



**REPUBLIC OF NAMIBIA**  
**MINISTRY OF ENVIRONMENT, FORESTRY AND TOURISM**

OFFICE OF THE ENVIRONMENTAL COMMISSIONER

**ENVIRONMENTAL CLEARANCE CERTIFICATE**

**ISSUED**

In accordance with Section 37(2) of the Environmental  
Management Act (Act No. 7 of 2007)

TO

NamPower (Pty) Ltd  
P.O. Box 2864, Windhoek

TO UNDERTAKE THE FOLLOWING LISTED ACTIVITY

THE OPERATION OF THE RUACANA POWER STATION, KUNENE RIVER,  
OMUSATI REGION

Issued on the date: 2020-08-24

Expires on this date: 2023-08-24

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### CONDITIONS OF APPROVAL

1. This environmental clearance is valid for a period of 3 (three) years, from the date of issue unless withdrawn by this office
2. This certificate does not in any way hold the Ministry of Environment and Tourism accountable for misleading information, nor any adverse effects that may arise from these activities. Instead, full accountability rests with the proponent and its consultants
3. This Ministry reserves the right to attach further legislative and regulatory conditions during the operational phase of the project

2023

# THE ENVIRONMENTAL MANAGEMENT PLAN FOR THE OPERATION AND MAINTENANCE OF RUACANA POWER STATION, OMUSATI REGION.



**THE DOCUMENT IS PREPARED BY NAMPOWER  
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## 1 LIST OF TERMS, ACRONYMS AND ABBREVIATIONS

EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMA	Environmental Management Act no 7 of 2007
EMP	Environmental Management Plan]
GIS	Geographical Information System
HIV/AIDS	Human immunodeficiency virus/ acquired immunodeficiency syndrome
MEFT	Ministry of Environment, Forest and Tourism
NHC	National Heritage Council
SHE	Safety, Health and Environment
SHEW	Safety, Health, Environment and Wellness
kV	Kilovolt

## 2 GLOSSARY OF TERMS

<b>Term</b>	<b>Definition</b>
<b>Corrective action</b>	Action to eliminate the cause of a detected non-conformance
<b>Document</b>	Information and its supporting medium. The medium can be paper, magnetic, electronic or optical computer disc, photograph or master sample or a combination thereof.
<b>Environment</b>	Surroundings in which NamPower operates, including air, water, land, natural resources, flora, fauna, humans and their interrelations.
<b>Environmental aspect</b>	Element of NamPower's activities/ products / services that can interact with the environment.
<b>Environmental Management Plan (EMP)</b>	An action plan or system which addresses the how, when, who, where and what of integrating environmental mitigation and monitoring measures throughout an existing or proposed operation or activity. It encompasses all the elements that are sometimes addressed separately in mitigation, monitoring and action plans.
<b>Environmental impact</b>	Any change to the environment (whether adverse or beneficial), wholly or partly resulting from the organisations environmental aspects.
<b>Environmental objective</b>	Overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve.
<b>Environmental target</b>	Detailed performance requirement applicable to NamPower or part thereof, that arises from the environmental objectives and that needs to be set to achieve those objectives.
<b>Procedure</b>	Specified way to carry out and activity or process.
<b>Record</b>	Document stating results achieved or providing evidence of activities performed.

### 3 INTRODUCTION

#### 3.1 Overview of the Ruacana Power Station

Ruacana Power Station is the largest power station in Namibia with an installed capacity of 347 Mega Watts (MW). It continues to be a paramount contributor to meeting Namibia's energy demand. Situated in the Kunene River in northern Namibia, the Ruacana falls and its meandering nature creates a natural setting for the Ruacana Hydroelectric scheme. The Ruacana Hydro Power Station forms part of the Kunene River scheme which consist of five (5) components, namely, the Gove Dam (with a capacity of 2600 Mm<sup>3</sup>, situated about 430km upstream of Ruacana), Calueque Dam (with a capacity of 475 Mm<sup>3</sup>, situated about 46km upstream of Ruacana), the Diversion Weir (with a capacity of 20Mm<sup>3</sup>) and the 525km. Gove Dam, located upstream in Angola, was constructed to facilitate the construction of the Calueque Dam and for the subsequent regulation of the river flow at Ruacana Power station for the ultimate purpose of maximizing its power generation.



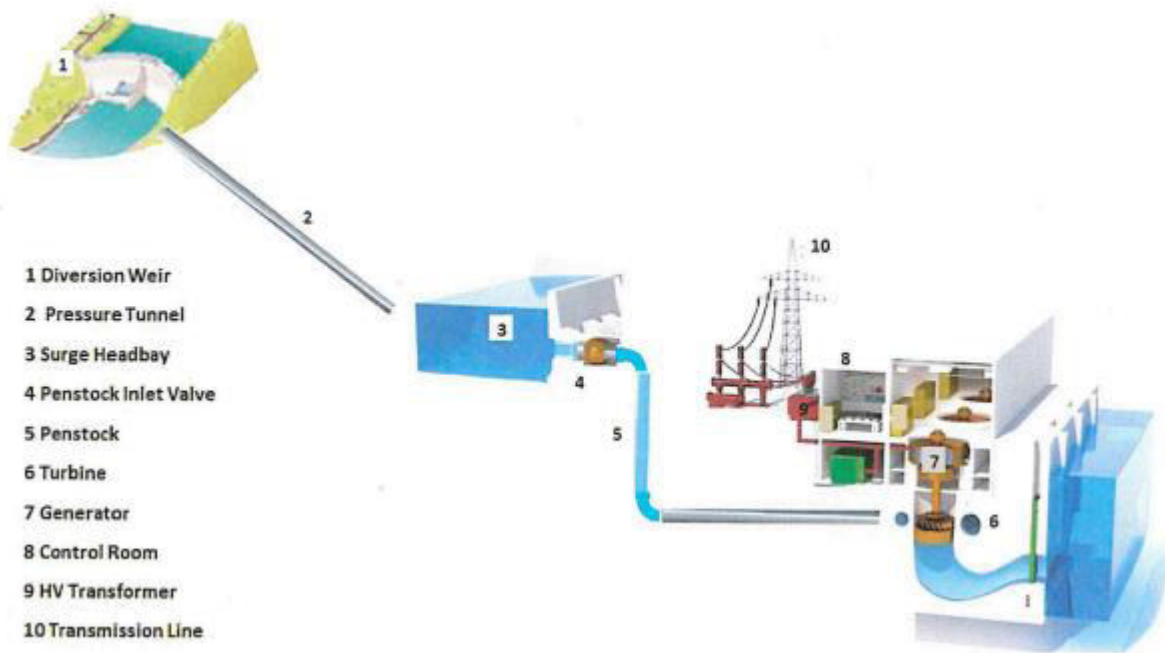
**Figure 1. Aerial photograph of the Ruacana Hydro Power Station**

Ruacana Power Station has two main functional areas, namely the operations and maintenance sections, responsible for the day-to-day operation of the power station in order to generate electricity and for the maintenance of the hydro turbines and related power station infrastructure respectively. The following process outlines the hydro-power generation at Ruacana Power Station:

**Table 1: Ruacana power station process outline**

<p><b>1. Diversion Weir</b></p>	<p>The first component of the Ruacana hydraulic system is the Diversion Weir, situated within Angolan territory. The Weir consists of two scour gates for flow control and level regulation. Part of the dam structure are five (5) flap gates for flood control which is operated by the Ruacana Maintenance team. The diversion weir also incorporates the pressure tunnel intake of the power station and has a capacity of approximately 20 million cubic meters.</p>
<p><b>2. The Pressure Tunnel</b></p>	<p>From the Diversion Weir which is 8.3m in diameter and 1 500m long, the pressure tunnel runs along the southern bank of the Kunene River, some 30m below the surface. After crossing the border, the Pressure Tunnel continues through a fault zone in the Palmwash ravine, and then feeds into an oval shaped Surge Head Bay.</p>
<p><b>3. Surge Head bay</b></p>	<p>The surge head bay is 31.5m deep. Its main purpose is absorbing water surges. From here, water is fed to the underground turbines via 4 (four) separate penstocks.</p>
<p><b>4. Penstock</b></p>	<p>Water is fed from the surge head bay to the turbines, located 134m underground via 4 penstocks of 3.6m diameter. The control of the water flow is done at the inlet of the penstock inlet Valve (PIV).</p>
<p><b>5. Turbines</b></p>	<p>Water is fed from the Penstock into the spiral casing and through the turbine runner where the potential energy of the water is converted into rotating mechanical energy which drives the rotor of the generator.</p>
<p><b>6. Generator</b></p>	<p>Energy conversion takes place from mechanical energy to electrical energy in the Westinghouse Generators 1-3 rated at 11kV, 88.888 MVA and Alstom Generator 4 rated at 11kV 105 MVA respectively.</p>
<p><b>7. High Voltage Transformer</b></p>	<p>The electricity is fed from the generators via the gen transformer (where the voltage is stepped up from 11kV to 330kV).</p>
<p><b>8. Transmission Line</b></p>	<p>From the Gen-transformers the power is fed to the high voltage yard / substation via the switching devices links, breakers, and the busbars where it is connected to the Transmission Line and the responsibility end as generation. The process from the transmission line is handled by the Network Operations section within Transmission.</p>





**Figure 2: Ruacana Power Station Flow Chart**

### 3.2 Area description

Ruacana Power Station forms part of Ruacana constituency, Omusati Region in northern Namibia. The district capital is Outapi town, which is about 80 km from the power station. Ovazemba and Ovahimba people are native to the area.

The climate at Ruacana is considered to be a semi-arid climate with little rainfall. The annual average rainfall is 374 mm with the driest month being May, with an average of 0 mm of rain, and the wettest being February, with an average of 109 mm. The average annual temperature is 22.1 °C. Generally November is the warmest month of the year with temperatures averaging 24.9 °C and July is the coolest with the lowest average temperature of 17.3 °C. Omusati Region is characterised by recurrent droughts and flash floods (Aurecon, 2019).

The study area is located in the Savanna biome; it is dominated by species such as Mopane (*Colophospermum mopane*) and Shepard's tree (*Boscia albitrunca*). The biome supports a high concentration of various species which are endemic to the region. Due to variable climatic events, the biome is vulnerable to inappropriate management and over-use, resulting in degradation and loss of productive potential. The large blocks of porphyroblastic gneiss, pink to grey in colour, characterise the geology at Ruacana, with incidental intercalation of chlorite-schists, hornblende schists and mica-schists materials (Aurecon, 2019).

Agricultural activities in the wider Ruacana area include livestock, crop and poultry production, feedlots, aquaculture and irrigation schemes. More specifically within the study area there was evidence of mahangu crops, also known as pearl millet, a rain fed cereal crop. Cattle and goat farming is the main subsistence activity for local communities. These activities are adapted to the low rainfall and soil conditions of the area. The Hippo Pools (Otjipahuriro) community camp site which is situated on the bank of the Kunene River downstream of the power station. The camp falls within a conservancy and generates income for the local community.

The famous Ruacana Falls located in the area is about 120 m. tall and 700 m. wide. This epic waterfall is one of the largest in Africa. Ruacana falls and the power station are known as tourist destinations or used as a signpost to other popular tourist destinations such as the Epupa Falls (over 100 km to the north-west) and Etosha National Park (over 200 km to the south-east) and Kaokoland (Aurecon, 2019).

#### **4 Purpose of this Environmental Management Plan (EMP)**

The purpose of this Environmental Management Plan (EMP) is to provide procedures, methods and environmental guidance that will be used to control and minimize the environmental and social impacts of all operational activities associated with the Ruacana Hydro Power Station (RHPS). The EMP is intended to manage, mitigate and uphold commitment made by the Ruacana Hydro Power station management team in order to minimize related environmental and social impacts throughout its operational activities. The EMP further aims at ensuring continuous improvement of environmental performance and reducing negative impacts by following sound environmental protection practices.

The scope of this EMP covers the activities at the power station from the Diversion weir (located approximately 1 kilometre upstream from the power station in the Angolan territory) to the transmission station and associated infrastructures. The activities covered include those related to the operation, maintenance and the upgrades of the power station and associated infrastructures.

##### **4.1 Objectives of the EMP are:**

- To ensure that all environmental aspects are effectively identified, monitored and managed and effective mitigation measures are taken.
- To ensure that the operation activities associated with the power station do not result in undue or reasonably avoidable adverse environmental impacts.

- To ensure that any potential environmental benefits are enhanced.
- To ensure that all relevant legislation are complied with during the operation and maintenance of the power station.
- To identify key personnel who will be responsible for the implementation of the EMP and outline functions and responsibilities towards environmental and social management.
- To propose mechanisms for monitoring compliance and preventing long term or permanent environmental degradation through an adaptive management approach to continuous improvement.
- To promote environmental awareness and understanding among employees and contractors through training and induction.
- To ensure that communities living around the station are not negatively affected by the operations of the station.

## 5 POLICY AND LEGAL FRAMEWORK

Legal compliance is an important aspect of sound environmental management. The table below list all related legislations which are applicable to the operation of the Ruacana Hydro power station.

**Table 2 Legislation applicable to the operation of the Ruacana Hydro Power Station**

Legislation	Section	Implication
<b>Environmental Management Act no 7 of 2007</b>	<b>Section 3</b>          <b>Section 33</b>	<ul style="list-style-type: none"> <li>• All activities performed should be in line with the following principles:               <ul style="list-style-type: none"> <li>○ Interested and affected parties should have an opportunity to participate in decision making</li> <li>○ Listed activities should be subject to an EIA</li> <li>○ Polluter should pay for rehabilitation</li> <li>○ Pollution should be minimized</li> </ul> </li> <li>• Environmental assessments should be carried out for listed activities. The proposed activity can be classified under the following range of activities:               <ul style="list-style-type: none"> <li>○ Generation of electricity</li> </ul> </li> </ul>

	<p><b>Section 27</b></p> <p><b>All other applicable sections.</b></p>	<ul style="list-style-type: none"> <li>○ Transmission of electricity</li> <li>• These sections detail the process to be followed in order to obtain a clearance certificate</li> <li>• All existing listed activities must obtain a clearance certificate within one year of the law coming into effect (February 2013). Therefore, all existing activities which can be considered a listed activity should apply for clearance.</li> </ul>
<p><b>EMA Regulations GN 28-30 (GG 4878) (February 2012)</b></p>	<p><b>Listed activity:</b></p> <p><b>5.1, 6 – 9, 13, 15 and 21 -24</b></p> <p><b>All other applicable sections.</b></p>	<ul style="list-style-type: none"> <li>• This activity can be considered as electricity generation and transmission.</li> <li>• These sections details the process to be followed in terms of producing an Environmental Assessment, and this process should be adhered to during the generation of information for this document.</li> </ul>
<p><b>Labour Act no 11 of 2007</b></p>	<p><b>Section 3</b></p> <p><b>Section 4</b></p> <p><b>Section 8 - 9</b></p> <p><b>Section 9</b></p> <p><b>Section 39 - 42</b></p>	<ul style="list-style-type: none"> <li>• Children under the age of 16 may not be employed</li> <li>• Forced labour may not be used during any construction activities</li> <li>• Basic conditions of employment, as stipulated by the law, must be met.</li> <li>• The employer shall ensure the health and safety of all employees and non-employees on site. Employees must fulfil their duties in order to ensure their own health and safety and that of other employees and people. Employees may leave the work site if reasonable measures to protect their health are not taken.</li> </ul>

	<b>All other applicable sections.</b>	<ul style="list-style-type: none"> <li>• These sections set out the rights and duties of employers and employees in order to ensure the health, safety and welfare of employees at the workplace.</li> <li>• Employer is also required to conduct its business operations on its premises in a manner that, as far as is reasonably practicable, persons who are not employees of that employer are not exposed to the risk of their safety or health.</li> </ul>
<b>Electricity Act no 4 of 2007</b>	<b>Section 17</b>  <b>Section 33</b> <b>All other applicable sections.</b>	<ul style="list-style-type: none"> <li>• NamPower shall hold a licence for each of the activities stated under section 17 (1) of this Act if it intends to carry out these activities.</li> <li>• Installations used for the provision of electricity should be operated with due compliance with the requirements of laws relating to health, safety and environmental standards. Therefore – any company involved within the Electricity Supply Industry must adhere to the laws covering the previously stated aspects or stand to lose their licenses to operate.</li> </ul>
<b>Water Act no 54 of 1956</b>	<b>Section 21 and 22</b>  <b>Section 23</b> <b>All other applicable sections.</b>	<ul style="list-style-type: none"> <li>• Conditions in terms of the disposal and management of effluent are to be adhered to.</li> <li>• Prohibits pollution of public or private water and any person causing pollution to a water source shall be guilty of an offence.</li> </ul>
<b>Public Health Act no 36 of 1919</b>	<b>Section 122</b>	<ul style="list-style-type: none"> <li>• It is an offence to cause any form of a nuisance which includes water pollution</li> </ul>
<b>Water Resources Management Act no 11 of 2013</b>	<b>Section 56</b>	The objective of this Act is to ensure that and the country's water resources are conserved and protected in ways consistent with or conducive to fundamental principles set out in section 3 of this Act.



		<ul style="list-style-type: none"> <li>• All heritage resources are to be identified and either protected or removed/mitigated with a permit from the National Monuments Council, before any development may take place</li> <li>• A chance find procedure should be followed in case of discovery of a heritage resource.</li> </ul>
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The Power Station Manager shall ensure that the employees and external service providers comply with the requirements outlined in this EMP. In the event of non-compliance, the following recommended process shall be followed:

- Non-compliances will be identified during inspections or audits carried out by the Safety, Health, Environment and Wellness (SHEW) Section and reported to the Power station Manager for corrective actions.
- The Power Station Manager shall notify the station employees about the non-compliance.
- Corrective and preventative actions must be implemented on an agreed timeframe.
- Follow – up inspections shall be conducted to assess whether the corrective and preventative actions were implemented effectively.

## 6 EMP ROLES AND RESPONSIBILITIES

It is the responsibility of the Ruacana Hydro Power Station management to ensure that all the environmental management actions are carried out effectively and timeously. It is important to note that the successful implementation of the EMP is, however dependent on clearly defined roles and responsibilities by several stakeholders. Below are the key employees that are responsible for the management of environmental and social issues during the operation of the power station:

### 6.1 The Power Station Manager shall ensure that:

- Environmental requirements are adequately covered in any external service provider’s contracts.
- Corrective and preventative actions are identified for non-compliances.
- Appropriate records and information regarding compliance with environmental requirements are maintained.
- The power station remains in compliance with the requirements of this EMP.

- All audit and inspection findings are close out timeously.
- All environmental incidents are reported as per the NamPower Reporting and Investigation Procedure
- The power station remain compliant to the SHEW procedures and policies.

## **6.2 The NamPower SHEW Section shall:**

- Assess compliance to the requirements of this EMP.
- Assist the Power station Manager in ensuring the station remains in compliance with this EMP.
- Provide SHEW inductions for the external service providers and awareness training for the employees.
- Organize and implement monitoring, inspections and audit functions, in consultation with the Power station Manager.
- Advise the power station employee on actions or issues impacting on the environment and provide appropriate recommendations to address these matters.
- Ensures that continual improvement is made with regard to the environmental performance at the power station.

## **7 ENVIROMENTAL ASPECTS, IMPACTS AND MANAGEMENT AND MITIGATION MEASURES**

### **7.1 Description environmental aspects and impacts related to the operation of the power station**

The table below outline the activities which are undertaken as part of the operation of the power station as well as the aspects and impacts associated with these activities.



**Table 3: The Power station activities and associated environmental aspects and impacts**

Activities	Aspect	Aspect Description	Potential Impact
<b>Diversion weir - opening and closing of gates</b>	Hydraulic oil leaks	Hydraulic oils can leak from the operations of the sour and flap gates at the diversion weir.	Hydraulic oils can end up in the river and cause water pollution.
	Waste generation	Waste such as used rags/absorbents can be generated from spill clean-up.	Waste generated can cause soil contamination and increase hazardous waste landfill space
	Use of natural resources	Hydraulic oil is a natural resource which is used in the operations of gates at the diversion weir.	The continuous use of hydraulic oil for lubrication contributes to the depletion of this natural resource in the long run.
	Grease and oil leaks	Grease and oil leaks could occur from the operation and maintenance of the crane's gear box.	Very small quantities of oil and grease used. Potential for negligible soil and water pollution.
	Hydraulic oil leaks/spill	Hydraulic oil leaks could occur from the hydraulic system. The spill can also occur from a potential pipe burst.	Soil or water contamination
<b>Surge head bay - Operation and maintenance of the crane</b>	Grease and oil leaks	Grease and oil leaks could occur from the operation and maintenance of the crane's gear box.	Very small quantities of oil and grease used. Potential for negligible soil and water pollution.

<p><b>Penstock Inlet Valve - Opening and closing of the PIV</b></p>	<p>Oil spills Waste generation</p>	<p>Oil can leak from bearings, governors, pumps, pipes, oil tanks. Oil spills could also occur as a result of damaged transfer pipes or overfilling oil tanks.  Used absorbents can be generated from the spill clean-up. Waste can also be generated from empty oil containers.</p>	<p>Water pollution  Increased hazardous waste landfill space</p>
<p><b>Power generation - Power generation involves a conversion of potential energy to electrical energy by turning the runner which is coupled to the generator and auxiliary services (oil cooling)</b></p>	<p>Use of natural resources</p>	<p>Oil is used in the power generation process including the maintenance of auxiliary services.</p>	<p>Contribute to resource (oil depletion)</p>
	<p>Altered water flow</p>	<p>The flow of the water discharged from the power station is different from the natural flow of the river. This can cause disturbance in the natural flow of the river.</p>	<p>Change in localised river ecosystem</p>
	<p>All industrial effluent</p>	<p>Industrial effluent consisting of water with contaminants resulting from cleaning throughout the power station could end up in the river.</p>	<p>Water pollution</p>
		<p>Electricity is generated from the hydropower plant.</p>	<p>Provision of electricity that enables economic development and improves living standard of Namibian citizens.</p>

	Littering	Non- Hazardous solid waste is stored and transported from a demarcated area to the Ruacana landfill site.	Improper storage and disposal of waste can lead to visual, soil and water pollution and off odours
	Oil Spills	Spillage of hazardous waste can occur during storage and transportation of (used oil, blast rite, batteries and other hazardous waste) due to leakages. Spillage can also occur during transportation and storage as a result of an accident.	Soil, water, air, visual pollution and off odours. Impacts on human health. Increase hazardous waste landfill site.
<b>Storage and disposal of waste</b>	Releases to air, water and soil (fluorescent tubes)	Fluorescent tubes bulbs are used to provide lighting throughout the power station. Heavy metals contained in these bulbs could end up in the environment.	Air, water and soil pollution
	Sludge and solid waste generation	Sludge generated from the water treatment plant	Filling up of disposal site.
	Waste generation	Waste is generated from the water treatment plant activities (chemical containers)	Filling up of landfill space
<b>Wastewater treatment</b>	Releases to water	Water from the treatment plant is released into the river. If the water from the treatment plant does not meet the special standards (under abnormal	Water pollution

		conditions), water pollution may occur.	
	Waste water releases	Domestic effluent is generated from day-to-day use of power station toilets, kitchens and washrooms, there could be a risk of water of water pollution if this effluent ends up in natural water system.	Water pollution
		Oil spill can occur from the generator transformers (inside the power station)	Water pollution
<b>Domestic effluent / sewage disposal</b>	Waste water releases	Oil spill can occur from the station transformers 1 & 2; transformers behind the diesel room; transformers in the HV yard and transformers in the reactor yard	Soil and water pollution
	Greenhouse gas emissions (SF6 gas release) Air emissions	SF6 gas may escape into the atmosphere during operation and maintenance of the SF6 switch gear.	Contribution to global warming
		Exhaust gases are emitted from the diesel room during the operation of the diesel generators	Air pollution

<p><b>High voltage switchgear room - High voltage switching</b></p>	<p>Greenhouse gas emissions (SF6 gas release)</p>	<p>SF6 gas may escape into the atmosphere during operation and maintenance of the SF6 switch gear.</p>	<p>Contribution to global warming</p>
<p><b>Diesel room - Diesel generators are kept on site to provide emergency power in the case of power failures. (Operation and maintenance of diesel generators)</b></p>	<p>Air emissions Noise</p>	<p>Exhaust gases are emitted from the diesel room during the operation of the diesel generators Noise is emitted during the operation of the diesel generators</p>	<p>Air pollution Noise pollution</p>
	<p>Noise Oil and diesel spills The use of renewable energy (solar)</p>	<p>Noise is emitted during the operation of the diesel generators Oil and diesel spills can occur during operation and maintenance of diesel generators. Spill can also occur from the make-up tanks and the bulk tank. There is a PV plant at the station which generates and supply electricity to the power station for use.</p>	<p>Noise pollution Soil and water pollution The PV plant has a positive impact of reducing the power station's carbon footprint.</p>

	Oil spills	Spillage of oil, detergents and other chemicals can occur from the workshop's day to day activities.	Soil and water pollution
<b>PV Plant - operations and maintenance of the PV plant</b>	Waste Generation	Waste such as off cuts, empty chemical containers, domestic waste, absorbents are generated during the day-to day workshop activities.	Filling up land fill space, littering, soil and water pollution
<b>Workshops - Maintenance and operations</b>	Wastewater	Wastewater is generated from washing of cars and workshop floors	Soil and water pollution
	Waste Generation	Hazardous waste such as gloves, needles and other medical waste is generated from the clinic.	Human health impact
	Use of water	Water is consumed for domestic purposes such as drinking, cleaning and watering the garden.	Contribution to the depletion of water resources
<b>Clinic, Administrative work and gardening</b>	Waste generation	Waste such as cans, paper, food packages, boxes and plastic are generated during day to day office and other activities. Garden waste is generated during maintenance and upkeep of the garden area.	Filling up land fill space, littering, soil and water pollution

## 7.2 Mitigation and management measures

In order to ensure that the potential impacts are prevented and/or minimised, it is necessary to ensure that the various activities related to the operation of the power station are adequately managed and monitored. This section presents the measures for mitigating and managing environmental and social impacts arising from operational activities. Table 4 below outlines mitigation measures as well as objectives to be achieved.

**Table 4 Mitigation measures to prevent and/or minimise potential impact associated with operational activities.**

Aspect	Mitigation objectives	Management and Mitigation measure	Responsible person
<b>Social: creation of jobs, indirect impact on the environment</b>	To promote socio-economic developments	<ul style="list-style-type: none"> <li>No management measures required as this has positive impacts.</li> </ul>	Power Station Manager
<b>Environmental awareness</b>	Minimise the occurrence of environmental impact on the work and surrounding area.	<ul style="list-style-type: none"> <li>All staff to receive environmental awareness training. Refresher environmental awareness training to be available when and as required.</li> <li>Information posters shall be erected at key locations at the power station.</li> <li>All staff are to be made aware of their individual roles and responsibilities in achieving compliance with the EMP.</li> <li>All visitors to receive induction prior to conducting any work at the power station.</li> </ul>	SHEW section Power Station Manager Operating and Maintenance Superintendent

		<ul style="list-style-type: none"> <li>• Communities nearby must be provided with information on issues (e.g. opening of diversion weir gates) that affect them timeously on appropriate platforms and on languages they understand.</li> </ul>	
<p><b>Petroleum product spills</b></p>	<p>Ensure that the petroleum product spills are prevented and if not, the impacts are minimised.</p>	<ul style="list-style-type: none"> <li>• All service providers delivering fuel to site should receive induction prior to entering site.</li> <li>• The fuel truck driver should be licensed to transport dangerous goods.</li> <li>• Spill kits must be made available onsite.</li> <li>• Employees must receive training on spill response.</li> <li>• In an event of a spill, contaminated soil must be collected. The contaminated soil should be bioremediated and if cannot be bio-remediated, must be removed and disposed at a hazardous waste disposal site.</li> <li>• Planned and corrective maintenance should be done on all containers/tanks/pipes containing or conveying petroleum product.</li> <li>• Regular visual inspection on bund walls and tanks/pipes containing petroleum product. Action must be taken to repair damaged bund walls or leaking pipes/tanks.</li> </ul>	<p>Power Station Manager Operating and Maintenance Superintendent SHEW</p>



		<ul style="list-style-type: none"> <li>NamPower Spill Response procedure to be implemented.</li> <li>Ruacana emergency response procedure must be complied to.</li> </ul>	
<b>Water use</b>	To ensure that the resources are used sustainably in order to prevent resource depletion	<ul style="list-style-type: none"> <li>Awareness on water and power saving measures should be provided to employees.</li> <li>Planned and corrective maintenance on water taps and pipes.</li> <li>Water meter readings should be analyzed on a monthly basis.</li> <li>Conduct monthly inspection within the power station to identify water leaks.</li> </ul>	Power Station Manager  Operating and Maintenance Superintendent
<b>Noise</b>	Confine noise levels within acceptable limits	<ul style="list-style-type: none"> <li>Proper operation, maintenance of vehicles and equipment.</li> <li>Regular occupational noise monitoring must be conducted.</li> <li>Personal Protective Equipment to be provided to employees.</li> </ul>	Power Station Manager  SHEW Section  Operating and Maintenance Superintendent
<b>Dam wall management</b>	To prevent dam wall failure	<ul style="list-style-type: none"> <li>Prepare and implement a dam inspection and maintenance plan.</li> </ul>	Power station Manager

		<ul style="list-style-type: none"> <li>• Proper management and operation of flap gates to prevent dam wall failure.</li> </ul>	
<b>Biodiversity</b>	To prevent biodiversity loss	<ul style="list-style-type: none"> <li>• Harvesting of plant material or other damage to fauna and flora must be prevented and avoided, and disciplinary measures including dismissal to be put in place.</li> <li>• Capture and release of stranded crocodiles and snakes</li> <li>• Contact details for snake catchers must be displayed on notice boards, easily accessible to employees.</li> <li>• The use of indigenous plants in landscaping must be prioritized over non-indigenous plants.</li> </ul>	Power station Manager  Operating and Maintenance Superintendent
<b>General and Hazardous waste Management</b>	To avoid manage and mitigate potential impacts on the environment caused by wastewater, incorrect storage, handling and general disposal of general and hazardous solid waste.	<ul style="list-style-type: none"> <li>• Waste shall be segregated into separate bins and clearly marked for each waste type in accordance with NamPower Waste Management Procedure.</li> <li>• The NamPower Waste Management Procedure must be complied to.</li> <li>• General waste must be disposed at a registered and licensed waste disposal site.</li> <li>• Bins shall be emptied regularly.</li> <li>• Hazardous waste shall be disposed of at a registered hazardous waste disposal site. Safe disposal certificates</li> </ul>	Power Station Manager  Operating and Maintenance Superintendent

		<p>should be kept onsite and a copy should be emailed to SHEW.</p> <ul style="list-style-type: none"> <li>• Recycling of waste should be promoted.</li> <li>• Sufficient covered waste collection bins shall be available onsite.</li> <li>• Inspect and maintain the waste facilities.</li> </ul>	
<p><b>Hazardous Substances</b></p>	<p>Minimise the risk of impact to the environment through safe storage, handling use and disposal of hazardous substances</p>	<ul style="list-style-type: none"> <li>• Drip trays must be available to contain accidental spills.</li> <li>• Machinery must be properly maintained to prevent oil leaks.</li> <li>• All hazardous substance will be stored in suitable containers as defined in the Material Safety Data Sheets (MSDS).</li> <li>• Containers should be clearly marked to indicate contents, quantities and safety requirements.</li> <li>• Ensure availability of MSDS.</li> <li>• The NamPower hazardous substances management procedure must be implemented.</li> <li>• Ensure all employees are trained on hazardous substances management.</li> </ul>	<p>Power Station Manager</p> <p>Operating and Maintenance Superintendent</p>

		<ul style="list-style-type: none"> <li>• Use and/or storage of materials, fuels and chemicals which could potentially leak into the ground must be controlled in a manner that prevents such occurrences.</li> <li>• All fuel storage tanks should be banded. The banded area must be of sufficient capacity to contain a spill/leak from stored containers, 110% of the total volume.</li> <li>• Ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers.</li> <li>• Flammable materials should be stored in clearly labelled designated areas with safety signage's.</li> <li>• Adequate firefighting equipment shall be made available at all hazardous storage areas.</li> <li>• No smoking shall be allowed within the vicinity of the hazardous storage area.</li> </ul>	
<b>Water quality management</b>	Minimize water and soil pollution	<ul style="list-style-type: none"> <li>• Effluents from the station should be treated first before being released in the environment.</li> <li>• An effluent discharge permit should be obtained from the Ministry of Agriculture, Water and Forestry.</li> <li>• Water monitoring should be conducted as per the program. Corrective and preventative measures must be</li> </ul>	Power station Manager

		identified and implemented if there is an exceedances in the laboratory results.	
<b>CFC's and SF6 gas</b>	Minimize greenhouse effect	<ul style="list-style-type: none"> <li>• Make use of environmentally friendly gases to minimize greenhouse effect</li> <li>• For safety, ensure that SF6 gas cylinders are properly stored and chained in an upright position.</li> </ul>	SHEW section  Power Station Manager
<b>Emergency procedure</b>	Enable a rapid and effective response to all types of environmental Safety and health emergencies.	<ul style="list-style-type: none"> <li>• Emergency numbers to be readily posted on a notice board on site.</li> <li>• NamPower emergency procedures to be consulted in case of emergency.</li> <li>• If a dam wall failure occurs, loss of human life should be prevented.</li> <li>• Warning systems for the opening of the gate must be tested on a frequent basis.</li> <li>• Warning signs must be placed at hippo pool to give warnings to people on the risk of swimming and flooding (when the gates are to be opened). The signs must be translated to a local language.</li> </ul>	Power Station Manager
<b>Prevention of disease</b>	To minimize the spread of HIV/AIDS	<ul style="list-style-type: none"> <li>• Condoms should be made available to the employees.</li> </ul>	Power Station Manager

		<ul style="list-style-type: none"><li>• Support awareness raising campaigns to be conducted on HIV/AIDS prevention, diagnosis, and treatment to reduce the stigma of the disease among employees.</li><li>• Employees to be encouraged to do voluntary HIV testing. HIV results to be kept confidential.</li></ul>	SHEW
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## 8 MONITORING AND AUDITING

Environmental monitoring, audit and inspections must be conducted at the power station. The environmental monitoring, audit and inspections at the power station will cover all management procedures and the requirements of this plan, this will be carried out by the NamPower SHEW section. Monitoring and auditing is important in order to measure the success of proposed mitigation measures and to ensure continuous improvement through continuous review of operation activities. Monitoring, audit and inspection reports detailing the monitoring results and inspection/audit findings shall be prepared by the SHEW section and communicated to the power station management.

**The following activities should be monitored:**

- Water quality
- Occupational Noise

## 9 COMMUNICATION AND REPORTING

Effective communication and reporting are key components in implementing an effective EMP. Reports shall be produced through the course of the implementation in various forms such as: incidents reports; non-compliance reports; audit and inspection reports and environmental monitoring reports safely stored preferably electronically on Power Cloud and be available for review. any other records pertaining to the implementation of this EMP should also be kept by the station.

## 10 RECORD KEEPING

Record keeping is important for the effective implementation of an EMP. A record keeping system must be established to ensure adequate control of updating and readily availability of all documents required for the effective implementation of the EMP. EMP documentation must be kept in both the hard copy and electronic format for safe keeping. These must include but not limited to:

- A copy of an EMP
- EMP implementation action plan
- Induction records;

- Monitoring reports;
- Audit and Inspection reports
- Safe disposal certificates

## **11 NON-COMPLIANCE AND GRIEVANCE PROCEDURES DURING OPERATION**

The power station Manager shall ensure that the employees and external service providers comply with the requirements outlined in this EMP. In the event of non-compliance, the following recommended process shall be followed:

- Non-compliances will be identified during inspections or audits carried out by the SHEW Section and reported to the power station Manager for corrective actions.
- Power station Manager shall notify the employees about the non-compliance.
- Corrective and preventative actions must be implemented on an agreed timeframes.
- Follow – up inspections shall be conducted to assess whether the corrective and preventative actions were implemented effectively.
- A complaints register must be maintained, in which any complaints from the community other stakeholders must be logged. Complaints must be investigated and, if appropriate, acted upon timeously.

## **12 TRAINING**

To ensure a successful EMP effective capacity building and continuous training of operational employees and all others (contractors and sub-contractors) involved in the implementation of the EMP is key. All those responsible for the management, implementation and operation of any aspect of the EMP shall be adequately trained for their role. Training records shall be maintained on site, for all employees, to provide evidence for auditing/inspection purposes.

## **13 ENVIRONMENTAL REVIEW AND UPDATE OF THE EMP**

In terms of review, the environmental unit shall review the EMP to assess its effectiveness and relevance after three years; after a reportable incident or significant non-compliance and



or following an addition/update or change to the EMP. The EMP shall also be reviewed to evaluate environmental controls and procedures to make sure they are still applicable to the activities being carried out. When reviewing the environmental team should consider all the non-compliances reported, corrective action reports and all the data collected and analysed onsite.

## **14 CONCLUSION**

All management measures and legal requirements outlined in this EMP should be complied with to ensure environmental compliance by all parties undertaking the operational activities. This will ensure that potential negative impacts are identified, avoided or mitigated.