from the reviewing of available data and other relevant literature pertaining to the climatic, geological, hydrological and hydrogeological settings (conditions) of the study area. These findings highlight potential areas that are vulnerable to groundwater pollution in the case of spills and leaks from the fuel station's USTs and surface fuel dispensing facilities (forecourts).

The source in this aspect are the fuel products (diesel and/or petrol) to be stored at the proposed fuel station, that are hazardous to human health and the environment (groundwater). The release of fuel products to the environment would pose a risk to receiving water bodies and soils.

The pathway is determined by the depth to water table, type of lithology in the area and groundwater flow direction. Based on the information gathered, the water levels in the area range between 20 and 40 meters below ground level (mbgl), which is considered relatively deep. However, water levels along the Okavango River are shallow (<20 m below surface). Groundwater within the proposed site area is hosted in Kalahari Group aquifers of unconsolidated to semi-consolidated sediments (sand, calcrete and gravel). The aquifers are considered porous and hold water in intergranular pore spaces. Due to the high permeability of these aquifers, fluids can enter the groundwater system fairly easily and rapidly. The nature of these sediments is expected to cause rapid infiltration of hydrocarbon products to groundwater and spreading over a large area. The extent of the pollution will also depend on the volume of hydrocarbon products spilled.

The Okavango River located about 800 m from site is considered a potential receptor, as groundwater in the area is said to flow radially (all directions) from the central recharge zone near the tarred road approximately 35 km southwest of Rundu (groundwater flow sub-system IIIa in Figure 5 4). There is said to be boreholes in Rundu. However, due to lack of information, the number and location of these in relation to the proposed site is not known. Existing (if any) boreholes within a 1 km radius could be good receptors of potential groundwater pollution from the fuel station. A hydrocensus would be required to identify nearby boreholes. It would provide valuable information such as borehole location, water levels and water quality, etc.

The potential impact on the groundwater resources in the area is considered moderate. The design of a sufficient groundwater monitoring plan and the drilling of tank observation wells to detect leakage of fuel products from the storage tanks is essential for the prevention and management of groundwater pollution.

After assessing the hydrogeological regime of the area with the available information, the impacts on the groundwater resources are considered moderate.

The impact of fuel station on groundwater can be adequately avoided or minimized by the implementation of measures and recommendations provided below:

- The fuel station development should be constructed at a standard same or better than the SANS 10089;
- Groundwater management plans and spill containment systems should be put in place and complied with during the construction, operational and decommissioning phases of the proposed fuel station;
- The fuel station should incorporate a multi-layered system to contain any potential leakage from the storage tanks or forecourt. For the storage tanks, these include double-skinned tanks in a concrete vault lined with synthetic polymer membranes, and compacted clay;
- Oil water separators should be inspected and cleaned daily;
- The soak away should be inspected daily for signs of staining. These precautions can only safeguard the impact (pollution) for a certain period, as equipment quality deteriorates with time. Hence, regular maintenance and monitoring of underground storage tanks is required to detect early spills or leakages;
- At least three tank observation wells (TOWs) should be drilled and installed around the fuel station. These wells will be used to detect possible pollution from the tanks in groundwater; and

- Awareness training of the impacts of fuel on groundwater should be provided to all staff from the design phase throughout to the decommissioning phase of the proposed fuel station.

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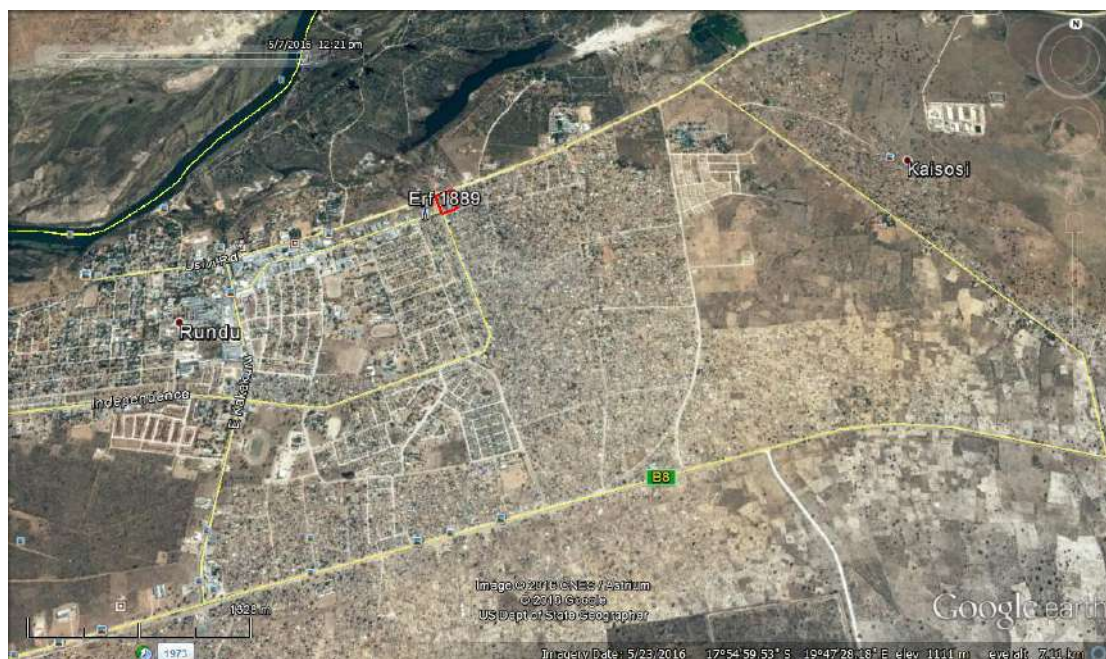
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Table 5-2: Aquifer and Aquitard distribution of the Kavango Region (Bittner, 2002) ..... 9





**Figure 1-2: The location of the proposed fuel station site in Rundu**

The increase in number of fuel stations is generally prompted by the fast-growing economy i.e. fuel consumption by vehicles and machinery. However, fuel products (including other hydrocarbons) are considered one of the major contaminants of groundwater and the wider environment in the vicinity of fuel stations worldwide, if not handled properly. The pollution of groundwater resources results from poor handling of fuel dispensing facilities (at forecourts) and underground fuel storage tanks. The afore-mentioned pollution does not only affect groundwater, but surrounding soils too. Fuel leakage and spills from broken fuel pipes and underground storage tanks (USTs) poses a threat to groundwater quality for the surrounding water users that rely on the groundwater resource. Potential impacts on groundwater need to be identified, assessed and adequately mitigated if they cannot be avoided.

This report covers the findings from the reviewing of available data and other relevant literature pertaining to the climatic, geological and hydrogeological settings (conditions) of the study area. The geological and hydrogeological setting of the area highlights potential areas that are vulnerable to groundwater pollution in the case of spills and leaks from the fuel station's USTs and surface fuel dispensing facilities (forecourt).

## 2 SCOPE OF WORK

The scope of work for the groundwater impact assessment includes the following:

- Legal implications of groundwater pollution ;
- The description of the physical conditions - climatic, geological, hydrological and hydrogeological settings of the area;
- Determining the groundwater flow in the study area in order to determine the direction in which potential pollution may be spreading;
- The concept of hydrocarbons transport mechanism;
- Potential Impacts of the fuel station on groundwater quality; and
- Groundwater pollution risk assessment.

## 3 METHODOLOGY

The investigation has been conducted on a desktop level i.e. no fieldwork / site investigation was conducted. The impact assessment of the fuel station on groundwater has been undertaken based on existing information on the study area i.e. literature review (consulting available archival data sources) and other data sources pertaining to hydrocarbons pollution.

## 4 LEGISLATION AND GUIDELINES PERTAINING TO GROUNDWATER

The development of the proposed fuel station has the following legal implications.

### 4.1 Water Resources Management Act, 2013 (Act No.11 of 2013)

The act provides for the management, protection, development, use and conservation of water resources; and provide for the regulation and monitoring of water services and to provide for incidental matters. The objectives of this Act are to ensure that the water resources of Namibia are managed, developed, used, conserved and protected in a manner consistent with, or conducive to, the fundamental principles set out in Section 3. Of special note are two principles:

*“3. (k) prevention of water pollution and implementation of the principle that a person disposing of effluent or waste has a duty of care to prevent pollution;*

*(l) a polluter is liable to pay all costs to clean up any intentional or accidental spill of pollutants.”*

The Act further provides for control and protection of groundwater, section 66, subsection 1 (d) (ii), water pollution control (section 68) and water related emergency or pollution threats (section 81).

#### **4.2 Petroleum Products and Energy Act of Namibia (Act No. 13 of 1990)**

The Act makes provision for impact assessment for new proposed fuel facilities and petroleum products known to have detrimental effects on the environment.

Furthermore, the Act prescribes the South African National Standard (SANS), as listed in section 4.12 as the criteria to which fuel installations must be constructed, operated and decommissioned.

#### **4.3 Pollution Control and Waste Management Bill (Guideline only)**

The relevant parts of this Bill to the proposed project are part 7 and 8.

- Part 7 states that any person who sells, stores, transports or uses any hazardous substances or products containing hazardous substances shall notify the competent authority, in accordance with sub-section (2), of the presence and quantity of those substances.
- The competent authority for the purposes of section 74 shall maintain a register of substances notified in accordance with that section and the register shall be maintained in accordance with the provisions.
- Part 8 provides for emergency preparedness by the person handling hazardous substances, through emergency response plans.

#### **4.4 Public Health Act No. 36 of 1919**

Under this act, in section 119:

*“No person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.”*

## 5 PHYSICAL CONDITIONS

### 5.1 Climate

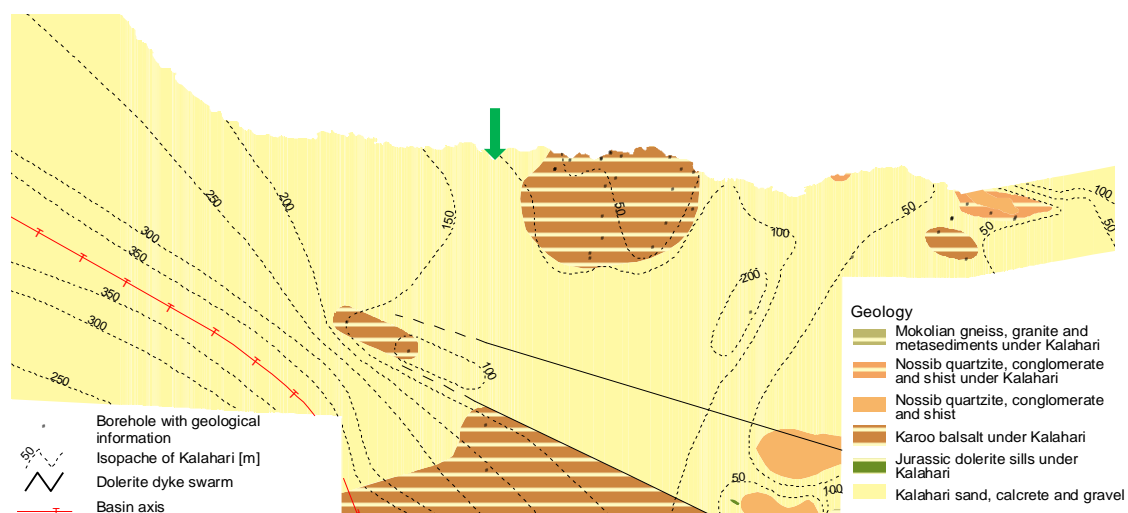
Situated in north-eastern Namibia, the Kavango East Region enjoys generally more rainfall than the rest of the country. The annual average rainfall varies between 450 and 600 mm, with a clear increasing trend from south to north. Rains fall almost entirely in summer, with the months from May to September usually being dry, and the first early rains coming to the region in October and November. Highest rainfalls usually occur in January and February. The Region is usually warm to hot with average maximum temperatures above 30 °C for nine months of the year, and average minimums are below 10 °C during the coolest months June, July and August. Temperatures below freezing are occasionally recorded but are rare and are usually only experienced in low-lying valleys such as found along the Kavango River and drainage lines (Omurambas) (Stubenrauch *et al.*, 2015).

The climate is classified as semi-arid with a moisture deficiency throughout the year. The Kavango regions are normally frost-free and the climatic conditions are favourable for crop production (Ministry of Agriculture, Water and Forestry, 1994).

### 5.2 Geology

According to Bittner (2002), the Okavango Basin is part of the greater Kalahari Basin, which covers most of the northern and eastern parts of Namibia and extends across the Namibian border into Botswana and Angola. The bedrock underlying the basin is filled with Kalahari Sequence deposits consisting of basal rocks of the Damara Sequence, followed by the Karoo Sequence sediments, overlain and intruded by volcanics of Karoo age. The unconsolidated to semi-consolidated clay, sand and gravel of the Kalahari Sequence fill the Okavango Sub-basin, which thickens from the northeast towards the northwest, from 0 to >400 m along the north-west trending basin axis. The basin axis stretches from the northwest corner of former Bushmanland through the southwestern Kavango Region and from there into the Ohangwena Region. Sub-outcrops of volcanic rock occur at the Okavango River near Rundu and between Mukwe and Bagani. Damara Sequence rocks crop out in the southern part of the Kaudom Park within the Nhoma River drainage and at the border between the Kavango and Caprivi regions near Andara. The geological map of the Kavango Regions is shown in **Figure 5-1**.

The approximate location of Rundu in the maps from **Figure 5-1** to **Figure 5-6** of this chapter is indicated by the green arrow, positioned on the north-eastern Namibia.



**Figure 5-1: Geological map of the Kavango Regions (modified geological map of Namibia 1:1000 000) (Bittner, 2002)**

The Kalahari Sequence forms a blanket of unconsolidated to semi-consolidated aeolian and alluvial sediments covering most of the area and is divided into three main units (see **Table 5-1** below). The uppermost unit consists mostly of unconsolidated windblown sand and sand deposited under fluvial conditions. The middle part is predominantly fluvial sand with minor aeolian deposits. The basal layer is as yet poorly understood and consists of conglomeratic, red clayey sand with carbonate cement. The Kalahari layers are thinnest along the Botswana border (less than 50 m) and thicken (260 m) towards the middle reaches of the Omatako-Omuramba and further to the northwest towards Nkurenkuru at the Okavango River. The geology and stratigraphy of the Kavango Regions are presented in **Table 5-1** below.

**Table 5-1: Geology and Stratigraphy of the Kavango Regions (Bittner, 2002)**

| Age  | Sequence/ Group |       | Formation        | Description   | Surface distribution                    |
|--|-----------------|-------|------------------|---|---|
| Recent<br>To<br>Late<br>Cretaceous<br>(64 - 0 mil.<br>years) | Kalahari        | Upper | Kalahari<br>Sand | Thin Aeolian sands<br>and loamy<br>calcareous soil with<br>crusts of ferricrete<br>and calcrete | Regional covering to all<br>older rocks |
|  |                 |       | Omatako          | Ferricrete and<br>ferruginous<br>sandstone  | Borehole intersections<br>only          |



| Age                                 | Sequence/ Group |        | Formation | Description  | Surface distribution  |
|-------------------------------------|-----------------|--------|-----------|--|---|
|                                     |                 | Middle | Eiseb     | thick layered, light coloured, sandy silcrete and calcrete, conglomerate bands in middle unit              | Borehole intersections only   |
|                                     |                 | Lower  | Tsumkwe   | Reworked sandy to clay rich conglomerate, poorly sorted basal scree with calcareous cement; minor mudstone | Borehole intersections only   |
| Cretaceous<br>(180 - 60 mil. Years) | Karoo           |        | Kalkrand  | Plateau Basalt   | borehole intersections only, e.g.:<br>Omatako/Kavango river area near Rundu,<br><br>south of Andara and northeast of Mangetti block |
| Early Namibia<br>(900 m.y)          | Damara/Nosib    |        | Duruchaus | Fine-grained greyish to brown, feldspathic quartzites with interbedded sandy shales                        | Nhoma, Andara and Popa Falls area   |

### 5.3 Hydrology

The hydrology of Namibia is characterised by the semi-arid to arid climate, and the very limited occurrence of surface waters. Namibia has no permanent rivers except for the border rivers, the Kunene, Okavango, Zambezi and Kwando-Linyati-Chobe in the north and the Orange River in the south, all of which have their sources outside Namibia, and are shared with other countries (Christelis and Struckmeier, 2001).

According to the Ministry of Agriculture, Water and Forestry (1994), the headwaters of the Okavango River are in two main tributaries, the Cubango River and Cuito River in the Angolan Highlands (see **Figure 5-2**).



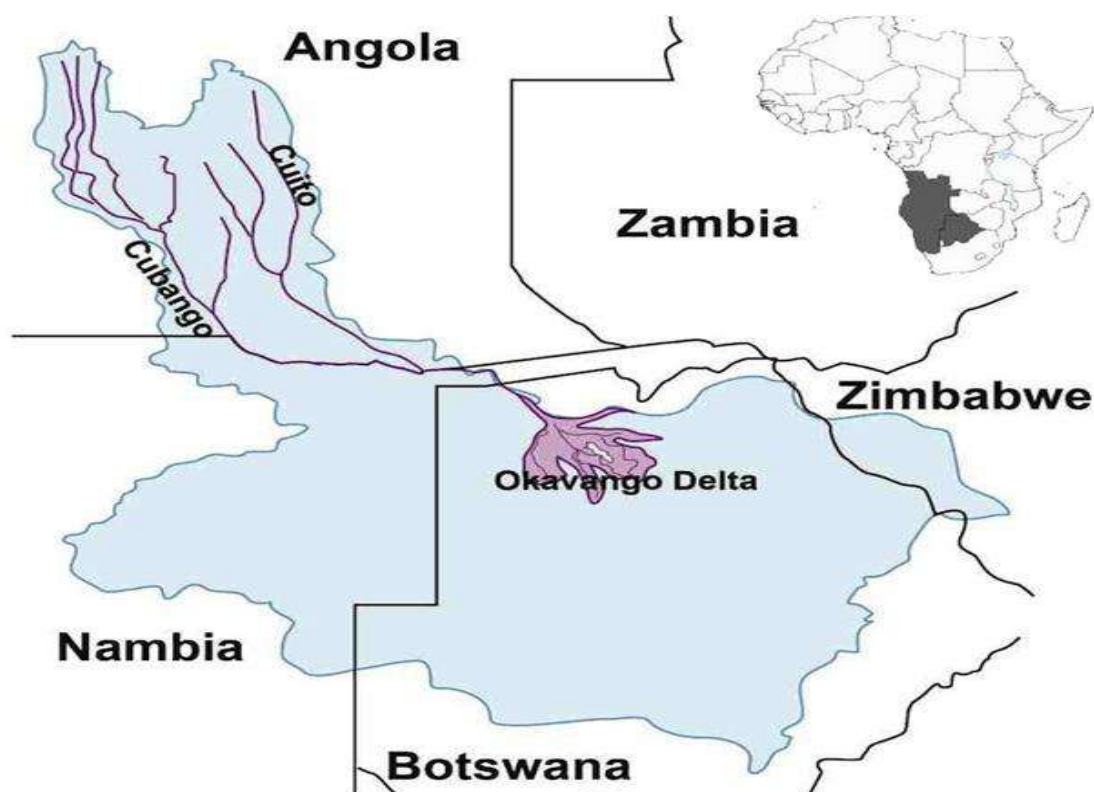


Figure 5-2: The Okavango River Basin (Delta Map) (Green *et al.*, 2013)

The Cubango River has a reported catchment area of approximately 115 000 km<sup>2</sup> with an annual rainfall of 605 to 1 125 mm averaging 983 mm, while the Cuito River has a catchment area of approximately 73 000 km<sup>2</sup> and an annual rainfall ranging from 476 to 1 100 mm, averaging 876 mm. The combination of these two mentioned tributaries produces a Mean Annual Runoff (MAR) of approximately 11 000 Mm<sup>3</sup>/annum in the Okavango River.

#### 5.4 Hydrogeology

According to the hydrogeological map of Namibia (Christelis and Struckmeier, 2001), the regional groundwater potential is moderate. Groundwater within the wider area of the Kavango Regions (Kavango East and West), is hosted in two distinct aquifer systems, Kalahari aquifers and fractured bedrock aquifers. These two aquifers are treated separately in this study as they have different characteristics. Kalahari aquifers hold water in intergranular pore spaces, whereas water in fractured aquifers is held in cracks and fractures in otherwise impermeable strata. Kalahari aquifers are common in the Kavango Regions (Christelis and Struckmeier, 2001).

Drilling success rates, defined as the percentage of borehole yields more than 1 m<sup>3</sup>/h, are commonly 100% in areas of Kalahari aquifers, while success rates of lower than 25% are common for fractured aquifers beneath thick unsaturated Kalahari layer.

Groundwater in the Kalahari is relatively easy to locate throughout most of the north-western and central Tsumkwe and the Kavango Regions.

#### 5.4.1 Aquifer Distribution

The aquifers in the study area can be sub-divided into two main groups, namely the primary (porous) aquifers and secondary (fractured) aquifers. The primary aquifers consist mainly of argillaceous and arenitic unconsolidated to semi-consolidated sediments of the Kalahari Sequence, that occur throughout the two Kavango Regions. The secondary aquifers comprise fractured and weathered pre-Kalahari bedrock. The secondary aquifers are only important in areas where the Kalahari sediments are absent or thinly developed such as in the north-eastern and southeaster parts of the Kavango Regions.

The Kalahari Sequence sediments constitute the most important aquifers in the region and the vast majority of boreholes drilled for rural and bulk water supply intersect the Kalahari aquifers. Boreholes drilled in close proximity to the Okavango River, intersecting paleo-channels, are often high yielding and most of the bulk water schemes are developed along the River. The aquifer and aquitard distribution of the Kavango Region are presented in **Table 5-2**.

**Table 5-2: Aquifer and Aquitard distribution of the Kavango Region (Bittner, 2002)**

| Sequence/Group |        | Formation                  | Aquifer   | Aquitard  |
|----------------|--------|----------------------------|---|---|
| Kalahari       | Upper  | 'Kalahari Sand'<br>Omatoko | aeolian sand, ferruginous sandstone<br><b>local perched aquifer</b>       | ferricrete, calcrete, clay layers                   |
|                | Middle | Eiseb                      | sandy silcrete and calcrete, conglomerate<br><b>main regional aquifer</b> | minor clay layers                                   |
|                | Lower  | Tsumkwe                    | Sandy conglomerate; often higher salinity                                 | clay rich conglomerate, mudstone<br><b>aquitard</b> |
| Karoo          |        | Kalkrand                   |   | <b>aquitard</b>                                     |
| Damara/Nosib   |        | Duruchaus                  | fractured quartzite_  | shale, solid quartzite<br><b>aquitard</b>           |

#### 5.4.2 Groundwater Recharge

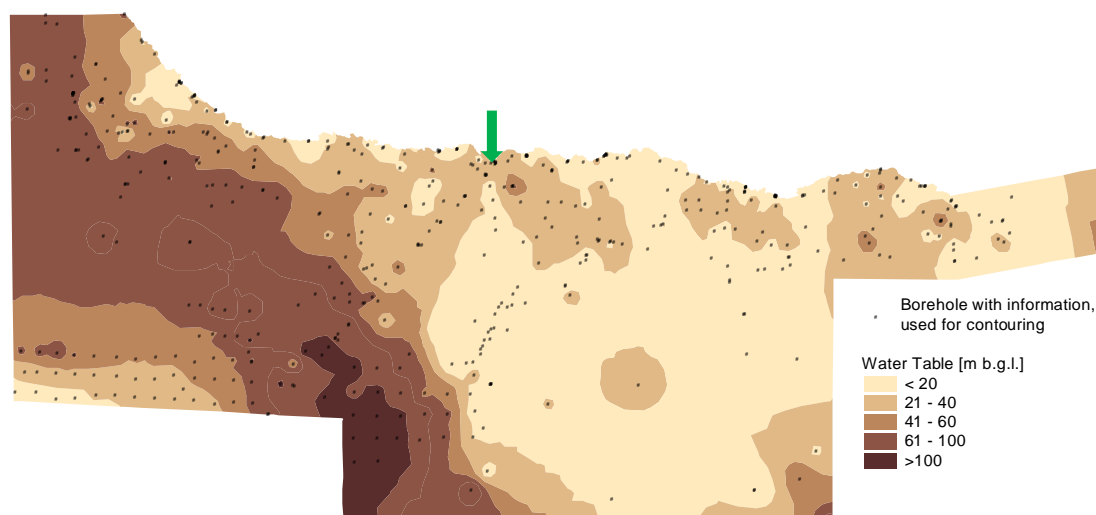
Recharge to the Kalahari Group aquifers is indicated to be primarily by inflow from fractured basement rocks (marble, dolomite and quartzite) adjacent to the Kavango regions. The areas of basalt and Damaran meta-sediment outcropping within the region are not considered to be recharge sources. Direct infiltration is considered to be minimal due to evapotranspiration and evaporation rates being high. These two processes can lead to near surface salinisation (salt concentration in sediments due to the unsaturated zone water flux) and any recharge waters could therefore show high levels of Total Dissolved Solids (TDS). Localised infiltration could occur in the interdunal zones and in the omirambas where they pond (Southern African Regional Environmental Programme, 2011).

The groundwater flow gradient suggests that the Okavango River is not a recharge source. However, in Botswana, where a similar groundwater gradient towards the Okavango River exists, recharge from the river is indicated within its floodplain.

The recharge mechanisms of the Kavango region need to be verified by strategically placed monitoring boreholes.

#### 5.4.3 Groundwater Table and Groundwater Flow Direction

In the Kavango East Region and along the Okavango River the water table or depth to piezometric level ranges from 10 - 40 m below surface. This is much different along the Kalahari basin axis in the Kavango West region where water level depths between 50 and 130 m below surface are observed. The depth to water table map is shown in **Figure 5-3**. The depth to water table for Rundu ranges from 21 to 40 m below surface.



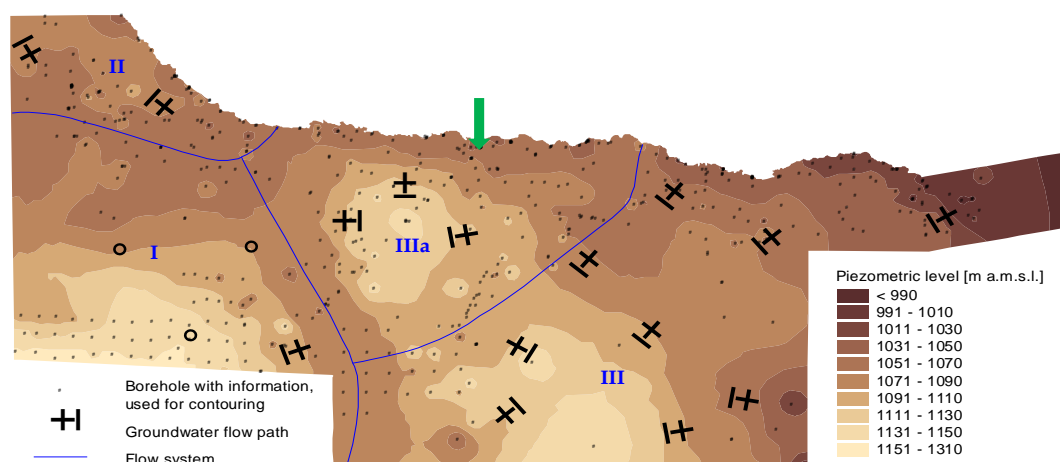
**Figure 5-3: Depth to water table map of the Kavango Regions (Bittner, 2002)**

According to Ministry of Agriculture, Water and Forestry (1994), a narrow area along the western part of the Okavango River shows direct recharge from the River, while groundwater flow is toward the River along the river's remaining channel.

Three main groundwater flow systems and one sub-system can be distinguished in the Kavango Regions.

**The first main flow system (I)** is located in the southwestern part, where the groundwater flow is in a northern direction originating in the recharge areas south of the Mangetti block. A large proportion of that groundwater was recharged in the Otavi Mountainland north of Grootfontein. A smaller proportion was recharged in the calcareous Kalahari cover between Abenab and the Kavango Region border. The flow is directed towards the east flowing Omuramba Mpungu, towards the northwest trending basin axis and eventually towards the

Okavango River. The flow gradient is in the range of 0.0003. A piezometric map for the Kavango Regions is shown in **Figure 5-4**. According to the map below, the piezometric level for Rundu ranges from 1051 to 1070 metres above mean sea level (mamsl).



**Figure 5-4: Piezometric Level Map**

The second main system (II) controls the groundwater flow in the north-western corner of the Kavango West Region between the Angola border, the Omuramba Mpungu and the Okavango River near Nkurenkuru. Here the flow is directed from north to south with the recharge area situated in Angola, most probably in the upper catchment of the Okavango River. The flow is again directed towards the Omuramba Mpungu and eventually towards the Okavango River. The flow gradient is negligible.

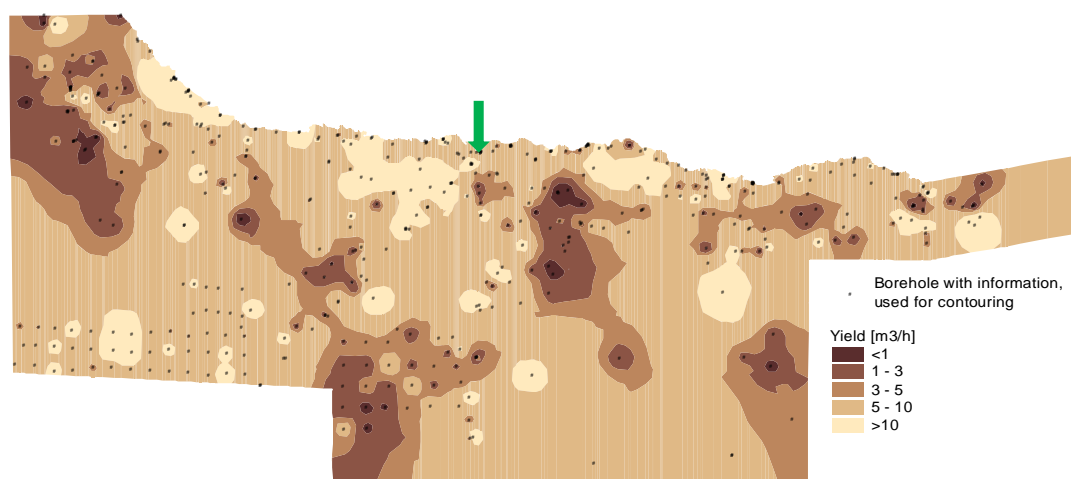
The third main flow regime (III) dominates the major part of the Kavango East Region, east of the basin axis. The recharge area is located northwest of Tsumkwe, covering parts of former north-central Bushmanland and the south-central Kavango Region. From there, the groundwater flows in all directions towards the Eiseb, Omatako and Okavango basin systems. In the Kavango Region the flow is mainly in a northern direction towards the Okavango River, but also in a western direction towards the Omuramba Omatako and the basin axis. The flow gradient is close to flat, at approximately 0.0004. It is interesting to observe that the Damara Sequence outcrop areas of the southern Kaudom Park and near the Okavango River at Andara do not function as recharge areas but rather as groundwater sinks.

A sub-system (IIIa) has developed in a slightly higher elevated area southwest of Rundu within the Kalahari Sequence. The flow from this local shallow aquifer is in all directions away from the centre of the circular recharge area near the tar-road approximately 35 km southwest of Rundu.

#### 5.4.4 Borehole Yield

Borehole yields in the Regions range between less than 1 m<sup>3</sup>/h and greater than 70 m<sup>3</sup>/h with the majority of boreholes yielding between 5 m<sup>3</sup>/h and 10 m<sup>3</sup>/h (see **Figure 5-5**), which is suitable to satisfy the general rural water supply demand. High yielding areas are along the Okavango River and within the shallow aquifer southwest of Rundu. Low yields between 1 m<sup>3</sup>/h and 3 m<sup>3</sup>/h can be expected in areas with a deep water table and where the Kalahari sediments comprise a higher clay content. The borehole yield depends generally on the drilling method and borehole design. The yield of recently drilled boreholes has improved compared to earlier drilling, due to the application of suitable drilling diameters, pre-manufactured screens and adequate gravel pack.

According to the map below, the borehole yield at Rundu ranges from 5 to 10 m<sup>3</sup>/h.

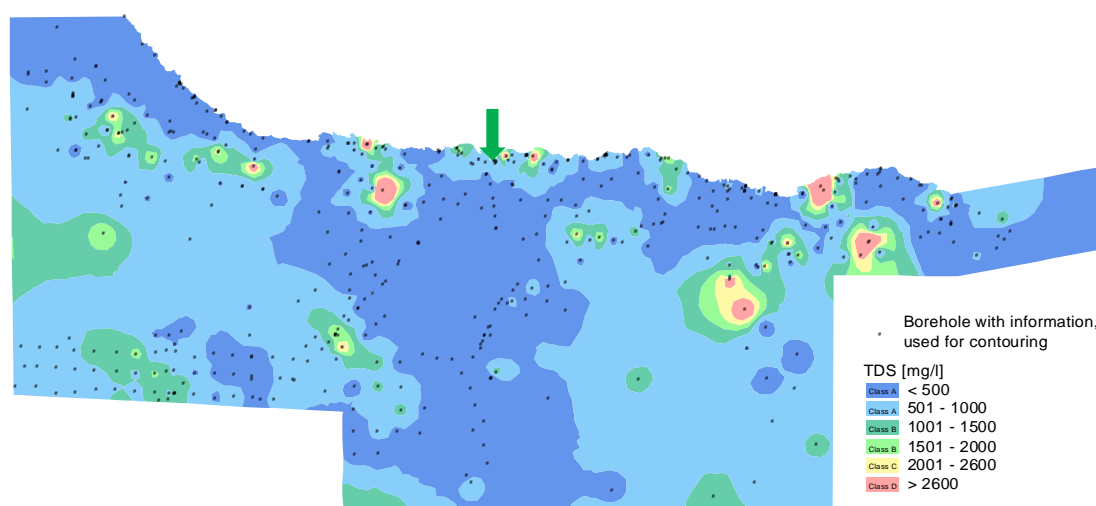


**Figure 5-5: Borehole yield distribution**

#### 5.4.5 Water Quality

The groundwater quality in Namibia (derived from the hydrogeological map) is classified based on the levels of Total Dissolved Solids (TDS).

The quality of the groundwater in the Kavango Regions is generally excellent and suitable for human consumption. Groundwater with elevated salinity had been observed only locally along the Okavango River, Omuramba - Mpungu, northwest and northeast of the Kaudum Park. The higher salinity of the groundwater along the Omuramba - Mpungu is most probably fault controlled. The deep-seated east trending faults function as flow barriers thereby hampering the groundwater flow. Deeper salt water from the Tsumkwe Formation and the bedrock below rises along the faults into upper Kalahari aquifers and mixes with the fresher water of the main regional aquifer. The TDS concentration for Rundu ranges between 501 and 1000 milligram per litre (mg/l), as shown in the TDS map for the Kavango Regions in **Figure 5-6**. The water quality for the town of Rundu is classified as Class A, which is excellent quality water and good for human consumption.



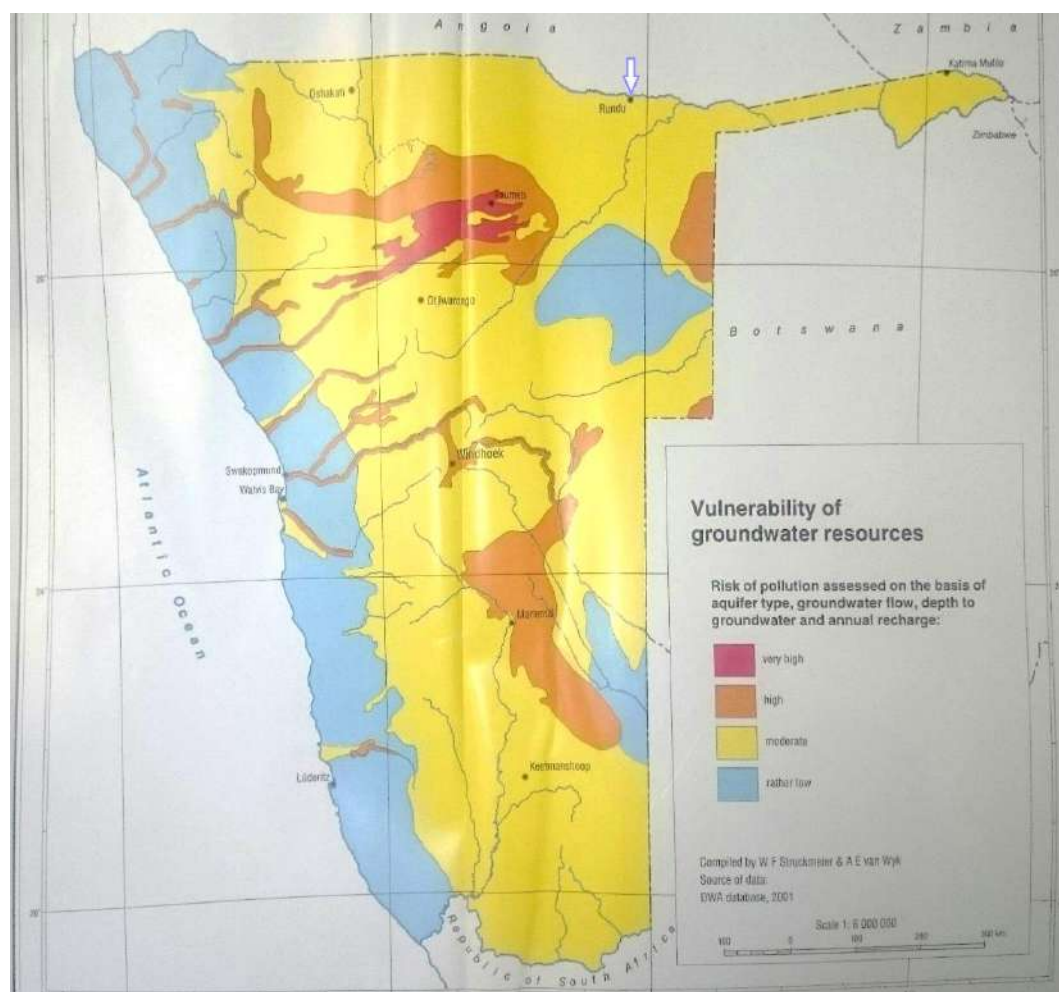
**Figure 5-6: Total Dissolved Solids Map (Bittner, 2002)**

#### 5.4.6 Groundwater Vulnerability to Pollution

In semi-arid rural areas, like in the Kavango Regions, where extensive agriculture like cattle farming is practised and with little industrial development taking place, groundwater pollution is a minor threat. However, with the increasing number of people and livestock, in particular in an area with a denser population such as along the Okavango River, as well as new developments like fuel stations in towns, the aspects of groundwater pollution and groundwater protection have increasingly become an issue.

The porous Kalahari aquifers (aeolian and alluvial sediments) in the area could provide a ready passage for the flow of pollutants from the ground surface to the water table (groundwater). Other areas of great concern are areas with a shallow water table (along the Okavango River), where fuel products can easily percolate into the aquifer.

According to Van Wyk *et al.* (2001)'s Groundwater Resources Vulnerability map of Namibia, the vulnerability of groundwater to pollution in Rundu is moderate. The vulnerability risk to pollution was also assessed based on the aquifer type, groundwater flow, depth to groundwater and annual recharge. The vulnerability map is shown in **Figure 5-7**, with Rundu town indicated by a white arrow on top of the map (northeast).



**Figure 5-7: Vulnerability of groundwater resources to Pollution (Van Wyk et.al, 2001)**

## 6 THE CONCEPT OF HYDROCARBONS TRANSPORT MECHANISM

Groundwater and soil pollution from hydrocarbon products is a significant issue associated with the storage and handling of such products (fuels). This section describes the process of hydrocarbon migration from the source of pollution to groundwater.

When a release of hydrocarbon products takes place onto 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 (Botha, 2014).

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 pore spaces 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, they 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, they 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 or groundwater pumping 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. The conceptual LNAPL migration in groundwater is shown in **Figure 6-1**.

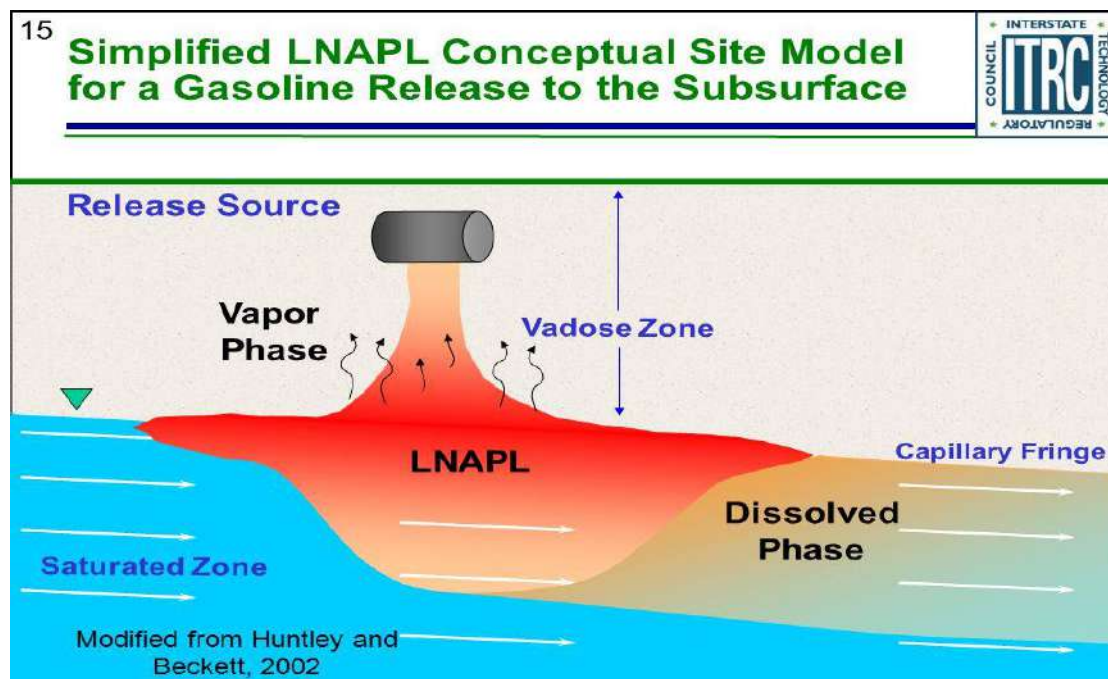


Figure 6-1: The Conceptual LNAPL Migration in Groundwater using Gasoline as an example (Ueland, 2011)

## 7 POTENTIAL IMPACTS OF FUEL STATION ON GROUNDWATER

Potential impacts to groundwater identified as a result of the construction and operation of the fuel station (filling station, underground storage tanks and a quick shop), include potential contamination of groundwater as well as surrounding soils by diesel and petrol products.

Statistics indicate that dispenser (pump) leaks are the most common form of containment failure. It is also indicated that leaks in underground pipework outnumber leaks from storage tanks 10:1 and in terms of leak size are the principal source of soil and groundwater contamination beneath fuel stations (SRK, 2006)

The nature of the sand and gravel soils on site in Rundu is, however, expected to cause rapid infiltration of hydrocarbon products and spreading over a large area. The extent of the pollution will also depend on the volume of hydrocarbon products spilled.

According to Botha (2014), the following are considered points of concern in the design, construction and operation of a fuel station / facility:

- Underground storage tanks leaking. This can be reduced through the use of composite tanks, multi hull tanks and leak detectors;
- Pipeline material not compatible with hydrocarbon products;

- 
- Joints in pipelines. This should be avoided and all joints and fittings should be in containment structures;
  - Pipelines damaged during excavations on site. Ensure that leak detectors are installed onsite;
  - Spill control at tank filler points. Ensure proper spill control is in place;
  - Spill control at fuel dispensing points. Ensure proper spill control is in place;
  - Oil water separator pipeline material not compatible with fuel. Normal sewage pipelines are often used. Some of these pipelines are not compatible with hydrocarbon products. These pipes often have a very thin wall that can easily get damaged, causing fuel leakage;
  - Oil water separator fuel removal & inspection. Often difficult to clean and or to monitor;
  - Oil water separator outflow. If this is not connected to a sewage system then the soak away should take place on surface so that any hydrocarbon staining can be clearly visible on surface. Maintenance of these systems are a concern and poor maintenance can lead to the separator filling up with fuel, which will eventually push through the separator to be released through the outflow. If the outflow is not visible it is unlikely to be detected and the hydrocarbon can then contaminate groundwater;
  - Use of soap on the spill control areas. Usage of soap that will enter the oil water separator will react with the fuel, putting it in suspension and causing fuel to pass through the separator;
  - Usage of incorrect dip sticks to measure fuel levels, causing overfilling of tanks. Clearly mark tank capacity and dip sticks;
  - Operator leaving tanker during tank filling causing over filling; and
  - Daily tank product reconciliation not taking place causing leaks to go undetected for extended periods. This is a problem specifically at consumer installations.

## 8 ASSESSMENT OF THE VULNERABILITY OF GROUNDWATER TO POTENTIAL POLLUTION

### 8.1 Risk Assessment

Generally, an environmental risk occurs when there is a means by which a hazard (e.g. process, activity or substance) can result in a harmful impact on the environment surrounding it. The part of the environment which is, or could be, affected is known as a receptor. Receptors include humans, flora and fauna, the built environment and water resources (controlled waters). The presence of a hazard alone does not constitute a risk; a risk is only present if there is a means by which the hazard can impact on sensitive receptor(s). The connection between the hazard and receptor is known as a pathway, and all three elements together constitute a source-pathway-receptor (S-P-R) linkage (SRK, 2006).

**Source (or hazard):** a substance capable of causing pollution or harm.

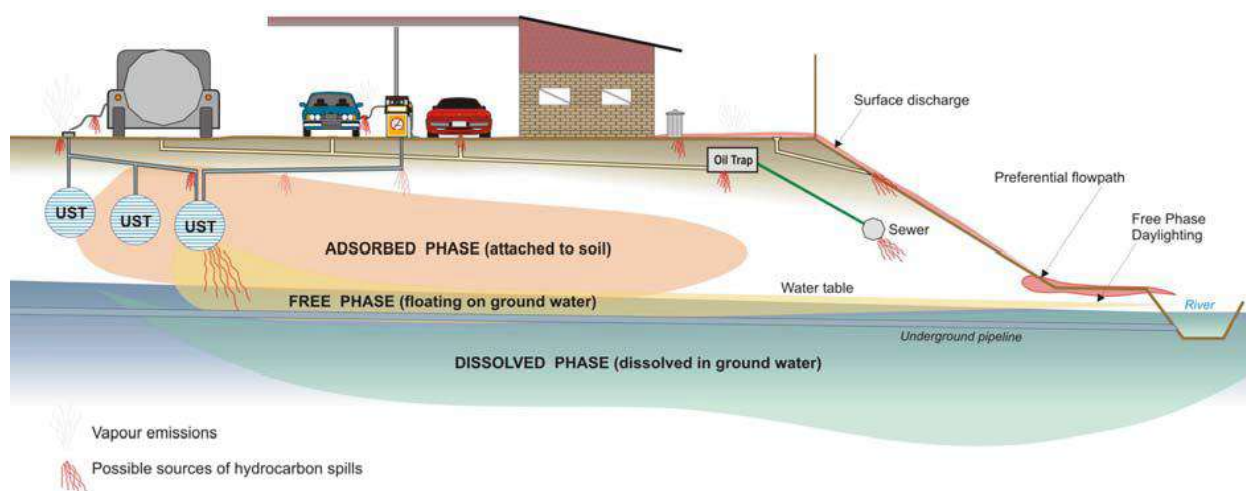
**Receptor (or target):** something which could be adversely affected by the contaminant.

**Pathway:** a route by which contaminants can reach the receptor.

Environmental risk assessment is the process whereby S-P-R linkages are identified and evaluated. If any of the three elements are absent then there is no complete linkage and thus no unacceptable risk.

The magnitude of a risk is a function of the consequences of pollution and the likelihood that such pollution will occur.

**Figure 8-1** shows a basic representation of the typical pathways of hydrocarbons to the environment (groundwater) associated with the operation of a fuel station.



**Figure 8-1:** Typical hydrocarbon pathways to the environment (modified after SRK, 2006)

## 8.2 Groundwater Impact Assessment

### 8.2.1 Source

The source in this aspect are the fuel products (diesel and/or petrol) to be stored at the proposed fuel station, which are hazardous to human health and the environment (groundwater). The release of fuel products to the environment would pose a risk to receiving water bodies and soils.

### 8.2.2 Pathway

The pathway is determined by the depth to water table, type of lithology in the area and groundwater flow direction. Based on the information gathered, the water levels in the area range between 20 and 40 meters below ground level (mbgl), which is considered relatively deep. However, water levels along the Okavango River are shallow (<20 m below surface - see subchapter 5.4.3). Groundwater within the proposed site area is hosted in Kalahari Group aquifers of unconsolidated to semi-consolidated sediments (sand, calcrete and gravel). These aquifers are considered porous and hold water in intergranular pore spaces. Due to the high permeability of these aquifers, water can enter the groundwater system fairly easily and rapidly. The nature of these sediments is expected to cause rapid infiltration of hydrocarbon products to groundwater and spreading over a large area. The extent of the pollution will also depend on the volume of hydrocarbon products spilled.

### 8.2.3 Receptor

The Okavango River located about 800 m from site is considered a potential receptor, as groundwater in the area is said to flow radially (all directions) from the central recharge zone near the tarred road approximately 35 km southwest of Rundu (groundwater flow sub-system IIIa in **Figure 5-4**). There is said to be water boreholes in Rundu. However, due to lack of information, there is no known information on how many or whether there are any boreholes within a 1 km radius from the proposed site. Existing (if any) boreholes within a 1 km radius and downstream of the site could be good receptors of potential groundwater pollution from the fuel station. A hydrocensus would be required to identify all the existing boreholes within a 1 km radius of the proposed fuel station. A hydrocensus would provide information like borehole location, water levels and water quality, etc.

The potential impact on the groundwater resources in the area is considered moderate. The design of a sufficient groundwater monitoring plan and the drilling of tank observation wells to detect leakage of fuel products from the storage tanks is essential for the prevention and management of groundwater pollution.

After assessing the hydrogeological regime of the area with the available information, the impacts on the groundwater resources are considered moderate.

## 9 CONCLUSIONS AND RECOMMENDATIONS

The quality of groundwater in the study area is excellent. Based on the information pertaining to the area where the fuel station is proposed to be located, groundwater is moderately vulnerable to pollution.

As a precaution against groundwater pollution from the fuel station, it is recommended that groundwater management plans and spill containment systems should be put in place and complied with during the construction, operational and decommissioning phases of the proposed fuel station. The fuel station development should be constructed at a standard the same or better than the SANS 10089. The fuel station should incorporate a multi-layered system to contain any potential leakage from the storage tanks or forecourt. For the storage tanks, these include double-skinned tanks in a concrete vault lined with synthetic polymer membranes, and compacted clay. The oil water separator outflow is considered to be the main weak point where pollution can take place, thus oil water separators should be inspected and cleaned daily. The soak away should be inspected daily for signs of staining. These precautions can only safeguard the impact (pollution) for a certain period, as equipment quality deteriorates with time. Hence, regular maintenance and monitoring of underground storage tanks is required to detect early spills or leakages. At least three tank observation wells (TOWs) should be drilled and installed around the fuel station. These wells will be used to detect possible pollution from the tanks in groundwater.

The most important prevention measure is, the provision of groundwater impact awareness training to the employees involved from the beginning of the fuel station development throughout to the decommissioning phase.

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