



**GOBABIS WATER SUPPLY SCHEME**

**ENVIRONMENTAL MANAGEMENT PLAN**

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**Prepared by:**  
NamWater, Private Bag 13389, Windhoek, Namibia  
Contact Person: N.P du Plessis  
Tel: +264-6171 2093  
Email: Plessisn@namwater.com.na

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## LIST OF ABBREVIATIONS

<b>AIDS</b>	Acquired Immune Deficiency Syndrome
<b>CoC</b>	Code of Conduct
<b>DEA</b>	Directorate of Environmental Affairs
<b>EMA</b>	Environmental Management Act
<b>EMP</b>	Environmental Management Plan
<b>HIV</b>	Human Immunodeficiency Virus
<b>I&amp;AP</b>	Interested and Affected Parties
<b>MET</b>	Ministry of Environment and Tourism
<b>NEM</b>	NamWater Environmental Manager
<b>MSDS</b>	Material Safety Data Sheet
<b>NWQG</b>	Namibian Water Quality Guidelines
<b>NWQS</b>	Namibian Water Quality Standards
<b>STI's</b>	Sexually Transmitted Infections
<b>WTW</b>	Water Treatment Works

## **1. PURPOSE OF THE EMP**

This Environmental Management Plan (EMP) has been compiled and updated for the management of potential environmental impacts during the operation, and decommissioning phases of the existing Gobabis Water Supply Scheme. Best practice is proposed for the generic issues of construction management and supervision as well as the on-going management and operation of the water supply scheme.

In terms of the Environmental Assessment Policy of 1994 and the Environmental Management (Act No 7 of 2007) (EMA), the activities required for the construction of the proposed project requires authorization from the Directorate of Environmental Affairs at the Ministry of Environmental and Tourism (MET: DEA).

An Environmental Clearance Certificate (ECC) was originally issued in 2016 and this EMP serves as an application for the renewal of the ECC.

## 2. INTRODUCTION

### 2.1 Gobabis Water Supply Schemes

Gobabis is situated in the Omaheke Region approximately 200 km east of Windhoek and is the commercial and administrative capital of the Omaheke Region. There are a number of sources supplying water to Gobabis reservoir. These include the Gobabis Water Treatment Plant (GWTP) at Gobabis fed by the Otjivero, Tilda and Daan Viljoen dams, the boreholes of the Black Nossob, Gobabis (South Station) and North-east schemes. In the 2009/2010 financial year 790 087 m<sup>3</sup> were sold from this scheme. Swart Nossob Boreholes is a groundwater scheme supplying water to three private consumers along the pipeline route as well as Gobabis during periods of surface water shortages.

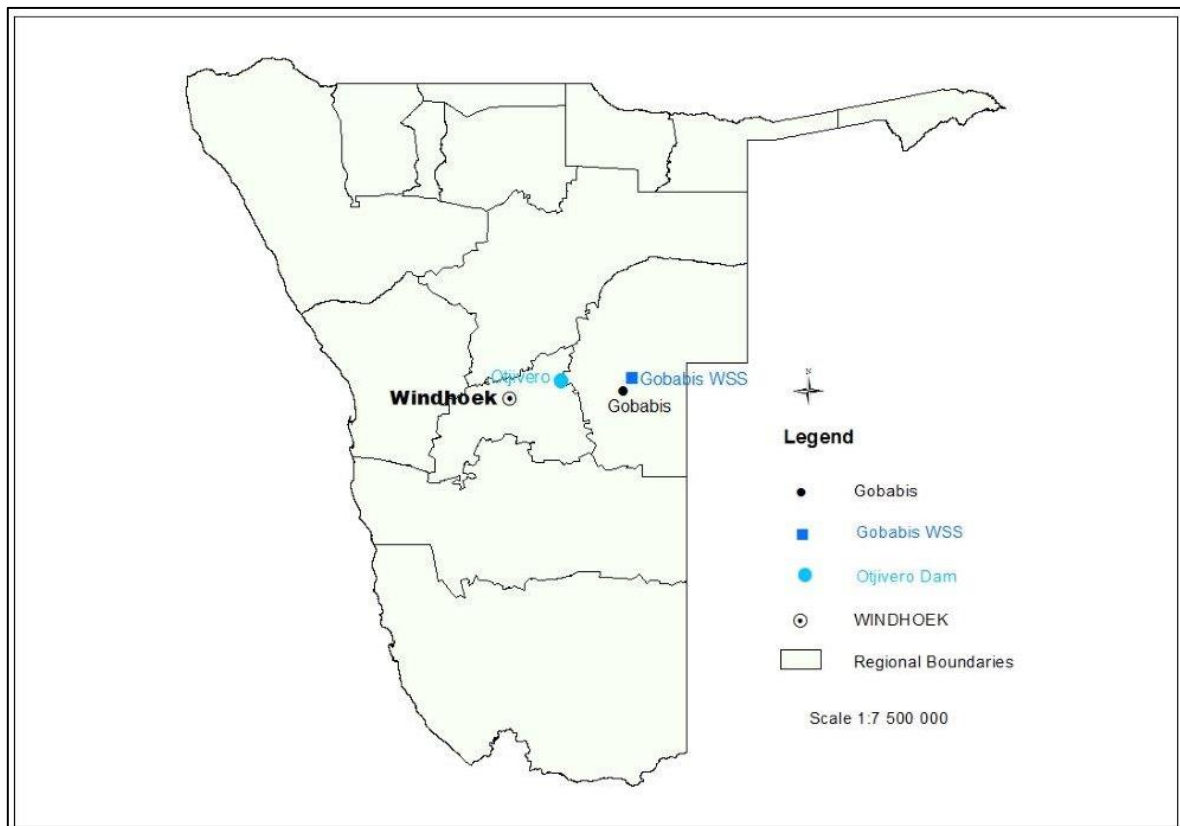
The Gobabis scheme supplies water to the Municipality of Gobabis, the Ministry of Defence and the Goba-Goba Lodge and occasionally to the Roads Contractor Company.

### 2.2 Otjivero-Gobabis Scheme

The Otjivero-Gobabis scheme supplies treated water to a number of users at the Omaheke Regional Council for use in the Otjivero Settlement, the Otjivero Primary School, the Omitara Clinic, a NamWater Staff house and a few private consumers.

The location of Gobabis is depicted in **Figure 1**.

The EMP is for an existing scheme and it is therefore only for the operation and maintenance of the scheme.



**Figure 1: Gobabis Location Map**

### 3. EXISTING GOBABIS WATER SUPPLY INFRASTRUCTURE

#### 3.1 Water Source

##### 3.1.1 Gobabis Purification Scheme

The Gobabis Purification scheme is a surface water scheme receiving raw water from Tilda, Daan Viljoen and Otjivero dams. The purification plant is 3.8 km west of Gobabis. The scheme supplies potable water to the Municipality of Gobabis.

##### 3.1.2 Black Nossob Boreholes

The Black Nossob Borehole scheme supplies groundwater to the Municipality of Gobabis during periods of surface water shortages. The scheme consists of eight boreholes (WW 34884, WW 34885, WW 34923, WW 34928, WW 34929, WW 34930, WW 34931 and WW 35022), which pump water into the main line from Otjivero Dam to Gobabis into the three concrete reservoir system at Gobabis with a combined design capacity of 15 000 m<sup>3</sup>, from where it is distributed into the reticulation system.

The boreholes are between 20 m and 50 m deep. The yields of the boreholes vary between 5 m<sup>3</sup>/h and 11 m<sup>3</sup>/h.

##### 3.1.3 North East Boreholes

The North East Borehole scheme supplies groundwater to the Municipality of Gobabis during periods of surface water shortages. The scheme consists of fourteen boreholes (WW 35212, WW 35215, WW 35219, WW 35224, WW 35229, WW 35234, WW 35237, WW 35238, WW 35243, WW 35186, WW 35190, WW 35197, WW 35203 and WW 35211), which pump water into the three concrete reservoir system at Gobabis with a combined design capacity of 15 000 m<sup>3</sup> from where it is distributed into the reticulation system.

The boreholes are between 99 m deep and 150 m deep. The yields of the boreholes vary between 3 m<sup>3</sup>/h and 18 m<sup>3</sup>/h.

##### 3.1.4 Gobabis South Station

Gobabis South Station scheme supplies groundwater to the Municipality of Gobabis during periods of surface water shortages. The scheme consists of four boreholes (WW 25870, WW 9860, WW 9862 and WW 9986), which pump water into the three concrete reservoir system at Gobabis with a combined design capacity of 15 000 m<sup>3</sup> from where it is distributed into the reticulation system.

The boreholes are between 60 m and 108.5 m deep. The yields of the producing boreholes vary between 10 m<sup>3</sup>/h and 15 m<sup>3</sup>/h.

##### 3.1.5 Otjivero-Gobabis

The four dam system supplying water to the Gobabis Purification scheme via the Otjivero-Gobabis pipeline comprises of the Otjivero Silt Trap Dam, Otjivero Main Dam and the raw water pump station, Daan Viljoen Dam and Tilda Viljoen Dam. Water is transferred from the Otjivero Silt Dam via a gravity system or pumping depending on the water levels. Similarly water is transferred from the Daan Viljoen dam via a pump and a canal to the Tilda Viljoen Dam.

A schematic layout of the existing infrastructure is indicated in **Figure 2** below.

## **3.2 Dams**

The surface water supply system which supplies the Gobabis Purification scheme with raw water comprises of a four dam system. The Otjivero Silt and Main dams are linked via the Otjivero-Gobabis pipeline with the Daan Viljoen and Tilda Viljoen dams.

### **3.2.1 Otjivero Silt Trap Dam**

The primary purpose of the Otjivero Silt Trap Dam is to prevent silt reaching the Otjivero Main Dam. The construction of the Otjivero Dams was completed in October 1984.

The wall of the Silt Trap Dam at Otjivero is located within the natural basin of the Main Dam and its principal function is to force flood waters in the river to deposit their silt load before reaching the Main Dam. The embankment also improves the dam basin characteristics of the Main Dam by making the sides of the reservoir steeper and so reducing the surface area of the water exposed to evaporation. An emergency spillway is provided by a lowered section of the earth fill embankment.

The embankment incorporates a concrete tower where the raw water intake works are located, allowing water to be transferred to the Main Dam. The water flows first by gravity from the Silt Trap Dam into the Main Dam until equilibrium of the water levels is reached. Thereafter the transfer of water is achieved by pumping.

The abstraction tower along with electrical submersible pumps forms part of the Otjivero Silt Trap Dam and transfers raw water to the Otjivero Main Dam.

### **3.2.2 Otjivero Main Dam**

The Otjivero Main Dam forms the principal storage dam for water supply to Gobabis. The Main Dam together with the Silt Trap Dam has a combined safe yield of 0.72 Mm<sup>3</sup>. This is achieved by transferring as much water as possible from the Silt Trap Dam to the Main Dam, thereby reducing evaporation losses.

The intake structure and outlet works are housed within the dam wall. The raw water pump station is situated downstream of the main wall on the left bank of the White Nossob River.

The concrete dam wall with central spillway appeared to be in good condition and no obvious defects were observed.

### **3.2.3 Daan Viljoen Dam**

The Daan Viljoen Dam was built on the western perimeter of the municipal area of Gobabis inside the Black Nossob River in 1957 and subsequently raised in 1958. This dam has a capacity of 400 000 cubic metres of water and a surface area of 0.203 km<sup>2</sup>. Daan Viljoen Dam acts as a silt dam for Tilda Viljoen Dam. Water is pumped from Daan Viljoen Dam to Tilda Viljoen Dam to take advantage of the significantly better water retention properties of Tilda Viljoen Dam. The water is pumped out of Daan Viljoen Dam into an open canal in which the water flows by gravity to Tilda Viljoen Dam.

The abstraction tower along with the electrical pumps forms part of Daan Viljoen Dam and transfers raw water to Tilda Viljoen Dam

### **3.2.4 Tilda Viljoen Dam**

Tilda Viljoen Dam was built in 1958 on the western perimeter of the municipal area of Gobabis as a pumped storage dam to improve the surface water storage capabilities at Gobabis. Tilda Viljoen Dam has a capacity of 1.25 million cubic metres and although the dam has no natural



source of inflow, it has much better basin characteristics than Daan Viljoen Dam. It is therefore possible to achieve a much more efficient utilization of the runoff of the Black Nossob River by transferring water from Daan Viljoen Dam to Tilda Viljoen Dam.

The abstraction tower with electrical submersible pumps is used to transfer raw water from Tilda Viljoen Dam to Gobabis Purification Plant.

### **3.3 Water Quality and Disinfection**

The quality of water supplied to Gobabis is evaluated for compliance with the NWQS and the NWQG. According to the NWQG the water quality complies with Group B which is suitable for human consumption (Appendix).

### **Gobabis Water Supply Scheme**

A chlorine gas installation installed on the supply line from the borehole schemes appears to be operational and in fair condition.

### **3.4 Pipe Work**

#### **3.4.1 Gobabis Purification Scheme**

The pipe work from the purification plant to the ground reservoir consists of approximately 1 400 m of 350 mm diam. FC pipe.

The theoretical pipe capacity at a velocity of 1 m/s for the 350 mm diam. FC is 520 m<sup>3</sup>/h.

#### **3.4.2 Black Nossob Boreholes**

The pipe work from the boreholes to the ground reservoir consists of approximately 600 m of 160 mm diam. uPVC CL6, 3 900 m of 200 mm diam. uPVC CL6 pipes and 12 900 m of 250 mm diam. uPVC CL6 pipes and is reported to be in reasonable condition and no major leakage or pipe bursts occur on these lines. As-built scheme information could not be obtained at the time of this report. The appurtenances in general are in good condition.

The theoretical pipe capacities at a velocity of 1 m/s for the 160 mm diam. uPVC, 200 mm diam. uPVC and 250 mm diam. uPVC pipes are 64 m<sup>3</sup>/h, 100 m<sup>3</sup>/h and 160 m<sup>3</sup>/h respectively.

#### **3.4.3 North East Boreholes**

The pipe work from the boreholes to the ground reservoir consists of approximately 5 300 m of 63 mm diam. uPVC CL6, 10 500 m of 110 mm diam. uPVC CL6 pipes, 6 400 m of 160 mm diam. uPVC CL6, 18 400 m of 250 mm diam. FC CL12 pipes and 10 700 m of 300 mm diam. FC CL12 pipes and is reported to be in reasonable condition and no major leakage or pipe bursts occur on these lines. As-built scheme information could not be obtained for this report. The appurtenances in general are in good condition.

The theoretical pipe capacities at a velocity of 1 m/s for the 63 mm diam. uPVC pipe, 110 mm diam. uPVC, 160 mm diam. uPVC, 250 mm diam. FC and 300 mm diam. FC pipes are 7 m<sup>3</sup>/h, 28 m<sup>3</sup>/h, 64 m<sup>3</sup>/h, 28 m<sup>3</sup>/h and 18 m<sup>3</sup>/h respectively.

#### **3.4.4 South Station Boreholes**

The pipe work from the boreholes to the ground reservoir consists of approximately 1 400 m of 110 mm diam. uPVC CL6 pipes and is reported to be in reasonable condition and no major leakage or pipe bursts occur on these lines. As-built scheme information could not be obtained for this report. The appurtenances in general are in good condition.

The theoretical pipe capacity at a velocity of 1 m/s for the 110 mm diam. uPVC pipe is 28 m<sup>3</sup>/h.

### **3.4.5 Otjivero-Gobabis**

The raw water pipeline from the Otjivero Dam to Gobabis consist of approximately 120 km 450 mm diam. fibre-reinforced cement pipe with a theoretical maximum flow capacity of 421 m<sup>3</sup>/h and is reported to be in reasonable condition with no major leakage or pipe bursts occurring on this line. Available information indicates a construction date of 1981 i.e., the pipeline is approximately 30 years old. However, there is no serious degradation of the pipeline at this stage. The appurtenances and manholes generally appear in good working condition.

### **3.5 Reservoirs**

There are two ground level reservoirs at the Gobabis Scheme; a raw-water and a clear water reservoir. Both are round, concrete reservoirs with a capacity of 450 m<sup>3</sup> each.

### **3.6 Water Treatment Plants**

#### **3.6.1 Otjivero Water Treatment Plant**

The Otjivero Water Treatment Plant is supplied with raw water from the Otjivero Dam. A small, non-conventional batch type water treatment plant is situated close to the Otjivero Main Dam wall. The major components of the plant are; a sedimentation tank (batch process), in which turbid water is clarified by the addition of chemicals, two pressure sand filters and final chlorination.

The Otjivero Water Treatment Plant (OWTP) treatment works consists of the following major components:

- Flash mixing/flocculation stage during filling of the batch clarifier fed via a pumping station from the Otjivero Main Dam;
- After mixing and flocculation the water is retained for at least 2 hours in the Clarifier, (old flocculator/clarifier) for proper settling.
- Booster pumps, abstract water from a floating suction pipe on the clarifier which pump the water through 2 x parallel steel pressure sand filters to the 755 m<sup>3</sup> reservoir located on a hill above the treatment works
- The sediment is flushed to the nearby White Nossob River after the clarified water is abstracted from the clarifier.
- Chlorination through floating dispensers in a small balance tank (10 m<sup>3</sup>) fed via a bal-valve from the reservoir.

The capacity of the purification plant is 150 m<sup>3</sup> per day based on 3 batches per day during a single shift.

#### **Gobabis Water Treatment Plant**

A conventional water treatment plant (GWTP) with a capacity of 400 m<sup>3</sup>/h is located near the Daan and Tilda Viljoen Dams at Gobabis and was constructed in 1980. Raw water is supplied to the GWTP plant from Tilda Viljoen Dam. During the 3 months of the year (normal operation) that raw water is being transferred from the Otjivero Dam to Tilda Viljoen the purification works use the raw water directly from Otjivero Main Dam, during the other 16 hours of the day when the plant is not in operation water is pumped to Tilda Viljoen Dam.

The GWTP consists of the following major components:

- A set of lifting pumps (2 duty and 1 standby) at the Tilda Viljoen dam;

- Dosing of flocculent ( Ultrafloc 3500) and lime slurry/flash mixing;
- Flocculation tank with mechanical agitation;
- Clarifier with collection launders to feed clarified water to the sand filters;
- Clarifier desludge system (manual operation);
- Intermediate chlorination before the sand filters;
- Four parallel sand filters with manual back wash control;
- Final chlorination in the contact tank/clear water feed sump; and
- Booster pumps, which pump the treated water to the 15 000 m<sup>3</sup> reservoir located on a hill above the treatment works

The purification process includes coagulation, settling, filtration, disinfection and stabilisation with lime to prevent corrosion.

Chlorine gas is used for intermediate and final chlorination in the contact tank/clear water feed sump.

The pump-room forms part of the purification works and houses three manually controlled electrical pumps (2 duty and 1 standby pump) which transfer clear water up to the storage reservoirs situated on the Nikodemus Hill. The water is then metered and distributed from the storage reservoirs into the water reticulation of Gobabis.

### **3.7 Power Supply and Control System**

#### **3.7.1 Gobabis Purification Scheme**

The operation of the treatment plant together with the balancing of the supply dams is controlled manually. When the treatment plant is operational the operation takes place only during weekdays from 08h00 to 17h00.

Electric power to the purification scheme is supplied from a ground transformer but the 3~phase kWh meter could not be located. Electricity is supplied by NamPower.

#### **3.7.2 Black Nossob Boreholes**

The Black Nossob scheme is linked to the Gobabis area office via telemetry and can be monitored and controlled remotely. The status of the boreholes is monitored by electronic pressure sensors.

Each of the boreholes is equipped with a MCC. Electric power to the boreholes is supplied from pole-mounted transformers each with a 3~phase kWh meter in a meter kiosk. Electricity is supplied by NamPower.

#### **3.7.3 North East Boreholes**

The North East Boreholes scheme is linked to the Gobabis area office via telemetry and can be monitored and controlled remotely. The status of the boreholes is monitored by electronic pressure sensors.

Each of the boreholes is equipped with a MCC. Electric power to the boreholes is supplied from pole-mounted transformers each with a 3~phase kWh meter in a meter kiosk. Electricity is supplied by NamPower.

### **3.7.4 South Station Boreholes**

The South Station Boreholes scheme is linked to the Gobabis area office via telemetry and can be monitored and controlled remotely. The status of the boreholes is monitored by electronic pressure sensors.

Each of the boreholes is equipped with a MCC. Electric power to the boreholes is supplied from a pole-mounted transformer with a 3~phase kWh meter in a meter kiosk. Electricity is supplied by NamPower.

### **3.7.5 Otjivero-Gobabis**

The scheme is operated manually with the water flow in the pipeline being managed from Gobabis. Normal operation is three months continuous pumping during the winter months, normally May, June and July, after which Tilda Viljoen has sufficient stored water to supply Gobabis demand for the remaining 9 months.

The Otjivero-Gobabis pipeline is used to supply Witvlei with potable water from Grönental during drought. This means that while Witvlei is experiencing water shortage, raw water cannot be transferred from Otjivero Main Dam to Daan Viljoen Dam.

Electric power to the booster pump station at Otjivero dam is supplied from a ground transformer with a 3~phase kWh meter in a meter kiosk. Electricity is supplied by NamPower.

### **3.7.6 Otjivero Water Treatment Plant**

Electric power to the treatment plant at Otjivero dam is supplied from the same ground transformer as the booster pump station. Electricity is supplied by NamPower.

## **3.8 Scheme Processes/Operation**

There is a fulltime NamWater scheme operator, who does checks on a daily basis whether all the systems are functional. The scheme has been electrified and automated with timer switches.

## **3.9 Maintenance**

Maintenance is done by a permanent NamWater team.

## **3.10 Pumps**

All motors bearings should be lubricated with a high-temperature lithium-based grease after 3000 hours.

If a pump/s are out of operation for six months, lubrication is required before service commence on all motor bearings.

## **3.11 Air Valves**

The valves must be opened monthly to be descaled and cleaned to ensure effective operation. The service intervals will depend on the severity of the conditions.

## **3.12 Pressure Gauges and Transducers**

The gauge cocks must be turned monthly to bleed-off air and ensure accurate readings. Turning prevents scale accumulation which prevents the gauge cock from functioning. The operational or service intervals will depend on the severity of the conditions.

### **3.13 Reservoirs**

The reservoirs should be checked for leaks and other damages on a monthly basis. If leaks are detected, it should be fixed immediately.

### **3.14 Pipe Breaks/leaks**

Monthly monitor of pipes should be done to avoid wastage of water in an event a major pipe break. The pipeline corridor for maintenance work is 10 m by 5 m.

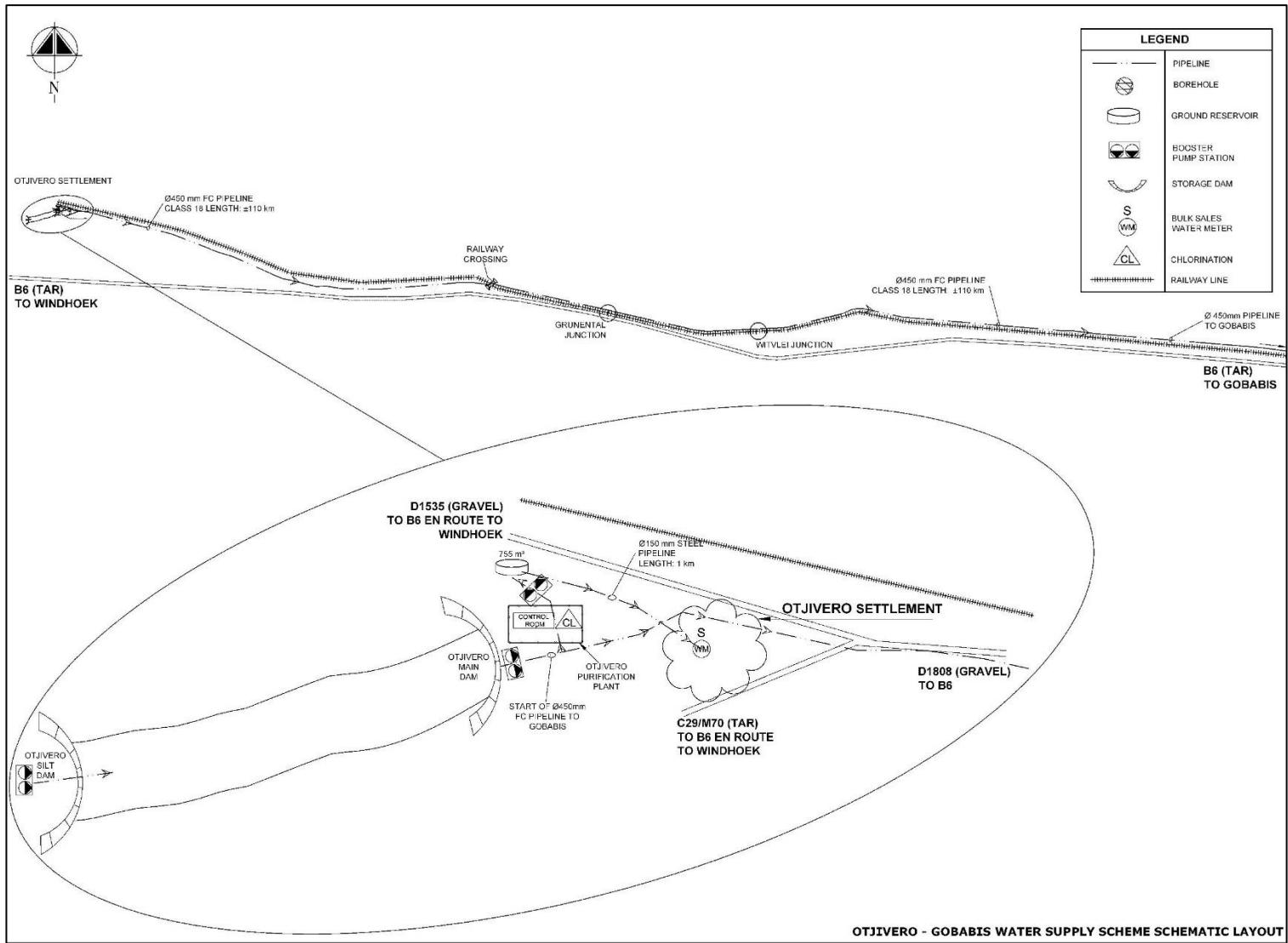


Figure 2: Otjivero – Gobabis Scheme Layout

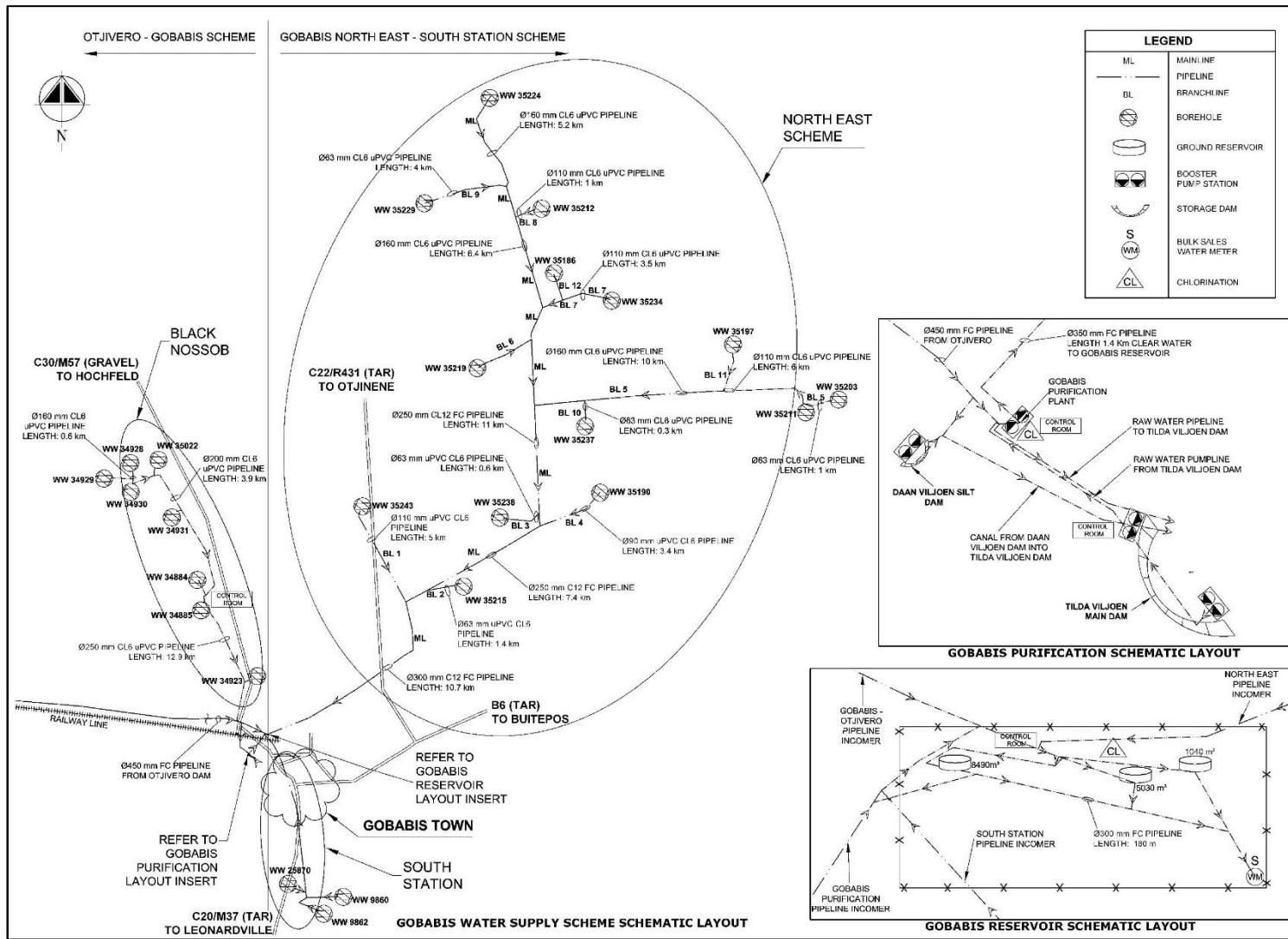


Figure 3: Gobabis Scheme Layout

## 4. BRIEF DESCRIPTION OF THE RECEIVING ENVIRONMENT

The baseline description provided below focuses on the receiving environment:

### 4.1 Climate

Most of the rain in the area falls as thundershowers in the summer months, from October to March. There is great variation between years, with the driest years having the least predictable rainfall. Gobabis has an extreme climate most times of the year with high temperatures especially during the rainy season and low temperature during the dry winter season, which is typical of central eastern Namibia.

#### 4.1.1 Precipitation

The climate in Gobabis can be described as sub-arid with an average annual rainfall ranging from 350-400 mm. Evaporation in this area is between 1700-1900 mm per year (Mendelsohn *et al.*, 2002).

#### 4.1.2 Temperature

The mean maximum temperature in the summer months in Gobabis ranges between 32-34°C. The mean minimum temperature in the winter months ranges between 2-4 °C, but they can drop below zero (Mendelsohn *et al.*, 2002).

### 4.2 Geology

The geology in the Gobabis area is made up of Kamtsas quartzite (Damara Sequence) and sediments of the Kuibis Subgroup (Nama Group), locally overlain by tillite and shale of the Dwyka Formation (Karoo Sequence). The fractured aquifers tapped by the various wellfields have moderate to high yields and receive fairly regular recharge (Christelis *et al.*, 2011:89).

### 4.3 Natural Fauna and Flora

Several species of fauna are found around in the Buitepos surrounds such as kudu (*Tragelaphus strepsiceros*), oryx (*Oryx gazella*), black wildebeest (*Connochaetes gnou*), waterbuck (*Kobus ellipsiprymnus*), springbok (*Antidorcas marsupialis*), duiker (*Sylvicapra grimmia*), black-backed jackal (*Canis mesomelas*), Warthog (*Phacochoerus africanus*), eland (*Taurotragus oryx*), Burchells zebra (*Equus quagga burchellii*), blue wildebeest (*Connochaetes taurinus*), hartebeest (*Alcelaphus buselaphus*), black faced impala (*Aepyceros melampus petersi*), steenbuck (*Raphicerus campestris*), African wild cat (*Felis silvestris lybica*), and the Namaqua sandgrouse (*Pterocles namaqua*) (Simmons *et al.*, 1998).

Gobabis is found within the Acacia Tree Shrub Biome, which is characterised by large, open-expanses of grasslands dotted with *Acacia* trees. The trees are tallest in areas of deeper sands in eastern Namibia (Mendelsohn *et al.*, 2002).

The tree and shrub savanna biome support a moderate to high species diversity, which includes the protected Aloe species (*Aloaceae*) and other endemics. Much of the area is contains the *Acacia hereroensis* as well as open to semi-open, short bushland with mesic grassland species, such as *Themeda triandra*, *Brachiaria serrata* (Mendelsohn *et al.*, 2009).

Other grass species include the common species *Stipagrostis uniplumis*, *Eragrostis nindensis*, *Microchloa caffra* and *Monelytrum luederitzianum*. A conspicuous part of this vegetation type is the dwarfshrub species *Leucosphaera bainsii* (wolbos), and the *Ericcephalus luederitzianus* (kappokbos) (Mendelsohn *et al.*, 2009). *Acacia mellifera* dominates undulating lands; other dominant species are *A. hebeclada* subsp. *hebeclada*, *Catophractes alexandri* (trumpet thorn).



## 5. THE LEGAL ENVIRONMENT

A legal review was done and the key laws of concern include those which protect the ecological integrity of the Gobabis ecosystem and its water resource, including the Water Act of 1954 and the Water Resources Management Act of 2004, and applicable international treaties such as the Convention on Biological Diversity. These laws and conventions place Namibia under an obligation to conserve the ecological integrity of the Gobabis ecosystem for the sustainable use by Namibians.

### 5.1 The Constitution of the Republic of Namibia

There are two clauses contained in the Namibian Constitution that are of particular relevance to sound environmental management practice, viz. articles 91(c) and 95(l). In giving effect to articles 91(c) and 95(l) of the Constitution of Namibia, general principles for sound management of the environment and natural resources in an integrated manner have been formulated. The formulation of these general principles resulted in the Namibia's Environmental Assessment Policy of 1994. To give statutory effect to this Policy, the Environmental Management Act was approved in 2007, and gazetted as the Environmental Management Act (Act No. 7 of 2007) (herein referred to as the EMA. As the organ of state responsible for management and protection of its natural resources, MET: DEA is committed to pursuing the 13 principles of environmental management that is set out by Part 2 of the Act.

To summarise, Articles 91(c) and 95(l) refer to:

- Guarding against over-utilisation of biological natural resources;
- Limiting over-exploitation of non-renewable resources;
- Ensuring ecosystem functionality
- Protecting Namibia's sense of place and character;
- Maintaining biological diversity and
- Pursuing sustainable natural resource use.

### 5.2 Environmental Assessment Policy (1995)

Cabinet endorsed Namibia's Environmental Assessment Policy in 1995 as the first formal effort in Namibia to regulate the application of environmental impact assessments and environmental management. Amongst others, the Policy provides a procedure for conducting EIA's which sets out to:

- Better inform decision makers and to promote accountability of decisions taken;
- Strive for a high degree of public participation and involvement of all sectors of the Namibian community during the execution of the EIA;
- Take into account the environmental costs and benefits of projects and programmes;
- Promote sustainable development in Namibia;
- Ensure that anticipated adverse impacts are minimized and that positive impacts are maximized.

### 5.3 Environmental Management Act (No 7 of 2007) (EMA)

The Environmental Management Act (EMA) was promulgated in 2007 by Parliament and gives effect to the Environmental Assessment Policy. The Act specifies the environmental assessment procedures to be followed as well as the listed activities (activities that require an EIA).

Of relevance to this project are the following listed activities, as provided in Section 27 of this Act, which include:

- Water use and disposal;

➤ Transportation

**5.4 EIA Regulations Government Notice No. 30, promulgated on 6 February 2012**

The regulations, promulgated in terms of the EMA, were promulgated on 6 February 2012 and indicated certain activities that require an Environmental Clearance from MET: DEA prior to commencing.

**5.5 Water Act 54 of 1956 and Water Resources Management Act 11 of 2013**

The Water Resources Management Act 11 of 2013 is presently without regulations; therefore, the Water Act 54 is still in force. The Act provides for the management and protection of surface and groundwater resources in terms of utilisation and pollution.

## 6. RESPONSIBLE PARTIES

NamWater's Environmental Manager is primarily responsible for the implementation of the EMP during the operational and maintenance phases.

### 6.1 NamWater

NamWater, as the implementing agency, is responsible for:

- Ensuring that the objects of the EMP are being obtained;
- Ensuring that all environmental impacts are managed according to the environmental principles of avoiding, minimizing, mitigating and rehabilitation. This will be achieved by successful implementation of the EMP;
- Ensuring that appropriate monitoring and compliance auditing are executed;
- Ensuring that the environment is rehabilitated to its natural state as far as possible.

NamWater shall ensure that all employees attend an Environmental, Awareness Training Course. This course shall be structured to ensure that attendees:

- Become familiar with the environmental controls contained in the EMP;
- Are made aware of the need to conserve water and minimise waste;
- Are made aware of NamWater's Code of Conduct;
- Are aware that a copy of the EMP is readily available at the plant and that all staff are aware of the location and have access to the document;
- Are informed that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) will be placed at prominent locations throughout the site.

## **7. ENVIRONMENTAL MANAGEMENT PLAN**

An Environmental Management Plans (EMP) is an important tool focusing on the management actions that are required to ensure environmental compliance of a particular project.

EMP implementation is a cyclical process that converts mitigation measures into actions and through cyclical monitoring, auditing, review and corrective action, ensures conformance with stated EMP aims and objectives. Monitoring and auditing, feedback for continual improvement ensures that environmental performance has been provided and corrective action is taken for an effective EMP.

The main aim of this EMP is to ensure that the project complies with the goals of the Namibian Environmental Management Act (No. 7 of 2007); and, more specifically, to provide a framework for implementing the management actions as described in the EMP for the operational and maintenance phases of the scheme. Best practice is proposed for the operation of the scheme.

There are some environmental impacts that cannot be avoided. These environmental impacts require mitigation, and in order to mitigate against these impacts an EMP is required. The EMP aims to ensure best practises are implemented and environmental degradation is avoided through appropriate environmental protection, adherence to legal requirements and maintaining good community relationships.

MET indicated that EMP's for existing operations are sufficient.

The project activities are grouped according to the different operational processes and stages. Most of the impacts can be reduced through good housekeeping.

## **8. MANAGEMENT ACTIONS**

### **8.1 Operation and Maintenance phase of the Gobabis Water Supply Scheme**

#### **8.1.1 Introduction**

The Operational Phase Section relates to the management and mitigation measures required to ensure that the continuation of the bulk water supply network and the maintenance of the infrastructure is operated in a manner that demonstrates responsible, precautionary environmental management.

The EMP will address specific areas of concern in terms of the long-term environmental management of the affected environment and is intended to serve as a guide to the on-going management of the water supply scheme site as well as the affected environment. The EMP will therefore aim to provide NamWater with the necessary tools to ensure that the potential impacts on the natural environment of the site during the operation of the water supply scheme are minimised. Moreover, it will aim to ensure that the infrastructure is operated and maintained according to Best Practice, in an environmentally sensitive and sustainable manner, and that the operation of the infrastructure does not result in reasonably avoidable environmental impacts.

**Table 2: Operation and Maintenance Phase Management Table**

Issue	Objective	Strategy	Actions	Time frame
Maintenance and emergency procedures	To ensure correct procedures are in place to avoid environmental impacts associated with maintenance activities as well as proactive intervention to avoid, and if required, to respond to emergencies	<ul style="list-style-type: none"> <li>• Establish environmentally sensitive and technically sound maintenance procedures as well as reporting structures.</li> <li>• Compile a staff competency assessment and training programme.</li> <li>• Establish emergency procedures to ensure appropriate response and minimise potential risk to the biophysical and social environment.</li> </ul>	<ol style="list-style-type: none"> <li>1. Establish regular reporting procedures on maintenance</li> <li>2. Undertake regular inspection and maintenance of all infrastructure to ensure in working order and to assess damaged / deficient equipment, as per the O&amp;M Manual.</li> <li>3. Review, and if necessary, revise maintenance manual.</li> <li>4. Establish emergency procedures guidelines for the blockage/failure, flooding, contaminant removal and disinfection, power failure and fire of the scheme.</li> <li>5. Implement the response procedures when emergency incident occurs.</li> <li>6. Complete the incident report checklist in the case of emergency and keep with monitoring records for submission.</li> <li>7. Undertake annual education course for all operational staff.</li> <li>8. Review, and if necessary revise emergency manual.</li> </ol>	<p>Bi-monthly for the lifespan of infrastructure as per the maintenance manual.</p> <p>Bi-annually for lifespan of works.</p> <p>When emergency incident occurs.</p> <p>Emergency incident</p> <p>Annually for lifespan of operation.</p> <p>Annually for lifespan of operation</p> <p>Annually for lifespan of operation</p>

## **8.2 Maintenance Procedures**

The optimal operation and effective maintenance of all the scheme components is important in protecting the environment and ensuring that resources are not wasted and environmental incidents arising out of equipment or infrastructure failures, are avoided. Operation and Maintenance Manuals are available for the Gobabis Water Treatment Works (WTW). The manuals provide a detailed guidance on the operation of all machinery and associated systems as well as related maintenance procedures, including maintenance schedules. Implementation of this manuals by NamWater will facilitate the proactive management of potential risks and thus result in impacts on the receiving environment being averted.

The maintenance procedures set out in the manuals, provides specific guidance in terms of the monitoring and maintenance of the scheme components. These procedures will specify the equipment item and specific component of each piece of equipment requiring checking, the scope and nature of the check that is to be carried out including detailed instructions related to the specific check, and the programme for conducting each check.

## **8.3 Facility Management and Operations**

NamWater shall ensure that sufficient budget allocations and provisions are made available to ensure that the infrastructure can be adequately operated and maintained. NamWater must also attend to damage to the scheme components resulting in water loss as a matter of high priority.

## **8.4 Routine Maintenance and Repairs**

The condition of the infrastructure shall be inspected routinely and a maintenance list compiled. Identified, preventative maintenance issues shall be undertaken as soon as possible. Any wastes arising from the repair and maintenance work must be removed and disposed-off at a designated waste disposal site as part of the operation.

## **8.5 Environmental Awareness**

Instilling a sense of environmental awareness and consideration in all employees, but especially those involved with the scheme operations is vital to the overall success of any environmental management plan. It is therefore recommended that a general environmental awareness course for the Scheme Staff Members, who may be required to carry out duties on the scheme, be undertaken.

## **8.6 Waste and Pollution Management**

### **8.6.1 Waste and Pollution Prevention**

To prevent the improper disposal of waste and to prevent pollution, the following management actions shall be enforced:

- All waste will be removed to an appropriate waste dump.
- No waste should be buried.
- General Waste: Includes waste paper, plastic, cardboard, harmless organic (e.g. vegetables) and domestic waste.
- No littering will be allowed. The plant area will be kept free of waste at all times.
- Provide sufficient waste bins at worksites. Make sure that all waste is removed from the worksites.

- Hazardous Substances include: sewerage, fuels, lubrication oils, hydraulic and brake fluid, solvents, paints, anticorrosives, insecticides and pesticides, chemicals, acids etc. It should be disposed of at designated hazardous disposal sites.
- Contaminated soil should be stored in drums and taken to the nearest appropriate waste dumpsite.
- Do not change oil on uncovered ground. Drip trays will be used to catch oil when vehicles are repaired in the field.
- Used oil and hydraulic fluids will not be discarded on the soil or buried. It will be removed from site and taken back to an appropriate dump.
- In the event of a hazardous spill:
  - ✓ Immediately implement actions to stop or reduce the spill.
  - ✓ Contain the spill.
  - ✓ Arrange implementation of the necessary clean-up procedures.
  - ✓ Collect contaminated soil, water and other materials and dispose it at an appropriate waste dumpsite.
- Used solvents and grease should be stored in drums or other suitable containers. It should be sealed and recycled or disposed at an appropriate disposal site.
- Hazardous waste should not be burnt.
- Bunding, concrete slabs and/or other protective measures should be installed where hazardous materials are handled.
- Ensure that the staff are informed and have information pertaining to the management of spills or ingestion.

### **8.6.2 Hazardous Materials**

Where hazardous materials are required for repair and maintenance work (including fuels and oils), care will be taken to ensure that a competent individual is appointed to enforce the responsible use of such materials. The operational staff or maintenance teams shall carry a copy of the relevant Material Safety Data Sheet (MSDS) whenever using such materials. The Scheme Supervisor shall ensure that persons working with hazardous materials have been trained in the handling of such substances, as well as in emergency procedures to be followed in the event of an accidental spillage or medical emergency. Maintenance teams shall also carry a spill kit containing the appropriate neutralizing chemicals, absorbent materials and other relevant equipment required to undertake a clean-up of any spill that may occur.

### **8.6.3 Noise Management**

During maintenance operations, all silencing mechanisms on all equipment must be in a good state of repair. Except for in emergency situations, no amplified sound may be broadcast. All routine maintenance shall be restricted to daylight hours.

## **8.7 Health and Safety**

To minimise the risk of HIV infection and the increase of STI's and the occurrence injuries the following management actions shall be enforced:

- Provide an AIDS awareness programme to all the staff.



- Make sure that all staff are equipped and know how to use safety and protective gear. This includes hard hats, goggles, hearing protectors, dusk masks, steel-toed shoes etc.
- Keep a comprehensive first aid kit at Scheme.
- Establish an emergency rescue system for evacuation of serious injured people.
- Emergency procedures for accidents should be communicated to all employees.
- Dangerous areas must be clearly marked and access to these areas controlled or restricted.
- Good driving and adherence to safety rules will result in a minimum number of road and workplace accidents.
- Fire extinguishers must be available at all refuelling sites. Staff should be trained to handle such equipment.
- Nobody is allowed to dispose a burning or smouldering object in an area where it may cause the ignition of a fire.
- Hazardous substances must be kept in adequately protected areas to avoid soil, air or water pollution.
- Work areas, such as these for the maintenance of equipment, must be on concrete slabs.
- Explosives should be stored according to the prescribed regulations.

## 9. SITE CLOSURE AND REHABILITATION

Rehabilitation is the process of returning the land in a given area that has been disturbed by construction and earthworks to some degree of its former state, or an otherwise determined state. Many projects, if not all, will result in the land becoming degraded to some extent. However, with proper rehabilitation most impacts associated with the reservoir construction project, could be mitigated and restored to an acceptable level. Poorly rehabilitated construction areas provide a difficult legacy issue for governments, communities and companies, and ultimately tarnish the reputation of operators as a whole.

Objectives of proper site closure and rehabilitation include the following:

- Reduction or elimination of the need for a long-term management program to control and minimise the long-term environmental impacts;
- Clean-up, treatment or restoration of contaminated areas (e.g. soils contaminated by oil or fuel spills, concrete spills, etc.). Excavation of contaminated material and disposal thereof in an acceptable manner.

Rehabilitation measures to implement:

- a. A site inspection will be held quarterly by the scheme supervisor after every maintenance work during operation of the scheme. Rehabilitation will be done to the satisfaction of the ENV section and MET.
- b. Frequent inspections of the scheme and effective follow-up procedures, to prevent minor defects from becoming major repair jobs.
- c. Make sure all soil polluted during maintenance work is properly stored in drums and removed to an appropriate waste dump.
- d. Make sure all windblown litter is removed once maintenance has seized.
- e. Make sure that all potential hazards (i.e. the sewerage pit) are properly closed and left in a safe and neat position.

Rehabilitation will be completed when the above have be achieved.

## 10. NAMWATER ENVIRONMENTAL CODE OF CONDUCT

### **What is an Environmental Code of Conduct?**

It is a set of rules that everybody has to follow in order to minimise damage to the environment.

### **What is the ENVIRONMENT?**

The ENVIRONMENT means the surroundings within which people live. The ENVIRONMENT is made up of the **soil, water, plants, and animals** and those characteristics of the soil, water, air, and plant and animal life that influence **human health and well-being**. **People** and **all human activities** are also part of the environment and have to be considered during the operation of the Scheme.

### **Do these ENVIRONMENTAL RULES apply to me?**

YES, The Environmental Rules apply to EVERYBODY. This includes all permanent, contract, or temporary workers as well as any other person who visits the Scheme. Every person will be required to adhere to the Environmental Code of Conduct.

### **ALL PERSONNEL must study and keep to the Environmental Code of Conduct**

The SCHEME SUPERVISOR will issue warnings and will discipline ANY PERSON who breaks any of the Environmental Rules. Repeated and continued breaking of the Rules will result in a disciplinary enquiry and which may result in that person being asked to leave the Scheme permanently.

### **What if I do not understand the ENVIRONMENTAL RULES?**

ASK FOR ADVICE, if any member of the WORKFORCE does not understand, or does not know how to keep any of the Environmental Rules, that person must seek advice from the SCHEME SUPERVISOR. The PERSON that does not understand must keep asking until he/she is able to keep to all the Environmental Rules.

### **Safety and Security**

1. Only enter and exit roadways and construction areas at demarcated entrances.
2. Wear protective clothing and equipment as per signboards at the Scheme and according to instructions from your SCHEME SUPERVISOR.
3. Report to your SCHEME SUPERVISOR if you see a stranger or unauthorised person in the construction area.
4. Never enter any area that is out of bounds or that is demarcated as dangerous without permission of your SCHEME SUPERVISOR.
5. Never climb over any fence or enter private property without permission of the landowner or your SCHEME SUPERVISOR.
6. Do not remove any vehicle, machinery, equipment, or any other object from the construction site without the permission of your SCHEME SUPERVISOR.
7. Keep clear of blasting sites. Follow the instructions of your SCHEME SUPERVISOR.
8. Never enter or work in the Scheme while under the influence of alcohol or other intoxicating substances.

9. All staff should know the emergency procedures in case of accidents.

### **Waste Disposal**

10. Learn the difference between different types of waste, namely:
  - general waste, and
  - hazardous waste.

Containers will be provided for different types of wastes.

**General Waste** includes waste paper, plastic, cardboard, harmless organic (e.g. Vegetables) and domestic waste

**Hazardous Waste** includes objects, liquids or gases that are potentially dangerous or harmful to any person or the environment. Sewage, fuel, tyres, diesel, oils, hydraulic and brake fluid, paints, solvents, acids, soaps and detergents, resins, old batteries, etc. are all potentially hazardous.

11. Learn how to identify the containers for the different types of wastes. Only throw general waste into containers, bins or drums provided for general waste.
12. Recycle drums, pallets and other containers.
13. Never bury or burn any waste on site, all waste is to be disposed in allocated refuse disposal containers, bins or bags.
14. Never overfill any waste container. Inform your SCHEME SUPERVISOR if you notice a container that is nearly full.
15. Do not litter.
16. Do not bury litter or rubbish in the backfill trench.

### **Plants and Animals**

21. **Do not ever pick any plants, or catch any animal.** People caught with plants or animals in their possession will be handed to the authorities for prosecution.
22. Never feed, tease, play with, or set devices to trap any animal or livestock. Wild animals are not to be domesticated.
23. Keep off the rock outcrops unless given specific permission by the SCHEME SUPERVISOR to be there.
24. Never cut down any tree or branches for firewood.
25. Never leave rubbish or food scraps or bones where it will attract animals, birds, or insects.
26. Rubbish must be thrown into allocated waste disposal bins/bags.
27. Always close the gates behind you.

### **Preventing Pollution**

28. Only work with hazardous materials in bunded areas.
29. Never discard any hazardous substances such as fuel, oil, paint, solvent, etc. into stream channels or onto the ground. Never allow any hazardous substances to soak into the soil.
30. Clean up spills immediately.

31. Immediately report to your SCHEME SUPERVISOR when you spill, or notice any hazardous substance overflow, leak or drip or spill on site, into the streambeds or along the road.
32. Immediately report to your SCHEME SUPERVISOR when you notice any container, which holds hazardous substances overflow, leak or drip. Spillage must be prevented.
33. Only wash vehicles, equipment and machinery, containers and other surfaces at work site areas designated by your SCHEME SUPERVISOR.
34. Do not change oil on uncovered surfaces.
35. If you are not sure how to transport, store, use, or get rid of any hazardous substances ask your SCHEME SUPERVISOR for advice.

#### **Health**

36. Drink lots of clean water every day.
37. Use toilets that have been provided.
38. Take the necessary precautions to avoid contracting HIV / AIDS. Condoms are available at most Clinics.
39. Inform your SCHEME SUPERVISOR when you are sick.
40. Do not work with any machinery when you are sick.
41. If you are working in malaria areas, you must take the necessary precautions.

#### **Dust Control**

42. Do not make any new roads or clear any vegetation unless instructed to do so by your SCHEME SUPERVISOR.
43. Keep to established tracks and pathways.
44. Keep within demarcated work areas.

#### **Saving Water**

47. Always use as little water as possible. Reduce, re-use and recycle water.
48. Never leave taps or hose pipes running. Close all taps after use.
49. Report any dripping or leaking taps and pipes to your SCHEME SUPERVISOR.

#### **Working Hours**

50. You may only work on weekends and after hours with the consent of the SCHEME SUPERVISOR.

#### **Archaeological and Cultural Objects**

52. If you find any archaeological, cultural, historical or pre-historical object on the construction site you must immediately notify your SCHEME SUPERVISOR.
53. Never remove, destroy, or disturb any cultural, historical, or pre- historical object on site.

**Cultural and Historical Objects include old buildings, graves or burial sites, milestones, old coins, beads, pottery and military objects.**

**Pre-Historical objects include fossils and old bones, old human skeletal remains, pieces of pottery and old tools and implements.**

#### **Sensible Driving**

54. Tracks and roads should be kept to a minimum. Where possible follow existing roads.

55. No off-road driving is allowed.
56. Never drive any vehicle without a valid licence for that vehicle class and do not drive any vehicle that is not road-worthy.
57. Never drive any vehicle when under the influence of alcohol.
58. **Always** keep your headlights on when driving on dusty roads.
59. Keep to the roads as specified by your SCHEME SUPERVISOR. Vehicles may only be driven on demarcated construction roads. Drivers should always use three-point turns, “u-turns” are not allowed. Do not cut corners.
60. Do not drive on rocky outcrops.

#### **Noise**

61. Keep noise levels as low as possible.
62. Do not operate noisy equipment outside normal working hours.

#### **Fire Control**

63. Do not make open fires, use a drum or tin and do not collect any vegetation to burn.
64. Do not smoke or make fires near refuelling depots or any other area where fuel, oil, solvents, or paints are used or stored. Fireplaces should be at a safe distance from fuel and explosive storage sites as well as vehicle parking sites.
65. Cigarette butts should always be thrown in allocated refuse bins. Make sure that the cigarette butt is out before throwing it into the bin.
66. Immediately notify your SCHEME SUPERVISOR if you see an unsupervised fire at the campsite or construction site.

#### **Dealing with Environmental Complaints**

67. If you have any complaint about dangerous working conditions or potential pollution to the environment, talk to your SCHEME SUPERVISOR.
68. If any person complains to you about noise, lights, littering, pollution, or any harmful or dangerous condition, immediately report this to your SCHEME SUPERVISOR.

**NP du Plessis**

**Tell: 061-71 2093**

**Cell: 081 127 9040**

**OR**

**Jolanda Kamburona**

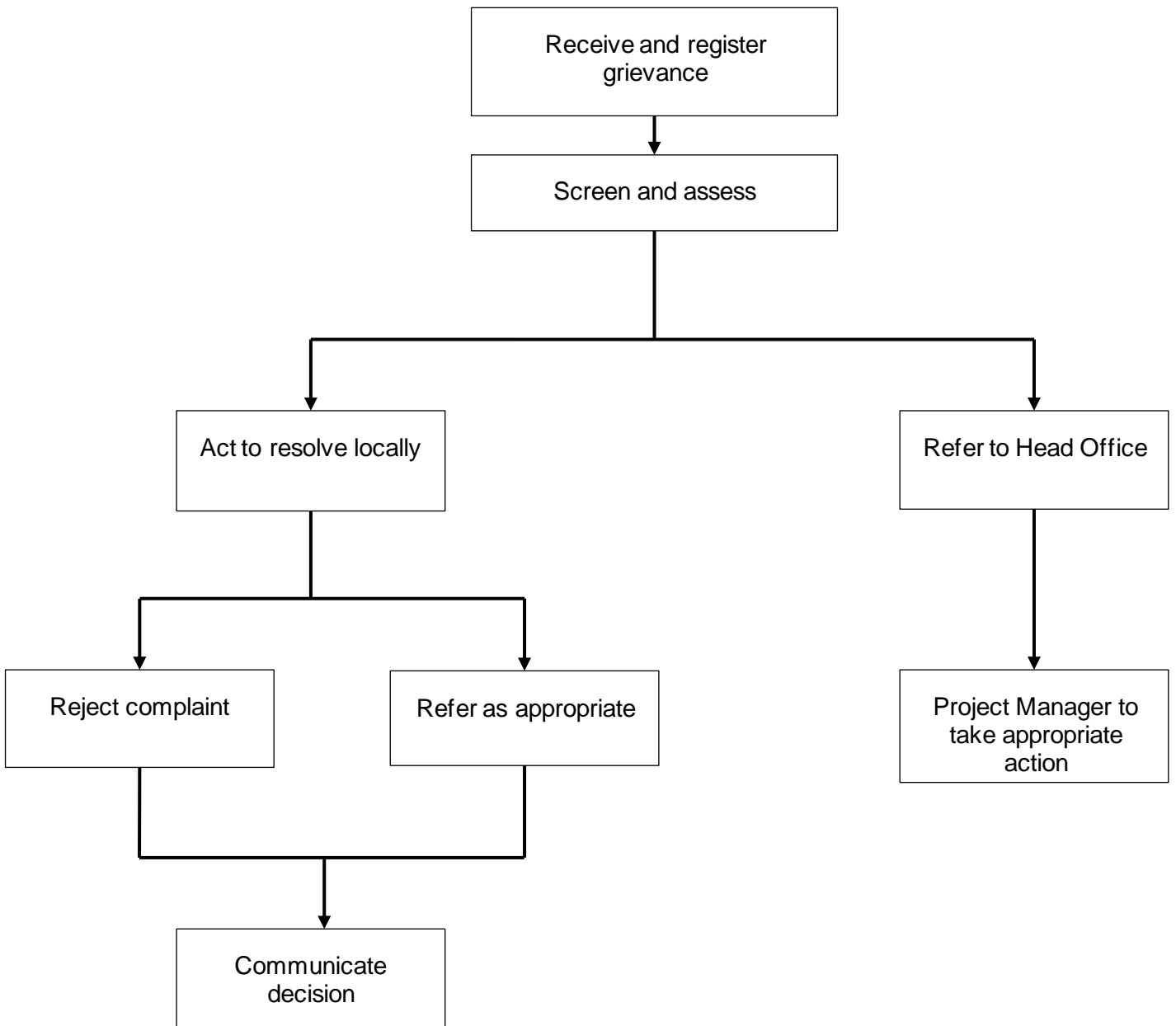
**Tell: 061-71 2105**

**Cell: 081 144 1528**

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**ANNEXURE 1: GRIEVANCE PROCEDURE AND REGISTRATION FORM**





Grievance Registration	
Case No:	Date:
Name of complainant:	Cell no:
	Email address:
Details of grievance: (Date, location, persons involved, frequency of occurrence, effects of ensuing situation, etc)	
Name of person recording grievance:	Cell number:
Proposed date of response:	
Signature of recording person:	Signature of complainant:
Date of redress:	
Decision and action:	