



**ENVIRONMENTAL MANAGEMENT PLAN**  
**FOR THE**  
**KHORIXAS SHORT POWER SUPPLY LINE**  
**CONSTRUCTION PROJECT**

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## LIST OF ABBREVIATIONS

<b>AC</b>	Alternating Current
<b>AC</b>	Asbestos Cement
<b>AIDS</b>	Acquired Immune Deficiency Syndrome
<b>CoC</b>	Code of Conduct
<b>DEA</b>	Department of Environmental Affairs
<b>ECO</b>	Environmental Control Officer
<b>EIA</b>	Environmental Impact Assessment
<b>EMA</b>	Environmental Management Act 7 of 2007
<b>EMP</b>	Environmental Management Plan
<b>HIV</b>	Human Immunodeficiency Virus
<b>I&amp;AP</b>	Interested and Affected Parties
<b>km</b>	kilometer
<b>kV</b>	kilovolt
<b>kVA</b>	kilo (Volt X Amps)
<b>MAWF</b>	Ministry of Agriculture, Water, and Forestry
<b>m</b>	meter
<b>mm</b>	millimeter
<b>MEFT</b>	Ministry of Environment, Forestry and Tourism
<b>NEM</b>	NamWater Environmental Manager
<b>NWQG</b>	Namibian Water Quality Guideline
<b>NWQS</b>	Namibian Water Quality Standard
<b>STI's</b>	Sexually Transmitted Infections
<b>v</b>	Voltage
<b>WSS</b>	Water Supply Scheme

## GLOSSARY OF TERMS

**Conductor:** A type of material that allows heat or electricity to pass through it.

**Environmental Impact Assessment (EIA):** The continuous method of assessing adverse effects of development on the environment.

**Interested and affected parties (I&AP):** Persons or groups of people, organizations, the institution that is directly or indirectly affected by the proposed development.

**Water Supply Scheme (WSS):** A collection of NamWater transportation infrastructure aimed at providing potable water to specific communities or industrial areas.

## 1. INTRODUCTION

Khorixas is located in the southern part of the Kunene Region approximately 130 km west of Otjiwarongo and is administered by the Khorixas Town Council.

There are approximately 2 200 erven in Khorixas and approximately 300 informal houses in Donkerhoek. The current population is estimated at 6 400 residents with approximately 1500 households. The location of Khorixas is depicted in **Figure 1**.

Khorixas town is fed water from concrete reservoirs located on top of a hill outside the town. The water gravitates to the town via a 300NB pipeline. No power supply is available at all three concrete reservoirs site. Solar panels are used to energise the existing electrical equipment. Namwater intends to construct a power line to power the reservoirs electronic equipment.

The power line will increase the electrical power supply to the Khorixas Water Scheme. The infrastructure will improve the reliability of water, which is critical for the communities that rely on these reservoirs. The construction and operation of the project requires urgency in the matter of assisting disadvantage communities.

## 2. PURPOSE OF THE EMP

This Environmental Management Plan (EMP) was developed as an important tool focusing on the management actions that are required to ensure environmental compliance for the construction, operation and decommissioning phases of the proposed Khorixas power line. The EMP has been compiled to assist the contractors, subcontractors, including consultants, to practise sound environmental management during the construction project.

Therefore, the purpose of this EMP is to ensure that construction and operational and decommissioning activities for this power line construction project complies with the environmental impact mitigation legislation and that optimal environmental management is achieved during the various phases of the project.

This EMP provides:

- ❖ Strategies and plans to manage environmental impacts identified through the application of best practices to avoid, reduce or mitigate potential adverse impacts to minimal of insignificant levels;
- ❖ Measures that could enhance positive impacts;
- ❖ Information required to ensure adherence to legal requirements;
- ❖ Strategies to maintain good community relationships;

- ❖ A method for auditing and monitoring implementation and operation of recommended measures, thereby ensure compliance with the EMP.
- ❖ Assignment of responsibilities with regard to measures to be implemented.
- ❖ Grievance procedure to ensure noncompliance and complaints received from interested and affected parties are recorded and addressed accordingly.

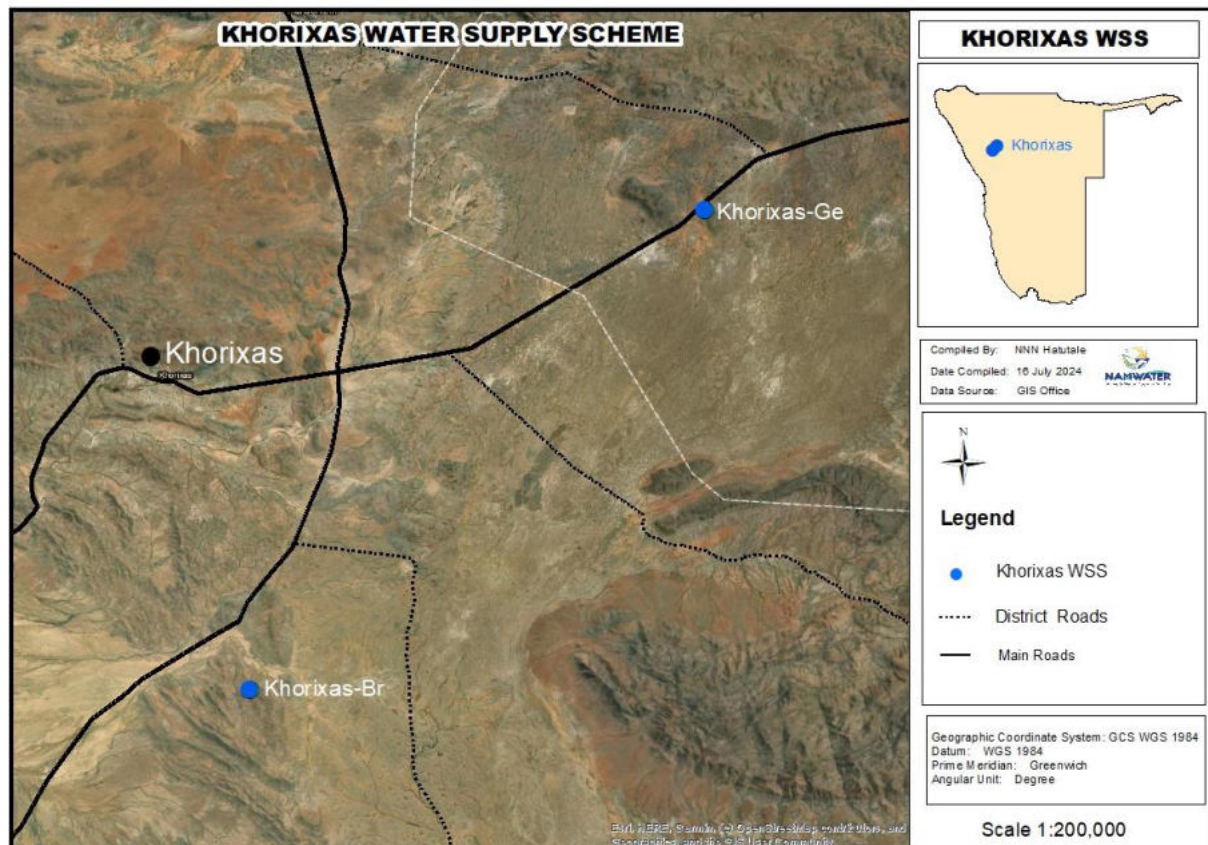


Figure 1: Khorixas Location Map

### 3. SCHEME EXISTING INFRASTRUCTURE

Please see **Annexure 1** for the existing scheme layout.

#### 3.1 Water Source

- ❖ Water is sourced from boreholes located around the settlement, Khorixas scheme comprises of three-terminal reservoirs, which are currently supplied from the Gainatseb-Khorixas scheme pipeline but can also be supplied from the Braunfels-Khorixas scheme.

### 3.2 Water Quality and Disinfection

- ❖ The chlorine gas and soda ash installation with Alldos dosing equipment is installed at the 3 039-m<sup>3</sup> concrete ground reservoir, whilst Chlorination is done inside the 2 236 m<sup>3</sup> reservoir by means of a floating dispenser.

### 3.3 Pipe Work

- ❖ The pipeline from the 490-m<sup>3</sup> reservoir to the three-terminal reservoirs at Khorixas consists of approximately 27 000 m fibre cement (FC) pipes, which varies between 250 and 300 mm diameter.

### 3.4 Reservoir

- ❖ The storage facility consists of the following three reservoirs at Khorixas: A 3 039-m<sup>3</sup> concrete ground reservoir, 2 236 m<sup>3</sup> concrete ground reservoir, 2 986 m<sup>3</sup> concrete ground reservoir.

## 4. DESCRIPTION OF THE PROPOSED PROJECT

### 4.1 Project objective

The primary objective of the project is to increase the electrical power supply to the Khorixas water scheme.

### 4.2 Scope of Work

The proposed power line project will encompass the following:

#### Construction of a single-phase power line

- ❖ The power required to energise the reservoirs' electrical equipment will require the construction of a power line. The proposed power line length is approximately +/- 800 m. The (230V AC) power lines will be supported by wooden monopole structures, each measuring approximately 9 metres in height.
- ❖ The span width between the wooden monopole structures will be approximately 100 to 120 metres. A single-phase electrical system will be installed, i.e. two conductors having a live and neutral line. **Figure 2** below illustrates a typical design of a single-phase (230V AC) power line.



- ❖ The electrical power is required to power the following electrical equipment at the reservoir: (a). Telemetry systems (b). Prepaid meter facilities (c). Level transducers (d) Electromagnetic flowmeters and (e) Actuated valves.



**Figure 2:** Typical single-phase design

## 5. DESCRIPTION OF THE ENVIRONMENT

The baseline description provided below focuses on the receiving environment:

### 5.1 Climate

The study area has a semi-arid climate, with warm to hot summers and mild winters. It borders on a desert climate.

#### 5.1.1 Precipitation

The study area has according to Mendelsohn *et al.*, (2009) a semi-desert climate, characterised by low rainfall. The average annual precipitation is 233 mm.

#### 5.1.2 Temperature

The area has hot summers and mild winters, average summer temperature rising to as high as 21.9 °C (Mendelsohn *et al.*, 2009). Extreme daily and seasonal variations are the norms for this part of the country.

## 5.2 Hydrogeology

According to Christelis *et al.* (2011), granitic and gneissic rock types cover vast areas in the Kaokoveld. Granites, gneiss and old volcanic rocks are roughly located in a triangle between Marienfluss, Swartbooisdrif, and Sesfontein. Metamorphic rocks including marble and quartzitic bands occur in the western part of the Kaokoveld. They form a strip between the Hartmann's Mountains and the coast that goes all the way down to the Uniab River.

Khorixas water is supplied from Braunfels where high-yielding boreholes are drilled into calcretes underlain by fractured dolomite of the Otavi Group. The Gainatseb spring yielding between 80-100m<sup>3</sup>/h also forms part of this scheme and contributes to the water supply of Khorixas. Other thick groundwater calcrete deposits in the Khorixas area, known as the Ugab terraces, are drained by the Ugab River itself and contain little groundwater (Christelis *et al.*, 2011).

## 5.3 Natural Flora

According to Mendelsohn *et al.* (2002), the study area is situated in the sparse shrubland vegetation structure and the flora species include the magnificent *Welwitschia* (*Welwitschia Mirabilis*), moringa (*Moringa oleifera*), devil's claw (*Harpagophytum*), tsamma melon (*Citrullus lanatus*), lovegrass (*Eragrostis nindensis*), trumpet thorn (*Catophractes alexandri*), rose natal grass (*Melinis repens s. grandiflora*) and a variety of the *Commiphora* species.

## 5.4 Fauna

The desert adapted elephant (*Loxodonta africana africana*), rhinoceros (*Rhinocerotidae*), giraffe (*Giraffa giraffe*), Herero chat (*Namibornis herero*), kudu (*Tragelaphus strepsiceros*), blesbok (*Damaliscus pygargus*), springbok (*Antidorcas marsupialis*) and ostrich (*Struthio camelus*) are some of the wildlife which can be found living in total harmony with the community and the communal farming activities of Khorixas (Mendelsohn *et al.*, 2002).

## 6. RESPONSIBLE PARTIES

### 6.1 Contractor

The contractor is responsible for the implementation of the EMP during the construction phase of the Khorixas power line. The EMP will be included in all tender and contract documents. This guarantees that the contractor is fully aware of his obligations and responsibilities.

The Contractor shall take adequate steps to educate all members of his workforce (in Consultation with NamWater) as well as his supervisory staff on the relevant environmental laws and protection requirements. The Contractor shall supplement these steps with prominently displayed notices and signs in strategic locations to remind personnel of environmental obligations.

The Contractor shall ensure that all his employees, and those of his Sub-Contractors, attend an Environmental, Awareness Training. This training shall be structured to ensure that attendees:

- ❖ Acquire a basic understanding of the key environmental features on the site and its immediate environs;
- ❖ Become familiar with the environmental controls contained in the EMP;
- ❖ Are made aware of all protected areas and that the trapping, catching, poisoning, and/or shooting of animals is strictly forbidden. No domestic pets are allowed on site;
- ❖ Are informed that natural features (e.g. rock formations) are not defaced or marked for the survey or other purposes unless agreed beforehand with the contractor.
- ❖ Natural water sources (e.g. streams) are not allowed to be used for the purposes of swimming, personal washing, and the washing of machinery or clothes;
- ❖ Are made aware of the need to conserve water and minimise waste;
- ❖ Receive pertinent, written instructions regarding compliance with the relevant environmental management requirements (viz. typical environmental “Code of Conduct”);
- ❖ Are made aware of any other environmental matters as deemed necessary by the contractor.
- ❖ Are made aware of the importance of preserving archaeological sites.

- ❖ Receive training on-site health and safety requirements.
- ❖ Ensure that the entire construction team is familiar with the Code of Conduct;
- ❖ Are aware that a copy of the EMP is readily available on-site and that all site staff are aware of the location and have access to the document;
- ❖ Become familiar with the environmental controls contained in the EMP;
- ❖ Are made aware of the need to conserve water and minimise waste.

## **6.2 Environmental Control Officer**

A suitably qualified and experienced Environmental Control Officer (ECO) shall be appointed by the Contractor prior to the commencement of construction to ensure that the mitigation and rehabilitation measures are implemented and to ensure compliance with the provisions of the EMP. The ECO is responsible to oversee and monitor compliance with and implementation of the EMP. **The ECO's responsibilities include:**

- ❖ Liaison with the community, NamWater, Consulting Engineer, Resident Engineer, and Environmental Authorities;
- ❖ Monitoring of all the Contractor's activities for compliance with the various environmental requirements contained in this EMP;
- ❖ Ensuring that the required remedial action is implemented in the event of non-compliance;
- ❖ Ensuring the proactive and effective implementation and management of environmental protection measures;
- ❖ Ensuring that institutions and that any and all public comments or issues are appropriately reported and addressed;
- ❖ Routine recording and reporting of environmental activities, incidents, and non-compliance on a monthly basis;
- ❖ Notifying the Environmental Authorities immediately of any events or incidents that may cause significant environmental damage or breach the requirements of the EMP; and
- ❖ Presenting Environmental Awareness Training courses to the Contractor's entire team of workers prior to commencing with construction. All new appointees should also receive the training.

The ECO shall visit the site a minimum of once a month. More frequent visits may be required if the situation required it or in cases of non-compliance.

### **6.3 NamWater**

NamWater's Environmental Manager is primarily responsible for ensuring implementation of the EMP during the operation, maintenance and decommissioning phases for the Khorixas power line project. Compliance will be monitored via compliance audits.

NamWater shall ensure that the contractor complies with the EMP. 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 the 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 is responsible for implementation of the EMP during the operational phase
- ❖ All training of operational personnel and monitoring is the responsibility of NamWater

## **7. LEGAL ENVIRONMENT**

A legal review was completed and the key laws of concern include those, which protect the ecological integrity of the Khorixas 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 Khorixas ecosystem for sustainable use by Namibians.

### **7.1 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 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, MEFT: DEA is committed to pursuing the 13 principles of environmental management that are 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.

## **7.2 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.

## **7.3 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 includes:

- ❖ The construction, transmission, and supply of electricity.

**Table 1: Applicable listed activity in terms of EMA and Regulations**

Activity	Description of Activity	Activity Triggers
Activity 1. (b) (Energy generation, transmission, and storage activities)	Construction, transmission, and supply of electricity;	The proposed power supply project will construct a power line to supply electrical power to the reservoir.

**7.4 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 a certain list of activities that may not be undertaken without an environmental clearance certificate: environmental management act, 2007 from MEFT: DEA prior to commencing the project.

**7.5 Objectives of the Convention on Biological Diversity**

- Conservation of biological diversity
- Sustainable use of components of biological diversity
- Fair and equitable sharing of the benefits arising out of the use of genetic resources

## 8. ENVIRONMENTAL MANAGEMENT PLAN

An EMP is a dynamic document that is regularly updated as required, it relates to the local natural and socio environment. The EMP is tailor-made for particular conditions and proposed development. The EMP is valid for all contractors and subcontractors. It is a project-specific plan developed to ensure appropriate environmental management is carried out.

The EMP provides for the establishment of a grievance procedure as indicated in **Annexure 2**. The grievance registration form is also illustrated in **Annexure 2**.

Monthly audits will be completed during the construction phase and more regularly if EMP compliance is not satisfactory. Construction, operational and maintenance audits will be done annually and more frequently if compliance is poor.

EMP implementation is a cyclical process that converts mitigation measures into actions and through cyclical monitoring, auditing, review and corrective action ensure conformance with stated EMP aims and objectives. For an effective EMP, continuous monitoring and auditing is required, and continual improvement of the EMP ensures corrective action is provided.

The project activities are grouped according to the different construction, operation and maintenance stages. Most of the potential impacts can be reduced to insignificant levels through good housekeeping.

## 9. ENVIRONMENTAL MONITORING

A monitoring program will be implemented for the duration of the construction and operation/maintenance phases of the power line project.

### **This program will include:**

- Monthly environmental inspections to confirm compliance with the EMP regulation conditions. Please see **Annexure 3** for compliance check list.
- The issues identified on the monitoring form must be discussed in detail with the contractor or scheme supervisor.
- The compliance checklist form must be signed by all parties (contractor, ECO and NamWater representative), and compilation of an inspection/audit report complete with corrective actions for implementation.
- The designated ECO shall keep a photographic record of any damage to areas outside the demarcated site area.
- The date, time of damage, type of damage and reason for the damage shall be recorded in full to ensure the responsible party is held liable.



- The Contractor shall be held liable for all unnecessary damage to the environment.
- A register shall be kept to record all complaints from the Landowner or community.

## **10. MITIGATION MEASURES PRIOR TO CONSTRUCTION**

The pre-construction or planning management plan is to be used as a guide during the planning, design and detailing of the development components. This part of the plan is to be referenced by all involved in decision making during the planning and design phases.

The designated ECO should be allocated appropriate authority to ensure EMP recommendations and requirements are accomplished. Ultimately the Contractor is responsible for the implementation of the EMP. NamWater will frequently inspect the construction site to ensure that the Contractor complies with the EMP.

### **10.1 EMP Training**

- a) The Contractor shall arrange for Environmental and Heritage Awareness Training programmes for the personnel on site, to the satisfaction of NamWater, and familiarise his/her/its employees with the contents of this EMP and especially the CoC, either in written format or verbally.

### **10.2 Workforce**

- a) The contractor will be responsible for the recruiting and management of his/her staff.
- b) The contractor should establish a formal and organised recruitment process. Any recruitment outside the agreed process is discouraged.
- c) All sub-contractors should be aware of the recommended recruitment procedures.
- d) Not recruitment should be done at construction sites.
- e) The EMP recommends that for unskilled vacancies, local labourers from Khorixas be employed.
- f) Repatriate employees to the town from where they were hired after completion of the contract, (i.e. if employed from further away than Khorixas).
- g) Inform job seekers that they are hired for a contract period only.
- h) Contractors should train and ensure skills development of the workforce.

### **10.3 Accommodation Camp, Construction Camp and Site Management**

#### **10.3.1 Vegetation:**

- a) The natural vegetation encountered on the sites (accommodation and construction camps) is to be conserved and left as intact as possible.
- b) Only trees and shrubs directly affected by the works, and such others as may be approved by the ECO in writing, may be felled or cleared.
- c) A firebreak shall be cleared and maintained around the perimeter of the accommodation and construction camps.

#### **10.3.2 Water for human consumption:**

- a) Water for human consumption should be available at the accommodation and construction camps.
- b) Potable water will be available along the power line construction sites.

#### **10.3.3 Location:**

- a) The accommodation camp will be established in Khorixas at a location as agreed with the Village Council.
- b) A construction camp with a lay down area and possibly a workshop will be established. The construction camp location will be identified based on the ease of access to the transmission line and in consultation with property owners. Furthermore, establishment should be preferably within already disturbed areas. After completion of the contract, these areas will be required to be rehabilitated.
- c) Access roads to construction camp will be discussed with property owners.
- d) The construction camp must be planned and laid out in such a way that the total footprint area is minimised.

#### **10.3.4 Ablution Facilities:**

- a) The accommodation camp shall have the necessary ablution facilities at commencement of construction.
- b) The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.
- c) Temporary ablution facilities shall be provided at the construction camp if it is located along the power line route.

#### **10.3.5 Waste Management:**

- a) The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of at appropriate landfill sites.
- b) Solid waste collection facilities and waste treatment facilities for litter, kitchen refuse, sewage and workshop-derived effluents should be planned in advance.
- c) The design, installation and operation of ablution facilities will be discussed with the local authority if the camps are located within Khorixas.
- d) The contractor should plan to collect and dispose all solid waste (domestic and construction waste) at an appropriate landfill.

#### **10.3.6 Cooking Facilities:**

- a) Cooking facilities will be provided.
- b) Gas or fuel-efficient stoves should be provided to the employees to limit the use of firewood.
- c) If firewood is to be used (which is to be provided by the contractor), the fires should not be left unattended. All grass and bushes shall be removed around fireplaces.
- d) Employees shall be made aware that the collection and removal of firewood is prohibited, except where indicated by the contractor as clearing takes place.
- e) Fires are only permitted in designated areas and shall not be left unattended.
- f) Cooking places shall be located at a safe distance from fuel/hazardous materials storage area and vehicle parking areas.
- g) Any fires that occur outside of designated areas shall be reported to the ECO immediately.

#### **10.3.7 Safety and Security:**

- a) Security requirements (including temporary fencing and lighting) should be considered during planning. Temporary fences are to be erected around the construction camp, to prevent theft of equipment and animals from entering the camp.
- b) Fire extinguishers should be readily available in the camp.

#### **10.3.8 Erosion:**

- a) Site activities shall be carefully managed in order to avoid site erosion and sedimentation. The contractor shall implement effective sediment and erosion control measures during construction and operation of the construction work.

## **10.4 Materials handling, use and storage**

### **10.4.1 Hazardous Material Storage:**

- a) Petrochemicals, oils and identified hazardous substances shall only be stored under controlled conditions.
- b) All hazardous materials will be stored in a secured, appointed area and has restricted entry.
- c) Areas for the storage of fuel or lubricants and for a maintenance workshop shall have a compacted/impervious floor to prevent the escape of accidental spillage of fuel and or lubricants from the site.
- d) Storage of hazardous products shall only take place using suitable containers approved by the ECO.
- e) These substances should be stored in a bunded area, with a volume of 130 % of the largest single storage container or 25 % of the total storage containers whichever is greater.
- f) In addition, hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure.

### **10.4.2 Fuels and Gas Storage:**

- a) Fuel should be stored in a secure area in a steel tank supplied and maintained by the contractor.
- b) Gas welding cylinders and LPG cylinders should be stored in a secure, well-ventilated area.
- c) The contractor must supply sufficient firefighting equipment in event of an accident.
- d) Strictly no smoking will be allowed where fuel is stored and used.

## **11. MITIGATION MEASURES DURING CONSTRUCTION**

The Construction management plan is a guideline for the contractor or subcontractor to serve as a guide to reduce and limit impacts caused by development of the power line. Contractor is urged to stick to mutually agreed working times (e.g. 08:00 – 17:00) No work to take place during the night. No work on Sundays or public holidays.

### **11.1 SITE PREPARATION**

#### **11.1.1 Clearing of site**

- a) Site clearing must take place in a phased manner, as and when required. Areas which are not to be constructed on within say one month of time must not be cleared to reduce erosion risks.
- b) The area to be cleared must be clearly demarcated and this footprint strictly maintained. Topsoil from the must be neatly stockpiled at the edge of the wayleave ready for backfill.
- c) Cooking places shall be located at a safe distance from fuel / hazardous material storage area and vehicle parking bays.
- d) All vehicles to be parked at a dedicated parking area.
- e) Construction camp should be fenced off.

#### **11.1.2 Vegetation Clearing**

- a) The extent of all construction site footprints will be minimised and limited to existing and / or already disturbed areas wherever possible.
- b) The areas to be cleared and the degree of clearing required will be determined and demarcated in consultation with the ECO before clearing begins.
- c) The Contractor may not deface, paint or otherwise mark and / or damage natural features / vegetation on the site, unless agreed beforehand with the ECO. Any features / vegetation defaced by the Contractor will be restored to the satisfaction of the ECO.
- d) The ECO must be present during vegetation clearing.
- e) During the clearing of woody vegetation, no basal cover or grass and topsoil shall be removed and damage to this layer shall be minimised as far as possible.
- f) Do not remove any vegetation unless it is absolutely necessary. Make sure that bulldozer, grader and excavator operators are informed.

- g) The clearing of plants or natural features for the proposed construction should be managed to avoid further damage to vegetation cover.
- h) Keep disturbance of vegetation and fauna to a minimum. The area to be disturbed should be as small as possible
- i) Protect identified plants using danger tape and steel droppers
- j) Identify animal species, populations and nest to be relocated. Relocate to areas with no associated risks. Such operations should be planned well in advance.
- k) Identify and demarcate the extent of the construction or accommodation site and associated work areas using danger tape with steel droppers.
- l) The use of herbicides and pesticides is prohibited.
- m) The collection and removal of firewood is not allowed.
- n) The Contractor shall either provide firewood or limit the use thereof by providing gas or fuel-efficient stoves.

### **11.1.3 Poaching of Fauna and Flora**

- a) Prevent the poaching of flora and fauna.
- b) Employees who poached fauna and/or flora will be handed to the authorities for prosecution.
- c) The Contractor will be held liable for the replacement of any plant or animal that is removed or damaged due to the Contractor's negligence or mismanagement.
- d) Employees should not collect any fruits or seeds without permission from appropriate persons.
- e) Regular checks of the surrounding environment must be undertaken to ensure no traps or snares have been set. Any snares or traps found on or adjacent to the site must be disposed of.

## **11.2 TRANSPORT, VEHICLES AND ACCESS DURING CONSTRUCTION PHASE**

### **11.2.1 Movement of construction vehicles**

- a) The contractors shall be held responsible for all project related traffic and impacts.
- b) During construction, use should be made of existing access routes to construction areas where possible.
- c) Construction traffic shall be controlled to ensure minimal disruption to other road users.

- d) Construct approved vehicle turning areas, avoiding selected ecological sensitive areas or species, and have adequate turning area routes approved by the ECO.
- e) Temporary access roads must be rehabilitated after usage to the satisfaction of NamWater.
- f) Do not construct new roads when the quality of existing roads deteriorates. Where possible, repair or upgrade existing roads.
- g) Areas to be cleared for road construction should be as small as possible.
- h) Road construction methods should ensure good road surfaces to preclude vehicles driving off-road to find smoother surfaces with less corrugation or potholes.
- i) Enforce speed limits at all times. Unless otherwise specified, the speed limit on construction roads is 50km/h.
- j) Enter and exit roadways to construction areas should be clearly demarcated.
- k) Erect signage to warn motorists about construction activities and heavy vehicle movement where appropriate.
- l) Use 3-point turns and no U-turns. Confine turning to the road.
- m) Prevent shortcuts between roads.
- n) No operator will operate any equipment when he is under the influence of any narcotics.
- o) Adhere to safety rules.
- p) Always keep your headlights on.
- q) Drivers must have the correct licence for the vehicle they are driving.

### **11.2.2 Transport of materials**

- a) All materials to be transported shall be appropriately secured and covered to ensure safe passage between destinations.
- b) Loads shall have appropriate cover to prevent them spilling from the vehicle during transit.
- c) The contractor shall be liable for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.
- d) The Contractor shall take all reasonable measures to minimise the generation of dust as a result of construction activity.
- e) Construction vehicles to use only designated roads and to adhere to speed regulations.

- f) The contractor is urged to use dust suppression methods.

### **11.2.3 Refuelling**

- a) Refuelling of vehicles should be done in designated areas with appropriate measures in place to prevent spillage.
- b) Using of drip trays, funnels, non-drip dispensing nozzles, and any other similar device.
- c) Regardless of the preventative measures in place, all mobile fuel bowsers shall carry a spill-kit that is adequately sized to contain at least a 200-litre spill.

### **11.2.4 Storage and management of fuels and lubricants**

- a) Store machinery, vehicles, and materials only in demarcated areas;
- b) Do not leave machinery and equipment standing around if not in use;
- c) Do not store machinery, vehicles or materials in undisturbed or rehabilitating areas.
- d) Only service machinery and vehicles in designated areas.
- e) Regularly check your vehicle for fuel and oil leaks.
- f) Maintain vehicles and equipment in good conditions through regular and thorough servicing.
- g) Inform the Foreman of leaking vehicles and machinery so that he can schedule repairs.
- h) Only refuel on the bund created for that purpose.
- i) Immediately clean any accidental fuel and oil spills – do not hose spills into the natural environment.
- j) Dispose of contaminated soil as hazardous waste in the correct location on site.
- k) If a mobile fuel bowser is used, then all refuelling shall occur with appropriate measures in place to prevent spillages (drip trays, funnels, non-dripping dispensing nozzles, etc.).

## **11.3 WASTE MANAGEMENT**

### **11.3.1 Solid Waste**

- a) Sufficient bins with lids shall be provided on-site to store domestic waste.
- b) No onsite burying, dumping or burning of any waste materials, vegetation, litter or refuse will be permitted.
- c) Bins are to be emptied, a minimum of once daily, and are not allowed to be overloaded.



- d) The waste may be temporarily stored on-site in a central waste area that is weatherproof and scavenger-proof, and which the contractor has approved.
- e) Enforce a waste management programme
- f) No waste should be buried.
- g) Refuse bins must be stable, i.e. cannot be tipped by animals, and have scavenger and baboon proof lids.
- h) Bins should be placed in pairs to ensure that one is always present while the other is being emptied.
- i) No littering will be allowed. Operation and maintenance areas will be kept free of waste at all times.

#### **11.3.2 Ablution facilities at the construction site**

- a) Temporary toilets shall be supplied along the power line route by the contractor during the construction phase, at a maximum of 1 toilet per 20 workers, within walking distance of the work area.
- b) The contractor shall ensure that no spillage occurs during the cleaning or emptying of toilets.
- c) Separate facilities for males and females are recommended, and the facility must provide privacy.
- d) Toilets shall be kept in a good state of repair and shall be serviced at intervals sufficient to ensure that they are kept in a clean and sanitary condition.
- e) Discharge of waste from toilets into the environment is prohibited.
- f) Acts of excretion or urination are strictly prohibited other than at the facilities provided.

#### **11.3.3 Handling of Hazardous Substances**

- a) Materials storage may only be at designated sites that have been determined by the ECO.
- b) Waste contents are removed from the site and be disposed of at an appropriate waste disposal facility.
- c) Designated areas for the storage of potentially hazardous material will be lined with concrete and secured.

#### **11.3.4 Concrete batching**

- a) The location of the batching plant (including the location of cement stores, sand and aggregate stockpiles) shall be as approved by the contractor after consultation with the ECO.
- b) Concrete batching shall take place at least 20 m away from any water resource to avoid contaminated water and/or sediment entering the resource.
- c) All batching activities are to occur on ground that has been protected. The batching plant shall be located on a smooth impermeable surface (concrete or 250 µm plastic covered with 5 cm of sand).
- d) The area shall be bunded and sloped towards a sump to contain spillages of substances.
- e) All visible remains of concrete and excess aggregate/cement/concrete shall be physically removed on completion and be appropriately disposed of.
- f) All wastewater resulting from batching of concrete shall be disposed of appropriately and shall not be discharged into the environment, unless treated to an acceptable standard, as determined by the ECO. Contaminated water storage areas shall be emptied when full and shall not be allowed to overflow.
- g) The contractor shall implement appropriate protection from rain and flooding.
- h) The Contractor shall ensure that sand, aggregate, cement or additives used during the mixing process are contained and covered to prevent contamination of the surrounding environment.
- i) Where “ready-mix” concrete is used, the Contractor shall ensure that the concrete trucks do not wash their chutes directly onto the ground.
- j) Any spillage resulting from the concrete truck drum-wash-water shall be cleaned up immediately and disposed of appropriately.
- k) Concrete trucks shall not be permitted to dump drum-wash on-site unless into contaminated water pond (that has been approved by the ECO) which must be fully rehabilitated at completion and the sediment collected for disposal.

#### **11.4 HEALTH AND SAFETY**

- a) The contractor is obliged to provide PPE to their employees.
- b) 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.
- c) Keep a comprehensive first aid kit at the scheme offices and at construction sites.
- d) Establish an emergency rescue system for evacuation of seriously injured people.
- e) Emergency procedures for accidents should be communicated to all employees.
- f) Dangerous areas must be clearly marked and access to these areas controlled or restricted.
- g) Good driving and adherence to safety rules will result in a minimum number of road and workplace accidents.
- h) Fire extinguishers must be available at all refuelling sites. Staff should be trained to handle such equipment.
- i) Nobody is allowed to dispose of a burning or smouldering object in an area where it may cause the ignition of a fire.
- j) Hazardous substances must be kept in adequately protected areas to avoid soil, air or water pollution.

#### **11.5 EROSION**

- a) Runoff on steep inclines should be diverted to prevent the formation of erosion gullies.
- b) Vegetative cover is the most efficient and economical means of controlling soil erosion.
- c) Berms should be constructed at selected intervals on long sloping areas to prevent erosion. Diversion berms should be reshaped as necessary to divert runoff.
- d) When equipment crossings are necessary, diversions may be wider with flatter side slopes to minimise erosion.
- e) Berms should be constructed with compacted soil, have a minimum top width of 60 cm and a minimum height of 30 cm, and should allow for a 10% settlement. It should have side slopes with a gradient of at least 2:1.
- f) Runoff should be guided to a point where it will not cause damage. Scour by the discharge of runoff should be prevented.
- g) Contractors urged to ensure all open trenches are backfilled.

- h) Backfill to the same contours or slightly higher to allow for settlement.

#### **11.6 SITES OF PALAEOLOGICAL AND ARCHAEOLOGICAL IMPORTANCE**

- a) Do not disrupt any archaeological or palaeontological sites. Inform ECO or NamWater ENV personnel who will take the necessary action.
- b) All workers should be educated about the importance of preserving archaeological sites.
- c) Educate specific workers about tell-tale signs of archaeological sites and the action to be taken if one is identified.

### **12. MITIGATION MEASURES DURING OPERATION**

#### **12.1 Monitoring of EMP DURING OPERATION**

The operation/maintenance phase is subject to annual monitoring/audits, to ensure correct and successful implementation of impact mitigation measures in order to reduce adverse impacts on environmental conditions needs to be ensured by a proper monitoring programme.

Monitoring of the operation/maintenance phase and implementation, adherence to the EMP, shall be the responsibility of NamWater's Environmental section. Reporting on adherence/compliance to stipulations as communicated to contractors, shall take place during scheduled site meetings.

All phases (construction and Maintenance) will use a monitoring checklist to guide relevant designated persons to conduct adherence of the EMP. Please see **Annexure 3** for compliance checklist.

## **13. REHABILITATION AND SITE CLOSURE**

### **13.1 What is Rehabilitation?**

Rehabilitation is the process of returning the land in a given area that has been disturbed by construction, operation, and maintenance to an acceptable state or an otherwise predetermined 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 construction, operation, and maintenance of the power line could be mitigated and restored to an acceptable level. Poorly rehabilitated areas provide a difficult legacy issue for governments, communities, and companies, and ultimately tarnish the reputation of companies as a whole.

Rehabilitation proposals and concept plans should be developed well before construction of the power line and those plans should be revised from time to time.

The Rehabilitation Phase refers to the period of the project after the completion of the actual construction works, the onset signalled by site clean-up, site rehabilitation, the withdrawal of the contractor from the site, and commencement of the maintenance period. To be fully effective, rehabilitation should begin as early as possible and be reviewed and updated on an ongoing basis. Rehabilitation should be an integrated part of all stages of the project life cycle.

### **13.2 Objectives of proper site closure and rehabilitation**

The aim is to restore the area to an acceptable standard as close to its baseline environmental state as possible. The objectives of the rehabilitation plan should be based upon the specific characteristics of the construction area and should reflect:

- ❖ Legislative requirements in the area;
- ❖ Health and safety considerations;
- ❖ Environmental and social characteristics of the surrounding area;
- ❖ Biodiversity in the area;
- ❖ Ecosystem services provided within the site's ecological boundaries;
- ❖ Post-closure land-use plan.

### **13.3 Rehabilitation measures to implement:**

- a. Rehabilitation must be carried out as soon as possible after construction is completed and must be implemented progressively as construction is completed in sections of the power line.
- b. Clear and completely remove from the site all foreign materials, construction equipment, storage containers, concrete and compacted platforms, chemical toilets, bunded area(s), dustbins, temporary services, and fixtures.

- c. Remove from the site all temporary fuel stores, hazardous substance stores, hazardous waste stores, and pollution control sumps and pollution containment structures.
- d. Remove from the site all temporary sanitary infrastructure and wastewater disposal systems. Take care to avoid leaks, overflows and spills and dispose of any waste in the approved manner.
- e. Should there be spills of hazardous substances in the soil, polluted soil will be collected and disposed of at a hazardous landfill site that accepts such waste and replaced with unpolluted soil.
- f. Ensure that all access roads utilised during construction (which are not earmarked for closure and rehabilitation) are returned to a usable state and/or a state no worse than prior to construction.
- g. Dismantle and flatten temporary drifts and watercourse crossings, reinstating all drainage lines to approximate their original profile.
- h. Rip and/or scarify all disturbed areas of the construction site, including temporary access routes and roads, compacted during the execution of the works.
- i. Rip and/or scarify along the contour to prevent the creation of down-slope channels.
- j. Make sure that all potential hazards are properly closed and left in a safe and neat position.
- k. Ensure that the area is safe for the intended end land use.
- l. Rehabilitation will be done to the satisfaction of the ENV section and MET.

#### **13.4 Rehabilitation and Closure Plan**

All contractors will have to submit a Rehabilitation and Closure Plan for approval by the NamWater Environmental Section. The Environmental Section will also audit the implementation of the plan.

## 14. 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 inquiry 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 of 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 backfilled trench.

### **Plants and Animals**

17. **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.
18. Never feed, tease, play with, or set devices to trap any animal or livestock. Wild animals are not to be domesticated.
19. Keep off the rock outcrops unless given specific permission by the SCHEME SUPERVISOR to be there.
20. Never cut down any tree or branches for firewood.
21. Never leave rubbish or food scraps or bones where it will attract animals, birds, or insects.
22. Rubbish must be thrown into allocated waste disposal bins/bags.
23. Always close the gates behind you.

### **Preventing Pollution**

24. Only work with hazardous materials in bunded areas.
25. 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.
26. Clean up spills immediately.
27. 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.
28. Immediately report to your SCHEME SUPERVISOR when you notice any container, which holds hazardous substances overflow, leak or drip. Spillage must be prevented.
29. Only wash vehicles, equipment and machinery, containers and other surfaces at work site areas designated by your SCHEME SUPERVISOR.
30. Do not change the oil on uncovered surfaces.
31. If you are not sure how to transport, store, use, or get rid of any hazardous substances ask your SCHEME SUPERVISOR for advice.

### **Health**

32. Drink lots of clean water every day.
33. Use toilets that have been provided.
34. Take the necessary precautions to avoid contracting HIV / AIDS. Condoms are available at most Clinics.

35. Inform your SCHEME SUPERVISOR when you are sick.
36. Do not work with any machinery when you are sick.
37. If you are working in malaria areas, you must take the necessary precautions.

#### **Dust Control**

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

#### **Saving Water**

41. Always use as little water as possible. Reduce, re-use and recycle water.
42. Never leave taps or hose pipes running. Close all taps after use.
43. Report any dripping or leaking taps and pipes to your SCHEME SUPERVISOR.
- 44.

#### **Working Hours**

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

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

46. If you find any archaeological, cultural, historical or pre-historical object on the construction site you must immediately notify your contractor.
47. Never remove, destroy, or disturb any cultural, historical, or prehistorical 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**

48. Tracks and roads should be kept to a minimum. Where possible follow existing roads.
49. No off-road driving is allowed.

50. Never drive any vehicle without a valid licence for that vehicle class and do not drive any vehicle that is not road-worthy.
51. Never drive any vehicle when under the influence of alcohol.
52. **Always** keep your headlights on when driving on dusty roads.
53. Keep to the roads as specified by your SCHEME SUPERVISOR. Vehicles may only be driven on demarcated roads. Drivers should always use three-point turns, “U-turns” are not allowed. Do not cut corners.
54. Do not drive on rocky outcrops.

### **Noise**

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

### **Fire Control**

57. Do not make open fires, use a drum or tin and do not collect any vegetation to burn.
58. 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.
59. Cigarette butts should always be thrown in allocated refuse bins. Make sure that the cigarette butt is out before throwing it into the bin.
60. Immediately notify your SCHEME SUPERVISOR if you see an unsupervised fire at the campsite or construction site.

### **Dealing with Environmental Complaints**

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

For any enquiries, please call

**Jolanda Kamburona**

**Tell: 061-71 2105**

**Cell: 081 144 1528**

**or**

**Fillemon Aupokolo**

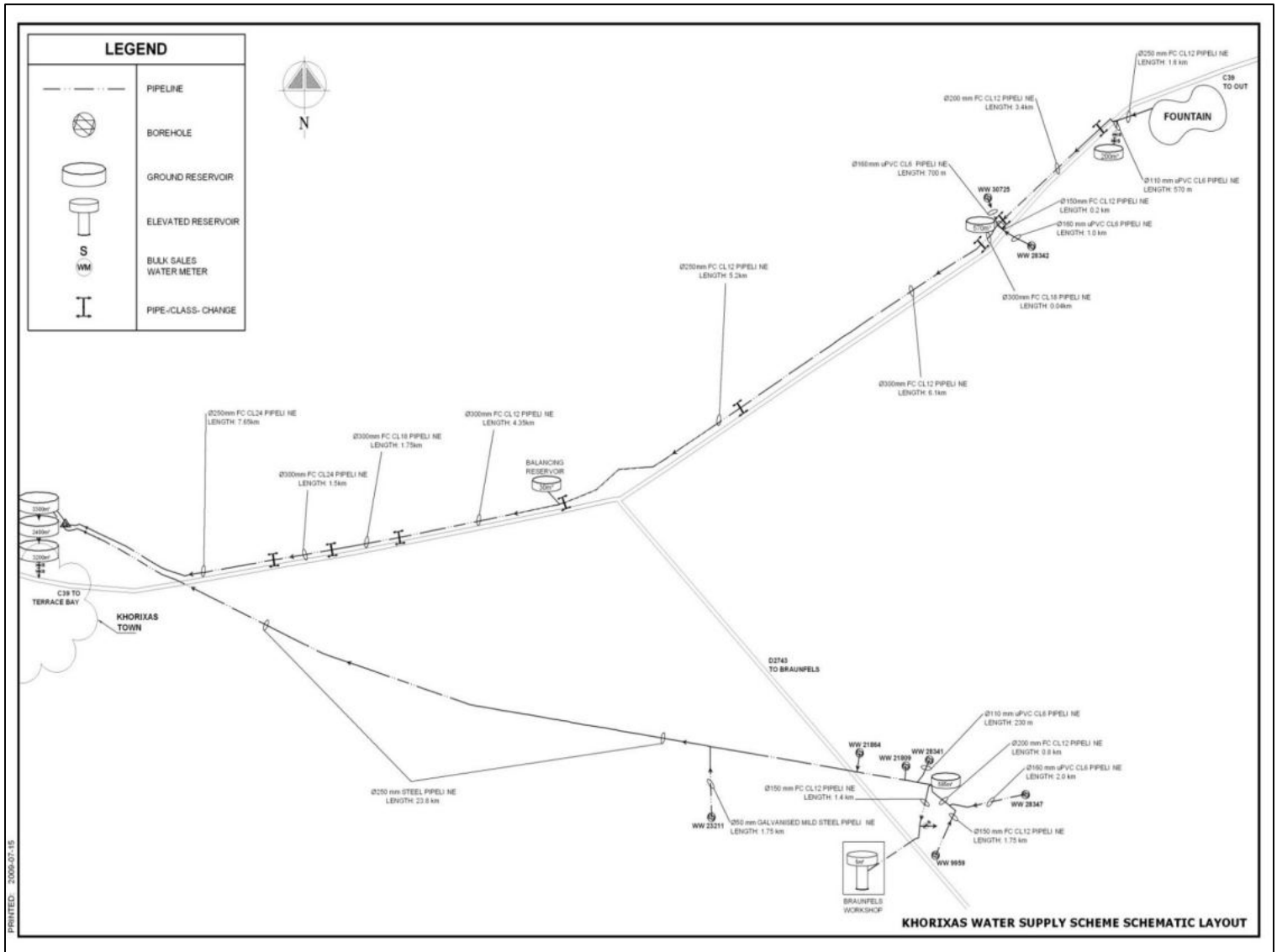
**Tell: 061-71 2095**

**Cell: 081 325 3301**

## 15. REFERENCES

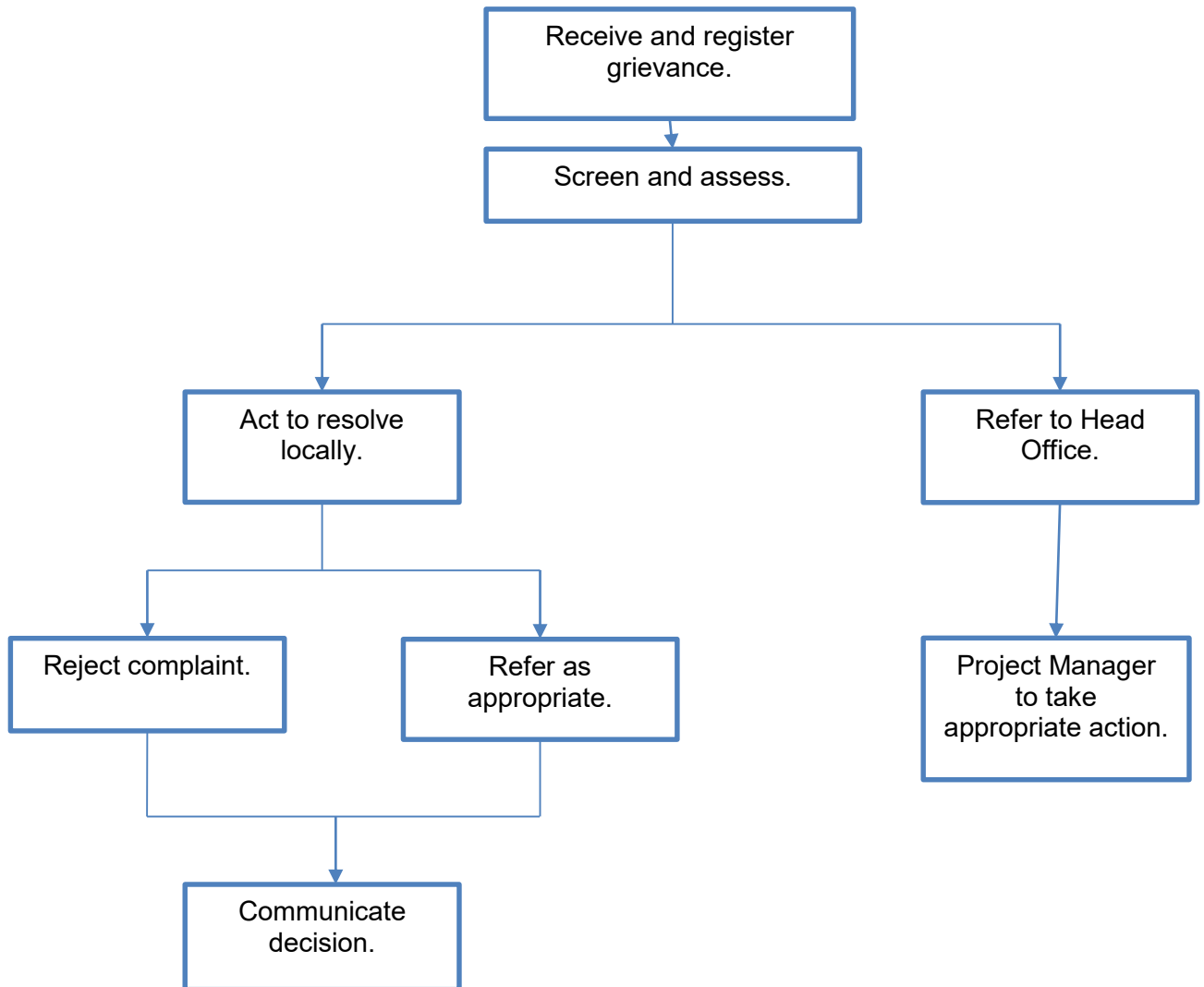
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# ANNEXURE 1: KHORIXAS SCHEMATIC LAYOUT



**ANNEXURE 2: GRIEVANCE PROCEDURE AND GRIEVANCE REGISTRATION FORM**

All grievances should be submitted through the completion of the grievance registration form as presented below and submitted to the Scheme Supervisor during the construction phase and to the Scheme Superintendent during the operation and maintenance phase.



Upon receipt of the registered grievance forms, the Scheme Supervisor shall screen and assess to either act to solve the grievance locally or refer it to head office. If the grievance is referred to the head office, the line manager should decide. If the grievance is to be solved locally, it should either be rejected or handled appropriately of which the decision should be communicated to the aggrieved person.

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:	

**ANNEXURE 3: ENVIRONMENTAL MONITORING CHECKLIST**

<b>Name:</b>	<b>Date:</b>
<b>Project:</b>	

**ENVIRONMENTAL MONITORING CHECKLIST**

Rating:  
(NC = NON-COMPLIANCE,  
C = COMPLIANCE,  
NA = NOT APPLICABLE)

	Rating:	Remedial Action or Non-compliance/ comments. (Action and Time Plan)
1. Vehicular access and movement of construction vehicles		
2. Movement of construction Personnel, laborers and equipment.		
3. Vegetation clearing		
4. Protection of fauna		
5. Cultural and/or archaeological sites		
6. Soil management		
7. Erosion control		
8. Access roads		
9. Excavation, backfilling and trenching		
10. Stockpiling, handling and storage of building Materials		
11. Servicing and re-fueling of construction Equipment		



<b>12. Solid Waste Management</b>		
<b>13. Liquid waste management</b>		
<b>14. Hazardous materials</b>		
<b>15. Run-off from construction camps</b>		
<b>16. Fire</b>		
<b>17. Dust</b>		
<b>18. Noise</b>		
<b>19. Site clean-up and rehabilitation</b>		
<b>Others:</b>		