



EIA FOR THE PROPOSED ENCROACHER BUSH BIOMASS POWER PROJECT IN NAMIBIA

**Environmental Management Plan for the Otjikoto
Biomass Power Station and Overhead Powerline**

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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	
ADT	Average Daily Traffic
BACI	Before-After-Control-Impact
CF	Capacity Factor
dB	Decibels
EAPAN	Environmental Assessment Professionals Association of Namibia
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
GHG	Green House Gases
ha	Hectare
IFC	International Finance Corporation
kV	Kilo Volt
MAWL	Ministry of Agriculture, Water and Forestry
MEFT	Ministry of Environment, Forestry and Tourism
MPs	Management Plans
MWe	Megawatts electrical
NamPower	Namibia Power Corporation (Pty) Ltd
NOx	Nitrogen Oxides
PM	Particulate Matter
SHE	Safety, Health and Environment
SHEQ	Safety, Health, Environment and Quality
SOx	Sulphur Oxides
tpa	Tonnes per annum

1. INTRODUCTION

This Environmental Management Plan (EMP) documents a series of individual management plans (MPs) which are designed to meet legal requirements, avoid, minimise, or manage the impacts associated with the implementation of the proposed Encroacher Bush Biomass Power Project (the Project). This EMP specifically relates to the following components of the Project:

- Construction of a 40 MWe Biomass Power Station at the Otjikoto site, near Tsumeb.
- Construction of a Transmission substation and connection to the national grid via an overhead powerline including rerouting of existing power lines on the site.

An Environmental Impact Assessment (EIA) Report has been produced by SLR Environmental Consulting (Namibia) (Pty) Ltd (SLR) to assess the potential environmental issues associated with the Project that the Namibia Power Corporation (Pty) Ltd (NamPower) is proposing.

The management plans recommended by the individual specialists form part of the assessment process and have been compiled into this EMP.

The EMP provides the commitments, which form the 'environmental contract' between NamPower and the Ministry of Environment and Tourism (MET).

A separate EMP was developed for the following components of the Project:

- Harvesting, processing and transportation of the encroacher bush as fuel source to the proposed Otjikoto Biomass Power Station.

1.1 KEEPING THE EMP CURRENT

It is the intention that this EMP should be seen as a "living document" that will be amended during the operational phase, as the activities might change or new ones may be introduced.

Should a listed activity(s) as defined in the Environmental Impact Assessment Regulations: Environmental Management Act (EMA), 2007 (Government Gazette No. 4878) be triggered as a result of future modifications or changes at the Otjikoto Biomass Power Station or powerlines, this EMP will be required to be updated through another EIA process as stipulated in the EMA and associated Regulations.

1.2 DETAILS OF THE PERSON WHO PREPARED THE EMP

SLR, the independent firm of environmental consultants who compiled the Encroacher Bush Biomass Power Project EIA Report has also compiled this EMP, with input from the various Environmental Specialists as presented in the EIA Report.

Werner Petrick, the EIA Project Manager has more than twenty years of relevant experience in conducting and managing EIAs, compiling and implementing EMPs, and Environmental Management Systems. Werner is certified as lead environmental practitioner and reviewer under the Environmental Assessment Professionals Association of Namibia (EAPAN). Immanuel Katali, the project assistant, holds an Honours degree in

Geography and Environmental Studies and Sociology and has 3 years of experience in the environmental management discipline. Immanuel is certified as an ordinary member under the Environmental Assessment Professionals Association of Namibia (EAPAN).

Chris Herbert is a Chartered Town Planner with over twenty (20) years of experience in both planning and EIA development. Chris has worked on a wide range of waste, energy, and minerals proposals. Recent biomass experience in the UK includes being the lead EIA professional on a 177,000 tpa waste wood biomass CHP plant for a German company, MVV.

Marc Scourfield has over 20 year’s industrial experience and is a Principal Process engineer in the Process Engineering & Process Safety Group. Marc has extensive operational and process engineering experience in energy from waste & biomass power plants, waste treatment technologies, and EHS experience in the oil and gas and waste management industries.

2. SCOPE OF THE EMP

The components of the EMP are included in Table 2-1 below.

TABLE 2-1: CONTENT OF THE EMP

EIA Regulation requirement	EMP Reference
Details of the persons who prepared the EMP and the expertise of those persons to prepare an environmental management plan.	Section 1.2
Environmental legislation relevant to this project.	Section 3
Project Description	Section 4
A description of the aspects and impacts of the Power Station and Overhead power line activities that are covered by the EMP.	Section 5
Overall objectives.	Section 6
Information on any proposed management or mitigation measures to address the environmental impacts that have been identified in a report contemplated by these regulations, including environmental impacts or objectives in respect of – i. Planning and design; ii. Construction activities; iii. Operation or undertaking of the activity; iv. Rehabilitation of the environment; and v. Closure, where relevant.	Section 7
An identification of the people who will be responsible for the implementation of the mitigation measures.	Sections 7 and 8
Proposed mechanisms for monitoring compliance with the EMP and reporting on it.	Section 9

3. ENVIRONMENTAL LEGISLATION

This section outlines Namibian legislation and international criteria and standards that are relevant to the proposed Otjikoto Biomass Power Station and overhead powerline.

Relevant legislation and standards currently in force in Namibia include the following:

- Environmental Management Act (Act 7 of 2007) and Regulations promulgated in terms of the Environmental Management, Act 7 of 2007
- The Forest Act (Act 12 of 2001) and Regulations (2015)
- The Soil Conservation Act (Act 76 of 1969) & the Soil Conservation Amendment Act (Act 38 of 1971)
- The Water Act, No. 54 of 1956 and Water Resources Management Act, No.11 of 2013
- Electricity Act (Act. of 2007)
- National Heritage Act 27 of 2004
- Labour Act 11 of 2007
- Nature Conservation Ordinance of 1975
- Atmospheric Pollution Prevention Ordinance 11 of 1976
- Draft Pollution Control and Waste Management Bill of 1999
- Public Health Act 36 of 1919

The development of the proposed project may be reliant on finance through loans from a lending institution and as such there is requirement for the proposed project to be undertaken in such a manner that it complies with the European Investment Standards, World Bank Group Equator Principles, and International Finance Corporation (IFC) Performance Standards.

The EIA process assessed the impacts of the proposed project in terms of the relevant Namibian environmental legislative requirements. Furthermore, the EIA process followed is considered to be sufficiently robust to conform to the Equator Principles and IFC Performance Standards.

For more details on the relevant Acts, Policies and Standards, refer to Section 2 in the EIA Report and legal summaries in Appendices 5 to 13.

3.1 ENVIRONMENTAL PERMITS AND APPROVALS

Before the operations can commence, NamPower will need to acquire a number of permits and certificates as outlined in Table 3-1 below.

TABLE 3-1: LIST OF ENVIRONMENTAL PERMITS/APPROVALS

Aspect	Legislation	Permits/Certificates/Authorizations	Regulator
EIA	Environmental Management Act (Act 7 of 2007)	Environmental Clearance Certificate for the proposed Otjikoto Biomass Power Station and associated activities, as well as the overhead powerline (refer to section 2.1.2.1 of the EIA Report for relevant listed activities).	Ministry of Environment, Forestry and Tourism *MEFT)
Atmospheric pollution	Atmospheric Pollution Prevention Ordinance, 1976	<p>This requires, in terms of section 5 (1), the registration of any premises, which results in so-called noxious or offensive gases authorising the holder to carry on the process in or on that premises.</p> <p>It also requires a provisional registration certificate authorising the erection of any building or plant that is intended to be used for the purpose of carrying on any scheduled process.</p> <p>The whole of Namibia has been declared a controlled area.</p>	Ministry of Health and Social Services / MEFT
Occupational health and safety issues, mostly compliance, some requiring permits or notification	Labour Act, 2007	<p>This law, under the Regulations relating to the Health and Safety of Employees at Work, 1997, stipulates various occupational health and safety requirements, some of which are to be complied with rather than related to obtaining prior approval. In this regard, we would like to refer to the following:</p> <ul style="list-style-type: none"> • Registration of what is referred to as “factories”, which term is not defined. See section 19 of the Regulations. • Notification to the Chief Inspector (Ministry of Labour) 30 (thirty) days prior to the commencement of building or construction work. See section 20, Regulations. 	Ministry of Labour, Industrial Relations and Employment Creation

Aspect	Legislation	Permits/Certificates/Authorizations	Regulator
Disturbance of archaeological objects.	National Heritage Act, 2004	Requirement to obtain consent, in terms of section 55, before altering or developing any land in which an archaeological object or palaeontological site or a meteorite is believed to be located. This is only relevant in the event of a chance find.	National Heritage Council of Namibia
Consumer installation permits	Petroleum Products and Energy Act, 1990	This law, through the Petroleum Products Regulations 2000 (Government Notice 155 of 2000), makes provision for retail and wholesale licences for fuel and diesel, which must be licensed, but also for authorisations by certificate of a so-called “consumer installation”. A “consumer installation” means a petrol or diesel installation “for the purpose of dispensing fuel into own or hired petrol or diesel consuming equipment”.	Ministry of Mines and Energy
Water Abstraction	The Water Act No. 54 of 1956 and Water Resources Management Act No. 11 of 2013	The proposed Otjikoto Biomass Power Station site is within the Subterranean Water Control Area and therefore a permit to abstract water would be required from	Ministry of Agriculture Water and Land Reform (Department of Water Affairs and Forestry)
Wastewater permit	Pollution Control and Waste Management Bill	Permit required for effluent discharge	

4. PROJECT DESCRIPTION

This section provides a summarised description of the sequence of the proposed project phases and activities of the proposed Otjikoto Biomass Power Station operation and the powerline including high level specifications. A detailed project description is included in section 4 of the EIA Report.

4.1 PROJECT OVERVIEW

The proposed Project will consist of the following components:

- Construction and operation of a 40 MWe Biomass Power Station at the Otjikoto site;
- Harvesting and processing activities of the encroacher bush to suitable fuel specification, including all temporary storage. The annual fuel requirements i.e. wood chips, on a dry basis, for a 40 MWe biomass plant would be:
 - 175,000 tpa at $\pm 60\%$ capacity factor
 - 200,200 tpa at $\pm 70\%$ capacity factor
 - 245,000 tpa at $\pm 85\%$ capacity factor
- Logistics, transportation and stock piling of the wood chips; and
- Transmission substation and connection to the national grid via an overhead powerline with a maximum rating of 66 kV.

4.2 PROJECT LOCATION

The location for the proposed Otjikoto Biomass Power Station site is approximately 7 km northwest of Tsumeb, in the Oshikoto Region, flanked by Trunk Road (TR) 1/10 (i.e. B1) on the southern side and District Road (DR) 3007 on the western side. The site, which is owned by NamPower, is strategically located in close proximity to NamPower's existing Otjikoto substation. Refer to Figure 4-1 for the location of the proposed Otjikoto Biomass Power Station site in relation to the existing substation and the town of Tsumeb.



FIGURE 4-1: LOCALITY MAP FOR THE PROPOSED OTJIKOTO BIOMASS POWER STATION SITE

4.3 CONSTRUCTION PHASE

The following facilities will be required as a minimum for the construction phase of the Otjikoto Biomass Power Station and overhead power lines:

- Contractors lay down areas;
- Workshops, maintenance areas, stores, wash bays, lay-down areas, batch plant, fuel handling and storage area, offices, change houses;
- Access road and parking areas. Access to the site during construction will be from DR3007 (see Figure 4-1);
- Ablution facilities for contractors;
- Handling and storage area for construction materials (paints, solvents, oils, grease);
- Generators for temporary power supply;
- Stockpiles;
- Security provisions, i.e. perimeter fencing;
- Waste collection and storage areas; and
- Temporary power and water supply infrastructure.

These facilities will either be removed at the end of the construction phase or incorporated into the layout of the operational Otjikoto Biomass Power Station.

Construction activities will take place during the establishment and preparation of the site for the Power Station and the overhead powerlines. Significant activities that are expected to take place during construction will include, but not limited to, the following:

- Appoint and manage contractors, labours, etc.;
- Site preparation and enabling works, including clearing, and grubbing, levelling of area and other earth moving activities. The total area that needs to be cleared for infrastructure at the project site is approximately 44 ha;
- Drilling and pilling;
- Stockpiling topsoil and sub-soil;
- Foundation excavations and hole excavation for the powerline;
- Backfill of material from borrow pits;
- Opening and management of borrow pits;
- Setting up contractors' laydown areas;
- Establishing access road from the DR3007;
- Delivery storage and handling of materials such as sand, rock, cement, chemical additives, etc.;
- General building/construction activities i.e. foundation and substructure works and structure works including, amongst others: mixing and pouring of concrete; steelwork erection; operation of construction vehicles and machinery; refuelling of machinery; civil, mechanical and electrical works; painting; grinding; welding; etc.;
- Construction of onsite 11/66kV substation
- Rerouting of the existing 132kV, 11kV and 33kV overhead powerlines that currently traverse the site.
- Construction of a new 132kV power line, operated at 66kV, between the new Otjikoto Biomass Power Station and the Otjikoto Substation
- Handling and storage of hazardous material;
- Handling, storage, and disposal of hazardous waste;
- Handling, storage, and disposal of non-hazardous waste; and
- Surveying and setting out of the final powerline route.

The construction will be done by appointed contractors, administered by NamPower. Approximately 300 jobs in total would be created during the 35 months construction phase of the project. The employment of local people in close proximity to the selected site during the construction phase would be preferred, particularly for unskilled and semi-skilled labour works. There will be no staff accommodation on site.

At this stage in project planning, it is assumed that water for construction activities will be abstracted from the on site borehole(s) and it is assumed that the power supply will be from on-site generators and / or an application will be made for the temporary supply from the relevant distributor in the region.

The types of waste that could be generated during the construction phase include:

- hazardous and non-hazardous industrial waste;
- general waste (domestic and other non-hazardous waste); and
- medical waste

Construction commencement is subject to regulatory approval i.e. approval of the EIA, and issuing of an Environmental Clearance Certificate (ECC) by the MEFT. Furthermore, specific governance approval and economic considerations will dictate the start of construction. Subject to the ECC approval by MEFT, NamPower intends to commence with construction as soon as possible upon attaining an ECC and depending on approval from the Central Procurement Board of Namibia (CPBN). Construction is expected to take approximately 35 months to complete.

4.4 OPERATIONS PHASE

4.4.1 OTJIKOTO BIOMASS POWER STATION

The proposed technical description of the Otjikoto Biomass Power Station is as follows:

- Size: 40 MWe (net export capacity);
- Grate fired boiler technology;
- Air cooled condenser;
- Net electrical efficiency at full load approximately 28%-30%;
- Capacity factor: 70%-85%;
- Availability: 92%; and
- Design lifetime: 25 years, 30 years is considered typical.

The proposed Power Station will have a maximum footprint of 10 hectares without ash storage. With onsite ash storage, fuel stockpiling, and receiving facilities, this is expected to be approximately 25 ha. It is estimated that the Power Station stockpile will need to have between a seven (7) day to a sixty (60) day capacity in order for it to operate at full capacity, and accommodate any interruptions in the fuel supply.

The Power Station is likely to consist of, but not be limited to, the following primary components:

- fuel handling and loading area;
- boiler house;
- turbine hall;
- electrical 11/66kV sub-station ;

- electrical switchroom & distribution transformers;
- compressor house;
- ash storage;
- air cooled condensers;
- stack (maximum height up to 75 m high), filters, silos, and emission controls;
- water treatment and sprinkler tanks;
- effluent treatment;
- workshops;
- offices, welfare, and parking facilities;
- weighbridge area;
- wood chips unloading bay;
- wood chips storage areas/barns;
- internal access roads; and
- surface water attenuation features.

The configuration of a typical biomass combustion plant is shown in Figure 4-2. The proposed operation of the plant is set out below:

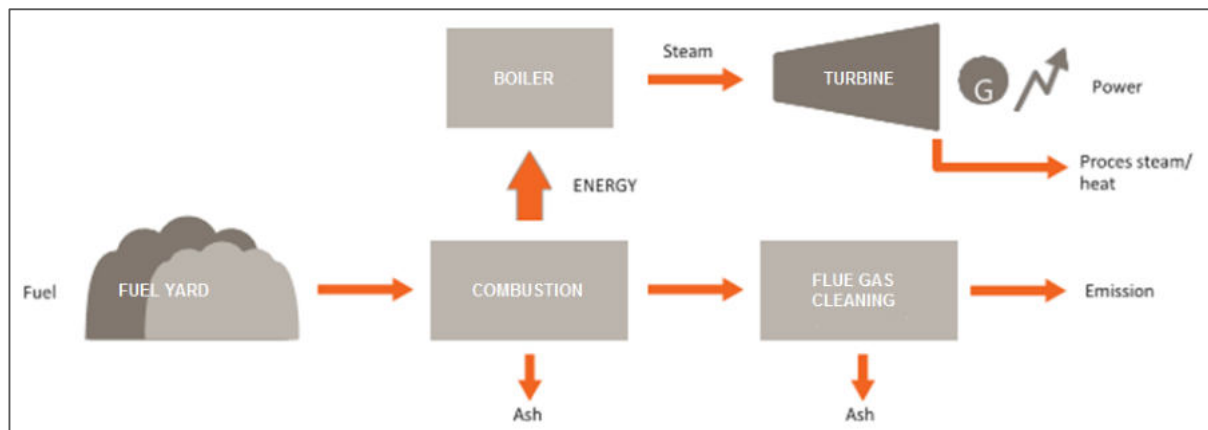


FIGURE 4-2: CONFIGURATION OF A BIOMASS COMBUSTION PLANT (COWI, 2017)

- The biomass fuel reception, including quality control, will be open for receiving biomass 12 hours per day from Monday to Saturday. The fuel trucks will haul the fuel to the unloading bay. A portion of the fuel will be dumped on the fuel yard concrete slab. Manually operated front loaders will be available for feeding fuel into the fuel receiving area.
- All fuel will be automatically transported by conveyers into a storage facility with a capacity of 4 days. The storage system operation will be managed on the principle that the first fuel that enters will be the first fuel to be fed to the boiler (first in first out).
- Grate combustion technology will be used to convert biomass to steam, and a steam turbine to produce electricity. If required, an air emissions clean-up system will be used to lower emissions to air quality standards.
- Ash will be transported by haul truck from the ash silo to an onsite ash dump facility or for other use by third parties.

4.4.1.1 Biomass Fuel Yield Estimates

Encroacher bush, which is the only intended fuel source for the proposed Otjikoto Biomass Power Station, will be harvested within the identified harvesting area surrounding the proposed Otjikoto Biomass Power Station.

The Biomass Power Station and the associated flue gas cleaning system is designed according to the specifications of the intended fuel. The proposed 40 MWe biomass plant will be fuelled by the combustion of P100 woodchips produced from encroacher bush harvested within a 100 km radius of the Project site. The Power Station would require approximately 245,000 tonnes of wood chips per annum (on a dry basis) at an 85% capacity factor.

The expected moisture content of the delivered biomass woodchips as fuel to the biomass power station will vary between 45% moisture content in the rainy season to a minimum of 5% in the dry winter months. Thus, the Otjikoto Biomass Power Station will need to be designed to handle a fuel source with high moisture variation in its boiler.

TABLE 4-1 below shows the average fuel requirements (dry basis) for the power station operating at the designed capacity factor of 70% and the worst case (base load) Capacity Factor (CF) 85%. The table assumes the following:

- Effective biomass per hectare (Dry basis) 12.65 t/ha
- Calorific Value of Fuel (Dry Basis) approximately 14.7 to 16.7 MJ/kg

TABLE 4-1 : TYPICAL BIOMASS POWER STATION FUEL REQUIREMENTS

Parameter	40 MWe
Hourly fuel demand (100% MW _{th})	26.89 tonnes/hr
Annual fuel demand (85% CF)	245 000 tpa
Effective biomass per hectare (Dry basis)	12.65 tonnes/ha
Calorific Value of Fuel (Dry Basis)	Approx. 14.7 - 16.7 MJ/kg
Harvested area required p.a.	Approx. 15 850 ha/annum

4.4.1.2 Ash

During the combustion process, two different types of ash with different physical and chemical characteristics will be produced i.e. fly ash and bottom ash. The fuel analysis completed during the feasibility phase, shows that the total ash represents approximately 3-6% of the biomass fuel. Fly ash is the fine ash that is suspended in the flue gas and adheres to the surfaces of heat exchangers and is also captured in the particulate filtration system. Bottom ash is the ash that exits the grate into the discharging system. Depending on how the plant will be configured some of the fly ash could be mixed with the bottom ash via the conveyor system and ash discharger, or the mixing can be undertaken externally.

Laboratory tests on ash from a similar power station using encroacher bush determined that both the bottom ash and the fly ash are classified as non-hazardous. The potential uses of the ash will be influenced by its chemical

and physical characteristics. Section 5.5 of the EIA Report provides a description of the proposed options for the ash utilisation or disposal.

4.4.1.3 Otjikoto Biomass Power Station Stack Parameters and Flue Gas Cleaning

During combustion, various kinds of impurities are generated some of which are found in the flue gas, i.e. the exhaust gas coming from the boiler. Most of these are related to the composition of the biomass and include; particles from ash, Nitrogen oxides (NO_x) from nitrogen, Sulphur oxides (SO_x) from sulphur, carbon monoxide (CO), and greenhouse gases (GHG) such as CO₂, methane (CH₄), and nitrous oxide (N₂O), etc. Particulates are the main pollutant of concern from wood boilers.

The plant design parameters, based on 6% oxygen, are provide in Table 4-2 below.

TABLE 4-2: POWER STATION STACK PARAMETERS

Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exhaust Vol.-Flow (m ³ /s)	Exit Temp (°C)
60 - 75	1.75	15	36.08	125

An optimum stack height was calculated, based on Good Engineering Practice (GEP) as part of the plant design (see the Air Quality, Climate Change and Health Risk Assessment report included in Appendix 5 of the EIA). Dispersion simulations were conducted to demonstrate the reduction in ground level concentrations (GLCs) as a result of a GEP stack design.

A cleaning system, such as bag house filters or electrostatic precipitators, will be installed for the removal of particulate matter (PM).

If the subsequent emission values require further flue gas cleaning, based on the monitoring requirements, NO_x emission can be reduced by retrofitting a selective non-catalytic reduction (SNCR) system in the combustion chamber of the boiler or utilising flue gas recirculation.

4.4.1.4 Water Requirements

The water demand for the proposed Otjikoto Biomass Power Station is determined by the project design and is directly linked to the size and selected technology. The demand for the 40 MWe Otjikoto Biomass Power Station option is summarised in Table 4-3.

TABLE 4-3 : OTJIKOTO BIOMASS POWER STATION WATER REQUIREMENTS

TECHNOLOGY TYPE	PLANT POWER (MW)	PLANT WATER CONSUMPTION (M ³ /HR)	WASTE WATER DISCHARGE (M ³ /HR)
Grate	40	5 - 10	2.2 - 5

4.4.1.5 Workforce and Housing

During operations, NamPower anticipates that approximately 62 employees will be required to run a 40 MWe power station. Tsumeb is a mining and processing hub, it is therefore likely that some skilled, semi-skilled and unskilled personnel will be sourced locally for operations.

Should there be a need for highly skilled personnel which cannot be recruited locally, they will be sourced regionally or nationally. No onsite housing facilities is planned for the employees during the operational phase. Staff will reside in nearby towns or villages and commute to and from site.

4.4.2 POWERLINES

The proposed Otjikoto Biomass Power Station will be connected to the national grid at the existing Otjikoto Substation via a new transmission line operated at 66 kV, approximately 3 km in length. The tie-in at the Otjikoto Substation will be on an existing space in the feeder bay section in the 66 kV yard. On the Otjikoto Biomass Power Station side there will be a new substation to step up the voltage from 11 kV to 66 kV. This substation will be close to the generator building of the Otjikoto Biomass Power Station.

An existing 132 kV transmission line with lattice tower structure crosses the proposed plant site; this line will need to be relocated. There are also 11kV and 33kV lines with wooden pole structures that will need to be relocated in collaboration with Cenored.

Currently, in this phase of the project, it is planned to be re-routed to the north and east of the plant site, and will then run parallel to the new transmission line (refer to Figure 4-3), rerouting it closer to the southern boundary is also being considered.



FIGURE 4-3: PROPOSED OTJIKOTO BIOMASS POWER STATION SITE AND EXISTING POWERLINES IN THE AREA.

Note: the blue line represents the powerline to be relocated.

4.5 DECOMMISSIONING PHASE

NamPower must ensure that adequate rehabilitation and closure of the proposed Otjikoto Biomass Power Station and overhead powerline takes place following the end of life of the proposed project. Socio-economic aspects relating to job losses, etc. also need to be considered at closure. Decommissioning can be considered a reverse of the construction phase with the demolition and removal of the majority of infrastructure and activities very similar to those described with respect to the construction phase. It is currently unknown whether the plant will continue to operate after the design life of between 25 and 30 years is completed as refurbishment may be economically considered at that stage.

The closure phase will occur after the cessation of all decommissioning activities. Relevant closure activities are those related to the aftercare and maintenance of remaining site and any associated structures.

5. ENVIRONMENTAL ASPECTS AND POTENTIAL IMPACTS

Understanding the biophysical and human environment in which the proposed Otjikoto Biomass Power Station, associated activities, and overhead powerline will be implemented is the first step to understanding the environmental impacts. The next step is to identify the environmental aspects during all project phases that give rise to the impacts. For example, the site preparation i.e. site clearing, has more than one environmental aspect associated with it; namely, noise, dust generation, disturbance to biodiversity and archaeology, etc. All of these aspects have the potential to cause impacts on the environment, or third parties in different ways. Successful management will be gauged by how well NamPower and their relevant contractors; avoid, minimise, or mitigate all the impacts associated with each environmental aspect.

The current environment was studied as part of the EIA process for the proposed Encroacher Bush Biomass Power Project, and environmental aspects and potential environmental impacts associated with the activities identified. All the facilities and activities associated with the proposed Otjikoto Biomass Power Station and the overhead powerline are described in the EIA Report for the Proposed Encroacher Bush Biomass Power Project in Namibia and summarized in section 4 of this EMP.

Potential environmental impacts were identified by SLR in consultation with IAPs, regulatory authorities, specialist consultants (see Team of Specialists in section 1.4.1 of the EIA Report), and NamPower. The impacts were assessed under the issue headings in Chapter 7 of the EIA Report. Impacts were considered in a cumulative manner, where possible, such that the impacts of the proposed Project were assessed in the context of the baseline conditions described in Section 6 of the EIA Report.

Table 5-1 provides a summary of the environmental aspects associated with the proposed Otjikoto Biomass Power Station and overhead powerline, how they could impact the biophysical and human environments, and their assessment ratings in the unmitigated and mitigated scenarios.

TABLE 5-1: DESCRIPTION OF ENVIRONMENTAL ASPECTS AND POTENTIAL IMPACTS ASSOCIATED WITH PROPOSED OTJIKOTO BIOMASS POWER STATION AND OVERHEAD POWERLINE

Environmental Component	Project Phase Aspects			Potential Impacts	Assessment Significance Rating	
	Construction	Operational (mainly related to the Otjikoto Biomass Power Station)	Decommissioning and Closure		Unmitigated	Mitigated
Traffic	<ul style="list-style-type: none"> Vehicle movement associated with earth moving activities. Transportation of construction workers. Deliveries, including abnormal vehicles. 	<ul style="list-style-type: none"> Deliveries, including chemicals for the Otjikoto Biomass Power Station. Transportation of operational personnel to and from the Otjikoto Biomass Power Station, on a daily basis. Collection activities, in particular, waste and ash from the plant. 	<ul style="list-style-type: none"> Vehicle movement associated with demolition and rehabilitation activities. Transportation of workers. 	Impact on road capacity and road condition/deterioration – TR 1/10	M	L
				Impact on safety of road users at the TR 1/10 and DR 3007 Intersection	M	L
Soils	<ul style="list-style-type: none"> Soil compaction through vehicle movement. Removal of soil for infrastructure development. Oil and fuel spills from equipment and vehicles used. 	<ul style="list-style-type: none"> Soil compaction through vehicle movement. Removal of soil for infrastructure development. Deposition of ash material during the operational phase in the plant area. Oil and fuel spills from equipment and vehicles used. Clearing activities – i.e. removal of vegetation. 	<ul style="list-style-type: none"> Soil compaction through vehicle movement. Oil and fuel spills from equipment and vehicles used. 	Soil compaction potentially affecting plants and animals above the soil surface, as well as soil macro-fauna and microorganisms below the soil surface.	M	L
				Loss of the natural functioning of the soil as a growth medium.	M	L
				Soil contamination through the deposition of ash material.	H	L
				Soil contamination through fuel and oil spills.	M	L
Biodiversity	<ul style="list-style-type: none"> Activities associated with clearing of 	<ul style="list-style-type: none"> Possible pollutants, i.e. chemicals used at the 	<ul style="list-style-type: none"> General demolition and rehabilitation activities 	Loss of habitat, destruction of animals and plants and	M	L

Environmental Component	Project Phase Aspects			Potential Impacts	Assessment Significance Rating	
	Construction	Operational (mainly related to the Otjikoto Biomass Power Station)	Decommissioning and Closure		Unmitigated	Mitigated
	existing natural bush before construction. <ul style="list-style-type: none"> • Various construction activities causing general disturbance. • Erection of a new overhead powerline. • Oil and fuel spills from equipment and vehicles used. 	Otjikoto Biomass Power Station, ash from the plant, sewage, etc. causing impacts to biodiversity habitats and populations. <ul style="list-style-type: none"> • Potential overhead powerline impacts on birds. 	<ul style="list-style-type: none"> • General disturbance • Oil and fuel spills from equipment and vehicles used. 	general disturbance of biodiversity.		
				Collisions and electrocution of birds on powerline structures.	L	L
Surface Water	<ul style="list-style-type: none"> • Spillages of hydrocarbons, paints, etc. during construction activities. 	<ul style="list-style-type: none"> • Pollutants, i.e. chemicals used at the Otjikoto Biomass Power Station, ash from the plant, sewage, etc. • Hydrocarbon spills from vehicle movement during operation. • New infrastructure development. 	<ul style="list-style-type: none"> • Spillages of hydrocarbons during decommissioning activities. 	Decrease in downstream surface water runoff due to the Otjikoto Biomass Power Station and associated activities.	L	L
				Contamination of surface water from pollutants at the Otjikoto Biomass Power Station and associated activities.	H	L
				Contamination of surface water from ash from the Otjikoto Biomass Power Station ending up in the runoff.	H	L
Groundwater	<ul style="list-style-type: none"> • Spillages of hydrocarbons, paints, etc. during construction activities. 	<ul style="list-style-type: none"> • Water abstraction for the Otjikoto Biomass Power Station. • Pollutants, i.e. chemicals used at the Otjikoto Biomass Power Station, ash from the plant, sewage, etc. 	<ul style="list-style-type: none"> • Spillages of hydrocarbons during decommissioning activities. 	Impacts of groundwater due to over abstraction of the underlying aquifer.	L	L
				Contamination of groundwater from pollutants at the Otjikoto Biomass Power Station and associated activities.	H	L

Environmental Component	Project Phase Aspects			Potential Impacts	Assessment Significance Rating	
	Construction	Operational (mainly related to the Otjikoto Biomass Power Station)	Decommissioning and Closure		Unmitigated	Mitigated
		<ul style="list-style-type: none"> Water treatment activities i.e. release of brine. 		<p>Seepage of effluent i.e. discharged brine, from the water treatment plant impacting the water quality in the underlying aquifer.</p> <p>Leaching of ash constituents from the onsite piles, impacting the underlying aquifer.</p>	M	L
Air Quality	<ul style="list-style-type: none"> Exhaust fumes from vehicles and generators. Construction / activities, including earthworks, general construction activities, vehicle movement, etc. causing the generation of dust. 	<ul style="list-style-type: none"> Vehicle entrained dust from paved roads. Material handling and storage causing dust Otjikoto Biomass Power Station stack emissions i.e. combustion. Exhaust fumes from vehicles and generators. Ash disposal activities. 	<ul style="list-style-type: none"> Exhaust fumes from vehicles and generators. Demolition activities. Decommissioning activities i.e. blasting during the demolition of infrastructure, handling and disposal of building waste causing dust.. 	<p>Air pollution i.e. nuisance impacts and third party health impacts including the following:</p> <ul style="list-style-type: none"> Construction phase – TSP, PM₁₀ & PM_{2.5}. Operational – PM₁₀, PM_{2.5}, SO₂ and NO₂. 	M	L
Noise	<ul style="list-style-type: none"> Site preparation & establishment. General construction activities. Earthworks for all surface infrastructure. Construction of foundations. Equipment maintenance. Access road construction. 	<ul style="list-style-type: none"> General site management activities. Off-loading of biomass. Material handling. Equipment maintenance. Vehicle movements. Waste management. Water management. Support services and amenities. 	<ul style="list-style-type: none"> Demolition. General decommissioning and rehabilitation activities. Earthworks. Vehicle movements. Support services and amenities. 	<p>Noise pollution – impact to third parties i.e. nuisance.</p>	L	L

Environmental Component	Project Phase Aspects			Potential Impacts	Assessment Significance Rating	
	Construction	Operational (mainly related to the Otjikoto Biomass Power Station)	Decommissioning and Closure		Unmitigated	Mitigated
	<ul style="list-style-type: none"> • Vehicle movement. • Generators. • Other support services and amenities. 					
Archaeology	<ul style="list-style-type: none"> • Site preparation and establishment. • Earthworks for all surface infrastructure. • Soil stripping and stockpiling. • General construction activities. • Access road construction. • Vehicle movements. 	<ul style="list-style-type: none"> • General operational activities. 	<ul style="list-style-type: none"> • N/A 	Damage to archaeological resources.	L-M	L
Visual	<ul style="list-style-type: none"> • Site preparation & establishment. • Earthworks for all surface infrastructure. • Soil stripping and stockpiling. • General construction activities. • Scaffolding & cranes • Access road construction. • Vehicle movements. 	<ul style="list-style-type: none"> • General operational activities. • Transport systems. • Power generation plant, particularly the stacks. • Waste management. • Support services and amenities. 	<ul style="list-style-type: none"> • General demolition and rehabilitation activities. • Earthworks. • Scaffolding & cranes. • Waste management. • Vehicle movements. 	Visual Impact to third parties.	L	L

Environmental Component	Project Phase Aspects			Potential Impacts	Assessment Significance Rating	
	Construction	Operational (mainly related to the Otjikoto Biomass Power Station)	Decommissioning and Closure		Unmitigated	Mitigated
Socio-economic	<ul style="list-style-type: none"> Community resilience and population influx during construction. New hazardous activities and infrastructure Community's safety, health, and security. Employment during the construction phase. 	<ul style="list-style-type: none"> Operations of the new Otjikoto Biomass Power Station and fuel supply. Employment during operations. Hazardous infrastructure. 	<ul style="list-style-type: none"> Closure of the plant. 	Hazardous excavation and infrastructure that could impact the safety of third parties.	H	L
				Economic impacts associated with the Otjikoto Biomass Power Station.	H+	H+
				Job creation and skills development.	H+	H+
				Community resilience to population influx.	H	M

6. OVERALL ENVIRONMENTAL OBJECTIVES

The following overall environmental objectives have been set for the proposed Encroacher Bush Biomass Power Project:

- To comply with national legislation and standards, as well as relevant international standards, for the protection of the environment.
- To comply with corporate sustainable development policies and objectives.
- To limit potential impacts on biodiversity through the minimisation of the footprint, as far as practical, and the conservation of residual habitat within the Otjikoto Biomass Power Station and powerline development areas.
- Conservation of protected tree species.
- To protect soils and groundwater resources through the implementation of measures for spill prevention and clean-up.
- To protect cultural heritage by implementing a chance find procedure.
- To ensure the legal and appropriate management and disposal of general and hazardous waste, through the implementation of a strategy for the minimisation, recycling, management, temporary storage, and removal of waste.
- To minimise the potential for dust emissions through the implementation of dust control measures.
- To minimise the potential for noise disturbance in surrounding areas.
- To minimise the potential for visual disturbance in surrounding areas.
- To avoid potential impacts on the safety of third parties through appropriate site access control.
- To develop, implement and manage monitoring systems to ensure good environmental performance with respect to the following: groundwater, surface water, air quality, noise, biodiversity and soil.
- To prevent pollution and undertake appropriate clean up if incidents occur.
- To support and encourage environmental awareness and responsibility amongst all employees and service providers.
- To provide and promote appropriate environmental education and training for all NamPower employees and service providers.
- To ensure that all the construction contractors adhere to the relevant management commitments.
- To keep surrounding communities informed of activities through appropriate, constructive communication.

It is recognised that NamPower has a “Safety, Health, Environmental and Quality (SHEQ) Management System” in place. The commitments in this EMP need to be incorporated into the SHEQ Management System, where relevant for the Biomass Power Project. A copy of the NamPower SHEQ Policy Statement is attached as Appendix 3 of the EIA Report.

7. MANAGEMENT PLANS FOR THE OTJIKOTO BIOMASS POWER STATION AND POWERLINE

The Management Plans (MPs), listed in the table below, are applicable to all the relevant Otjikoto Biomass Power Station and powerline activities. The MPs follow in the subsequent sections.

TABLE 7-1: VARIOUS MANAGEMENT PLANS

Number	Various Management Plans
7.1	Encroacher Bush Biomass Power Project General MP
7.2	Biodiversity MP
7.3	Soil MP
7.4	Groundwater MP
7.5	Surface water MP
7.6	Archaeology MP
7.7	Noise MP
7.8	Traffic MP
7.9	Air Quality MP
7.10	Third Party Health Risk MP
7.11	Visual MP
7.12	Socio-Economic MP
7.13	Climate Change Adaption and Management Measures

7.1 Biomass Power Project

General MP



7.1 GENERAL MANAGEMENT PLAN

7.1.1 Objectives

- To define roles and responsibilities for the implementation of the EMP.
- To ensure that channels of communication are maintained over the over the life of the Encroachers Bush Biomass Power Project with surrounding landowners and other relevant stakeholders.
- To ensure that public complaints are recorded and addressed.
- To ensure that all persons working at the project site are aware of the objectives of the EMP as well as the consequences of their individual actions.
- To prevent physical harm to third parties and animals from hazardous excavations and infrastructure.
- Avoid/minimise environmental impacts from spills
- To ensure effective management of wastes generated during construction, operation, and decommissioning
- Implementation of the required management measures and compliance with the EMP.
- To recognise impacts on environmental resources in the area.
- Minimise the risk for environmental emergencies occurring and implement controls to deal with situations, should they occur.
- Ensure appropriate response to an emergency and prevent the recurrence of incidents

7.1.2 Action Plan

TABLE 7-2: GENERAL MP

7.1	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible Entity	Phase	Implementation & Frequency
7.1.1	Roles and responsibilities for the implementation of the EMP	7.1.1.1	Ultimate responsibility to ensure implementation of and compliance with the EMP rests with NamPower.	NamPower	Construction phase	On approval of the EMP
		7.1.1.2	The NamPower Project Manager is responsible for overseeing implementation, monitoring and auditing of compliance with the EMP during construction.	NamPower	Construction phase	Continuous
		7.1.1.3	Ensure regular compliance checks during the construction period. Records are to be kept.	NamPower	Construction phase	Continuous
		7.1.1.4	The NamPower Power Station Superintendent is responsible for implementation, monitoring and auditing of compliance with the EMP during all project phases. Ensure regular compliance checks are undertaken during operations. Records are to be kept.	NamPower & Contractors	Construction phase/ Operational phase	Continuous
		7.1.1.5	NamPower will ensure that all contractors and sub-contractors are aware of and familiar with site operations, the key environmental issues, and consequences of non-compliance to the EMP.	NamPower	Construction phase	Prior to construction commencing i.e. tender stage
		7.1.1.6	Adherence to; the ECC, permit conditions, the EMP and NamPower policies, will be included as a contractual requirement.	NamPower	Construction phase/ Operational phase	Continuous
		7.1.1.7	All contractors will be provided with a copy of this EMP.	NamPower	Construction phase	Prior to construction commencing i.e. tender stage

		7.1.1.8	The Contractor will provide NamPower with a signed letter indicating their acknowledgement of the conditions of the ECC, relevant permit conditions, the EMP, and relevant policies.	EPC Contractor & sub-contractors	Construction phase	Prior to construction commencing i.e. tender stage
		7.1.1.9	Contractors are responsible for compliance with the EMP for all aspects of their work package and need to develop activity specific Method Statements / Management Plans and relevant Environmental Emergency Response Plan(s).	EPC Contractor & sub-contractors	Construction phase	Continuous Prior to relevant activities commencing
		7.1.1.10	The Project Manager will appoint or nominate, in writing, a capable and suitably qualified Environmental Control Officer to monitor all environmental aspects and compliance with the EMP.	NamPower	Construction phase	Prior to construction commencing.
		7.1.1.11	Provide the Environmental Control Officer with the necessary resources and authority to oversee implementation of the EMP and monitor compliance with the EMP.	NamPower	Construction phase/ Operations phase	Continuous
		7.1.1.12	Implement the EMP and monitor compliance, ensure regular compliance checks are undertaken. Records shall be kept.	NamPower & Contractors	Construction and Operations	Continuous
		7.1.1.13	Any incident or non-compliance shall be recorded, and corrective actions implemented. These shall be reported to designated NamPower official.	Contractors	Construction and Operations	Continuous
7.1.2	Ongoing stakeholder and community outreach, education and general communication	7.1.2.1	Maintain and update the Encroacher Bush Biomass Power Project Stakeholder Database. Ensure that relevant stakeholder groups are included in the stakeholder database, including nearby residents and the Tsumeb Municipality. Ensure that a stakeholder communication and engagement strategy is devised and implemented to keep the relevant stakeholders informed about the project.	NamPower	Construction and Operations	Continuous
		7.1.2.2	Communicate at least annually with the identified stakeholder groups.	NamPower	Construction and Operations	Continuous
		7.1.2.3	Communication channels could include: stakeholder meetings or open days with members of the public and/or other key stakeholders, i.e. relevant Government officials; newsletters for	NamPower	Construction and Operation	Prior to relevant activities commencing and

	<p>both employees and the public; national and local newspapers; television; radio and the internet; an annual sustainable development report; and/or an education centre to facilitate site visits for key stakeholders.</p> <p>Develop a detailed Stakeholder and Community Engagement Plan, taking the above mentioned channels into consideration.</p>			maintained after that
7.1.2.4	Develop and maintain a complaint register for stakeholders and publicise the channels through which issues can be submitted to NamPower and the EPC Contractor so that they can be addressed.	NamPower & Contractors	Construction and Operations	Prior to relevant activities commencing and maintained after that
7.1.2.5	Develop and maintain a complaint register for employees and contractors working at the Power Plant Station and inform them of the channels through which issues can be submitted to Management so that they can be addressed.	NamPower & Contractors	Construction and Operations	Prior to relevant activities commencing and maintained after that
7.1.2.6	The complaints register will record the following: date when complaint was received; name of person to whom the complaint was reported; nature of the complaint reported; the way in which the complaint was addressed including the date. The complaints register includes the registration of grievances and concerns.	NamPower & Contractors	Construction and Operations	Continuous
7.1.2.7	Any complaints regarding the project will be brought to the attention of the SHEW Officer within 24 hours after receiving the complaint. The Project Manager and the EPC Contractor will assess the merits of every complaint and initiate an investigation when required. Complaints will be investigated and remedied where possible. A response will be provided to the complainant.	NamPower & Contractors	Construction and Operations	When a complaint is registered
7.1.2.8	The complaints register will be kept up to date for inspection by members of the MEFT. This will include a complete auditable record of complaints, responses provided, and actions taken.	NamPower & EPC Contractor		When a complaint is registered

		7.1.2.9	If necessary, an independent mediator should be introduced if the complaint cannot be resolved between NamPower, the EPC Contractor, and the affected party.	NamPower & EPC Contractor	Construction	If required
		7.1.2.10	In the event that other, relevant, projects are developed in proximity to the town of Tsumeb prior to, or in conjunction with, the Biomass Power Project, liaise with the developer to ensure possible cumulative impacts are considered.	NamPower	Construction	If required
7.1.3	Environmental awareness and training	7.1.3.1	Environmental induction training will be provided to all persons undertaking work at the Project, which will be incorporated into normal induction training. This will include permanent workers, contractors, and consultants.	NamPower, Contractors & EPC Contractor		On arrival at the project and at least annually thereafter
		7.1.3.2	This will ensure that all persons working at the project are: (a) aware of the environmental sensitivities of the project site; (b) informed of the risks of the project; (c) aware of the objectives of the EMP; and (d) consequences of their individual actions.	NamPower and Contractors and EPC Contractor		On arrival at the project and at least annually thereafter
		7.1.3.3	Promote basic road safety behaviour for all NamPower employees and contractors through the induction training and awareness raising. Typical issues include: (a) keeping to safe speed limits, but as a minimum all specified road speeds will be adhered to; (b) ensuring that all drivers have valid licenses; (c) making sure that all vehicles are roadworthy; and (d) zero tolerance for drinking and driving.	NamPower and Contractors and EPC Contractor		On arrival at the project and at least annually thereafter
		7.1.3.4	Using lights appropriately for night driving.	NamPower and Contractors	Construction and operations	Continuous

				and EPC Contractor			
		7.1.3.5	Job-specific training will be provided to all personnel for the activities identified through a risk assessment.	NamPower & Contractors	Construction and operations	Identify though the risk assessment	
7.1.4	Safety and security of third parties	<p><i>Note that a separate Occupational Health and Safety (OHS) Plan shall be developed for the Otjikoto Biomass Power Station and Overhead Powerline activities and that this does not form part of this EMP. NamPower will adhere to all the relevant Namibian Legislation regarding health and safety, and implement a formal health and safety management system.</i></p>					
		7.1.4.1	Security fencing will be provided around the entire site with security access control.	NamPower / EPC Contractor	Construction and Operations	Prior to relevant activities commencing and maintained after that	
		7.1.4.2	All security staff will be trained to ensure that no unauthorised third parties enter operational areas or other potential construction or operation areas.	NamPower / EPC Contractor	Construction and Operations	When appointed	
		7.1.4.3	Permanent warning signs will be placed at appropriate locations to warn people of the safety risks of entering the operations area.	NamPower / EPC Contractor	Construction and Operations	Prior to relevant activities commencing and maintained after that	
		7.1.4.4	Any persons entering the Otjikoto Biomass Power Station area will be required to undergo a formal induction. This will, as a minimum, cover health, safety, and environmental matters.	NamPower / EPC Contractor	Construction and Operations	Continuous	
		7.1.4.5	The site will be operated as an alcohol-free and drug-free area. Random alcohol and drug testing of employees and contractors may be conducted upon entry to site.	NamPower / EPC Contractor	Construction and Operations	Continuous	
		7.1.4.6	Only transport companies that comply with all legal health and safety requirements will be used for the handling and transport of substances, materials, and products. Routine inspections will be conducted.	NamPower / EPC Contractor	Construction and Operations	Continuous	

		7.1.4.7	<p><u>Emergency Situations</u></p> <p>Develop and implement an emergency response plan for third parties falling into hazardous excavations. If people or animals fall into hazardous excavations or off infrastructure causing injury, the related Emergency Response Procedure will be followed.</p>	NamPower / EPC Contractor	Construction and Operations	Prior to relevant activities commencing and maintained after that
7.1.5	Spill prevention and management	7.1.5.1	<p>Ensure that all potentially polluting substances and materials such as hydrocarbons, hazardous chemicals, contaminated water, and wastes, are handled in a manner that they do not pollute the environment. This will be implemented through one or more procedure(s), work instruction(s), and or method statement(s) covering the following:</p> <p>(a) Pollution prevention through basic infrastructure design and through education and training of workers, permanent and temporary.</p> <p>(b) Correct off-loading, storage and handling procedures for hazardous substances e.g. petroleum products.</p> <p>(c) The required steps to enable fast reaction to contain and remediate pollution incidents. Options include in situ treatment, on site bioremediation, or disposal of contaminated soils as hazardous waste. The preferred option is in situ remediation or on site bioremediation of soils.</p> <p>(d) Specifications for post rehabilitation audit criteria will be developed.</p>	NamPower / EPC Contractor	Construction and Operations	Continuous
				NamPower / EPC Contractor	Construction and Operations	
				NamPower / EPC Contractor	Construction and Operations	
				NamPower / EPC Contractor	Construction and Operations	
				NamPower / EPC Contractor	Construction and Operations	
		7.1.5.2	Bunded areas for the storage and handling of hazardous substances will have the required capacity in accordance with local or international design standards.	NamPower / EPC Contractor	Construction and Operations	Continuous
		7.1.5.3	Appropriate containers will be used for the storage and transport of hazardous substances. Use original containers for materials such as paints and hydrocarbons where possible.	NamPower / EPC Contractor	Construction and Operations	Continuous
		7.1.5.4	Containers used to hold hazardous material should be clearly marked and stored on an impermeable surface within a bunded area.	NamPower / EPC Contractor	Construction and Operations	Continuous

	7.1.5.5	All equipment should be properly maintained to prevent oil and fuel spills.	NamPower / EPC Contractor	Construction and Operations	Continuous
	7.1.5.6	Ensure adequate signage at chemical and hydrocarbon storage areas.	NamPower / EPC Contractor	Construction and Operations	Continuous
	7.1.5.7	Material Safety Data Sheets (MSDS) for all chemicals and hydrocarbons will be displayed in close proximity to the area of storage.	NamPower / EPC Contractor	Construction and Operations	Continuous
	7.1.5.8	Hazardous chemicals and hydrocarbons will not be released into the environment or sewage treatment system. These materials will be contained and disposed of as hazardous wastes.	NamPower / EPC Contractor	Construction and Operations	Continuous
	7.1.5.9	Personnel dealing with hazardous substances will be trained and have the appropriate personal protective equipment (PPE).	NamPower / EPC Contractor	Construction and Operations	Prior to relevant activities commencing
	7.1.5.10	Designated refuelling areas for excavators and cranes and other construction vehicles should be implemented. Refuelling procedures will be developed with access to the locked fuel dispenser being controlled through this procedure.	NamPower / EPC Contractor	At a Spill	Prior to relevant activities commencing
	7.1.5.11	If any onsite refuelling is planned drip trays must be provided to contain any spills.	NamPower / EPC Contractor	Construction and Operations	When refuelling
	7.1.5.12	Regular inspections will be carried out on areas where hazardous substances are stored or handled.	NamPower / EPC Contractor	Construction and Operations	Continuous
	7.1.5.13	Ensure that the fuel transport companies have a system in place to deal with hydrocarbon spills and subsequent clean-up. Ensure that all fuel and oil storage facilities and transport tankers have spill kits. All spills of chemicals or hydrocarbons e.g. oil, grease, diesel, petrol, etc. will be cleaned with the use of suitable absorbent materials.	NamPower / EPC Contractor	Construction and Operations	Continuous
	7.1.5.14	Chemical and hydrocarbon spills will be regarded as an environmental incident and reported through the incident reporting system.	NamPower / EPC Contractor	Construction and Operations	Continuous

		7.1.5.15	Major spillage incidents (greater than 200L) will be handled in accordance with the Encroacher Bush Biomass Power Project Emergency Response Procedure.	NamPower / EPC Contractor	Construction and Operations	When there is a spill
		7.1.5.16	Ensure appropriate inspections are conducted to ensure early detection of spills. The integrity of containers and bunds will be monitored regularly to ensure that no seepage escapes.	NamPower / EPC Contractor	Construction and Operations	Continuous
7.1.6	Waste management	7.1.6.1	<p><u>Waste management hierarchy</u></p> <p>The following waste management hierarchy will be implemented:</p> <p>(a) Waste minimisation.</p> <p>(b) Re-use, recycle and recover waste.</p> <p>(c) Treat waste if possible.</p> <p>(d) Disposal in suitably permitted and managed facilities.</p>	NamPower & EPC contractor	Construction and Operations	Continuous
		7.1.6.2	NamPower and their contractors will assess each waste type where practical to see whether there are alternative uses for the material. This will be undertaken as a priority before any disposal option.	NamPower / EPC Contractor		Continuous
		7.1.6.3	<p><u>Classification and record keeping</u></p> <p>The NamPower Power Station Superintendent, with input from the EPC Contractor, will develop and implement a waste management plan that will cover the storage i.e. skips/bins location and types of waste, etc., handling, and transportation of construction waste to and from the site. Waste separation will also be included in the procedure.</p>	NamPower & EPC contractor	Prior to start of Construction activities	Prior to relevant activities commencing and maintained after that
		7.1.6.4	Written evidence of safe disposal of all waste types will be kept.	EPC contractor	Construction and operations	Continuous
		7.1.6.5	<p><u>Waste collection in work areas</u></p> <p>Adequate skips and rubbish bins equipped with lids will be provided in the relevant work areas.</p>	EPC contractor	Construction and operations	Prior to relevant activities commencing and

7.1.6.6	Littering will be prohibited. Daily routine of litter picking should be implemented, as and when required.	EPC contractor	Construction and operations	maintained after that
7.1.6.7	Mixing of re-usable materials with other wastes, especially hazardous wastes will be prevented.	NamPower & EPC contractor	Construction and operations	
7.1.6.8	Care will be taken to ensure that scrap metal and building rubble does not become polluted or mixed with any other wastes.	NamPower & EPC contractor	Construction and operations	
7.1.6.9	Onsite facilities will be provided for sorting and temporary storage prior to removal and disposal to appropriate recycling or disposal facilities offsite i.e. for general waste and hazardous waste.	NamPower & EPC contractor	Construction and operations	
7.1.6.10	During decommissioning and closure, lay down areas within the site footprint for reusable non-hazardous materials will be established.	NamPower & EPC contractor	Decommission & Closure	Decommission & Closure
7.1.6.11	<u>Waste transport</u>	NamPower & EPC contractor	Construction and operations	Prior to relevant activities commencing and maintained after that
	Waste will be transported to the appropriate disposal facilities. Random informal audits of the waste disposal facilities should be undertaken.			
7.1.6.12	Vehicles transporting hazardous waste will be clearly marked.	NamPower & EPC contractor	Construction and operations	
7.1.6.13	The integrity of transport packaging and containers will be appropriate to the type of waste being transported.	NamPower & EPC contractor	Construction and operations	
7.1.6.14	Loading and unloading procedures will be followed to avoid spillage.	NamPower & EPC contractor	Construction and operations	
7.1.6.15	<u>Waste Disposal</u>	NamPower & EPC contractor	Construction and operations	
	No waste shall be burnt or buried on site.			
7.1.6.16	Domestic waste will be disposed of at a registered landfill site in Tsumeb.	NamPower & EPC contractor	Construction and operations	Continuous

		7.1.6.17	Hazardous waste will be disposed of at the licensed hazardous landfill in Walvis Bay, Windhoek, or elsewhere if a new Hazardous waste site is developed in Namibia that is better located.	NamPower & EPC contractor	Construction and operations	Continuous
7.1.7	EMP compliance	7.1.7.1	A copy of the ECC and EMP will be kept at the main site office.	NamPower & EPC contractor	Construction and operations	Continuous
		7.1.7.2	NamPower and all of the contractors' personnel will have access to an electronic copy of this EMP.	NamPower & EPC contractor	Construction and operations	Prior to relevant activities commencing
		7.1.7.3	Each contractor will keep a copy of the EMP at their site office and this copy will be available to their staff.	Contractor	Throughout the duration of the contract.	Continuous
		7.1.7.4	Contractors will implement all procedures and written instructions in terms of the approved EMP.	Contractor	Throughout the duration of the contract.	Continuous
		7.1.7.5	Contractors will not deviate from the EMP or written instructions without approval from NamPower.	Contractor	Throughout the duration of the contract.	Continuous
		7.1.7.6	Records relating to the compliance and non-compliance with the conditions of the ECC and EMP will be kept in good order. Such records will be available for inspection at the site office and must be made available to the MEFT within seven (7) working days of the date of the written request by the Department for such records.	NamPower & Contractors	Construction and operations	Continuous
		7.1.9	Environmental monitoring		<i>Note: The following are general monitoring requirements. The specific monitoring requirements relating to relevant environmental aspects are provided in section 9.2 of this EMP.</i>	
7.1.8.1	All sampling will be conducted by suitably qualified and competent persons using appropriate sampling techniques. All samples will be analysed at an accredited, independent laboratory. Records of monitoring must be kept for the site.	NamPower & Contractors		Construction and Operations	As required	

		7.1.8.2	Any results of concern should be reported to the Power Station Superintendent or Project Manager.	NamPower & Contractors	Construction and Operations	As required
		7.1.8.3	If monitoring indicates an issue or item of concern, the Manager will consider and investigate the possible source(s).	NamPower & Contractors		As required
		7.1.8.4	Should the Biomass Power Station's activities be or possibly be, the source then measures to correct the incident and/or prevent the recurrence of such an incident must be implemented.	NamPower & EPC contractor		As required
		7.1.8.5	Install and maintain a weather station for the recording of weather data.	EPC Contractor	Construction	As soon as possible
		7.1.8.6	Recording and reporting on weather data i.e. temperature, wind speed, wind direction and precipitation.	EPC Contractor	Construction and Operations	Continuous
7.1.9	Environmental emergencies	7.1.9.1	Risk assessments will be undertaken for relevant facilities and activities as prescribed by the SHE Officer or Project Manager. The risk assessments must be documented and kept on record.	NamPower & EPC contractor		Prior to establishment of new activity or facility
		7.1.9.2	Environmental Emergency Response Plans will be developed for potential high risks. The Emergency Response Plans will follow the template provided in Appendix A of this EMP.	NamPower & EPC contractor		Prior to establishment of new activity or facility
		7.1.9.3	NamPower and the EPC Contractor will provide employees and contractors with a copy of Emergency Response Plans.	NamPower & EPC contractor		Prior to establishment of new activity or facility
		7.1.9.4	In the case of an emergency the appropriate response in terms of the Emergency Response Plan will be initiated.	NamPower & EPC contractor		In an emergency situation
		7.1.9.5	The Emergency Response Plans must be reviewed and updated after an emergency, a practice drill, or at least annually.	NamPower & EPC contractor		Annually or after an incident or practice drill
7.1.10	Reporting	7.1.10.1	Report regularly as required to the relevant authorities in terms of authorisations issued by the relevant departments or Ministries.	NamPower & EPC contractor	Construction and operations	Bi-annual & at an incident

		7.1.10.2	In the event of an emergency an incident report will be submitted to MEFT and MME.	NamPower & EPC contractor	Construction and operations	Bi-annual & at an incident
		7.1.10.3	Annual Environmental Performance Reports are to be submitted to the MEFT.	NamPower & EPC contractor	Construction and operations	Bi-annual & at an incident
		7.1.10.4	Hydrocarbon spills of 200 litres or more must be reported to the relevant Ministries i.e. MEFT, MAWF, DWA.	NamPower & EPC contractor	Construction and operations	Bi-annual & at an incident

7.2 Biodiversity MP



7.2 BIODIVERSITY MANAGEMENT PLAN

7.2.1 Objectives

- To avoid or minimise the loss of habitat, destruction of animals and plants, and general disturbance of biodiversity.
- To avoid the impacts of birds due to collisions and electrocutions on powerlines and other relevant structure.

7.2.2 Action Plan

TABLE 7-3: BIODIVERSITY MANAGEMENT PLAN

7.2	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible entity	Phase	Implementation & Frequency
7.2.1	Loss of habitat, destruction of animals and plants and general disturbance of biodiversity	7.2.1.1	Design waste product storage and processing areas to minimize pollution.	NamPower	Prior to construction, at the start of operations	Prior to establishment of new activity or facility
		7.2.1.2	Secondary use found for ash or safe disposal (See Soil MP and Groundwater MP for more details).	NamPower	Prior to construction, at the start of operations	Ongoing
7.2.2	Loss of habitat, destruction of animals and plants and general disturbance of biodiversity	7.2.2.1	Keep footprint as small as possible within the design brief.	NamPower & EPC Contractor	Prior to construction, at the start of operations	Ongoing
		7.2.2.2	Do not clear areas that are not within the infrastructure footprint or outside the fire safety buffer of infrastructure.	NamPower & EPC Contractor	Prior to construction, at the start of operations	During site preparation activities Ongoing
		7.2.2.3	If necessary, thin out encroacher species in surrounding areas according to harvesting guidelines.	NamPower & EPC Contractor	Prior to construction,	During site preparation activities

			at the start of operations	
7.2.2.4	As far as possible, do not remove large trees of any species.	NamPower & EPC Contractor	Prior to and throughout the duration of construction and operations	On approval of EMP & prior to construction
7.2.2.5	Proper management plans and clear responsibilities to be implemented (see General MP).	NamPower & EPC Contractor	Prior to and throughout the duration of construction and operations	On approval of EMP & prior to construction
7.2.2.6	Frequent inspections (see General MP).	NamPower & EPC Contractor	Prior to and throughout the duration of construction and operations	On approval of EMP & prior to construction
7.2.2.7	Before construction starts, the proposed Otjikoto Biomass Power Station site and powerline route should be inspected for any signs of bird nesting activity. Birds that are in the process of nesting or raising chicks should not be disturbed.	NamPower & EPC Contractor	Prior to and throughout the duration of construction and operations	On approval of EMP & prior to construction

	7.2.2.8	Ongoing awareness to contractors and NamPower Employees (i.e. regular toolbox talks) should be promoted about the value of biodiversity and the negative impacts of disturbance, especially to breeding birds and protected flora species; as well as the negative impacts of poaching (including breeding birds).	NamPower & EPC Contractor	Prior to and throughout the duration of construction and operations	On approval of EMP & prior to construction
	7.2.2.9	Where possible, the unnecessary destruction of habitat e.g. large trees, whether live or dead and/or the degradation of the environment, including any sensitive drainage lines and other vegetated areas, should be avoided.	NamPower & EPC Contractor	Prior to and throughout the duration of construction and operations	Ongoing
	7.2.2.10	Should any new open-water habitats be constructed e.g. evaporation ponds, they should be sited away from the powerline where the layout and practically allows.	NamPower & EPC Contractor	During construction and operations	Ongoing
	7.2.2.11	Open water surfaces should be covered where possible, to prevent access by birds. Pipe leaks should be rectified promptly.	NamPower & EPC Contractor	During construction and operations	Ongoing
	7.2.2.12	Anti-poaching measures should be strictly enforced, and this should be emphasised during induction to contractors e.g. the following are not allowed on site; weapons, snares, traps, poisons; eggs or feathers with offenders being issued with a warning or prosecuted as appropriate.	NamPower & EPC Contractor	During construction and operations	Ongoing
	7.2.2.13	Possession of a firearm or snare or any other weapon should be prohibited onsite; such items should be confiscated if detected, and the offender issued with a warning or prosecuted as appropriate	NamPower & EPC Contractor	During construction and operations	Ongoing
	7.2.2.14	Traffic rules on site including the access road, especially speed limits, should be enforced strictly.	NamPower & EPC Contractor	During construction	Ongoing

				and operations		
		7.2.2.15	Vehicles should always travel with headlights switched on; driving should be limited at night.	NamPower & EPC Contractor	During construction and operations	Ongoing
		7.2.2.16	Certain instances of injury to or killing of animals and illegal removal of plants or collection of birds' eggs, etc. may be considered emergency situations. These will be managed in accordance with the Biomass Power Project Emergency Response Procedure.	NamPower & EPC Contractor	During construction and operations	Emergency / incident occurring
7.2.3	Collisions of birds on powerline structures and other structures during operation of the Otjikoto Biomass Power Station.	7.2.3.1	For the rerouting or construction of the powerline structures, marking the new powerline and any stay wires as a mitigation for bird collisions is not recommended at this stage due to the potential impacts being low, even without mitigation.	NamPower & EPC Contractor	During construction and operations	Design
		7.2.3.2	Any telecommunications structures e.g. masts/towers constructed in the area should be mitigated, as recommended below.	NamPower & EPC Contractor	Construction	
			(a) Should the communication mast structure include stay wires, such wires should be marked with standard vibration dampers in alternating black and white, to increase visibility (consult NamPower for details). The entire length of at least all the outer stay wires of the structure should be marked.	NamPower & EPC Contractor	Construction	
			(b) While subscribing to mandatory Civil Aviation Authority requirements, attempts should be made to reduce the impact of necessary light emanating from telecommunication structures as far as possible, e.g. through the following:	NamPower & EPC Contractor	Construction	
			(i) reducing numbers and intensity of lights at night to the minimum;	NamPower & EPC Contractor	Construction	
			(ii) using intermittent light, preferably strobe lights i.e. avoid steady light in favour of flashing/blinking lights; if there is a choice of colour, white lights appear to have lower impacts on wildlife than red.	NamPower & EPC Contractor	Construction	

			(iii) Down-shielding security lighting for on-ground facilities and equipment to keep light within the boundaries of the site.	NamPower & EPC Contractor	Construction	
		7.2.3.3	Attempts should be made to reduce the impact of necessary light on any other overhead structures as far as possible.	NamPower & EPC Contractor	Construction	Ongoing
		7.2.3.4	Monitoring of bird collisions (see Section 9.1.1 for more details). Should monitoring indicate that collisions are taking place on powerline structures associated with the project, apply suitable mitigation measures the effectiveness of which should also be monitored.	NamPower & Contractors	Construction and operations phase	Ongoing Incidents occurring
7.2.4	Electrocutions of birds on powerline structures during operation of the Otjikoto Biomass Power Station	7.2.4.1	On the proposed structure for the powerline, if this is technically and economically feasible, a braced or slanting insulator, rather than a standard/horizontal post insulator, would help to deter perching by large birds.	NamPower	During construction	Prior to the establishment of any new activity or facility.
		7.2.4.2	Using a delta or triangular design for stringing the conductors of this structure would reduce the electrocution risk, as the conductors would be further apart compared to a vertical configuration of the conductors.	NamPower	During construction	
		7.2.4.3	In the case of any wooden distribution pole structures used for a temporary power supply, including poles used for transformer and/or switchgear structures: (a) The earth wire on each powerline pole should be "gapped", i.e. an air space safety gap should be included in the earth wire running along the pole. The gap should be wide enough to avoid being permanently active, but close enough to allow lightning strikes to bridge it. (b) Any stay wires on wooden powerline poles should be "gapped" similarly, by means of an insulator. (c) "Jumper" wires on poles should be offset vertically, to increase the distance between these live components.	NamPower	During construction	
				NamPower	During construction	

		(d) Transformer structures should be designed in such a way that they are not attractive as bird perches or nesting sites. Selected live components should be insulated e.g. using black PVC piping or low-density polyethylene pipe (LDPE). On any strain structures where "jumper" wires are used in a horizontal configuration, the two outer jumpers should be suspended below the cross arm and the third/centre jumper should be insulated, or all jumpers insulated.	NamPower	During construction	
	7.2.4.4	Monitoring of bird electrocutions (see Section 9.1.1 for more details). Should monitoring indicate that electrocutions are taking place on powerline structures, apply suitable mitigation measures, the effectiveness of which should also be monitored.	NamPower & Contractors	Construction and operations	Ongoing Incidents occurring

7.3 SOIL MP



7.3 SOIL MANAGEMENT PLAN

7.3.1 Objectives

- To avoid or minimise the compaction of soil as far as practical.
- To avoid or minimise the loss of the natural functioning of the soil as growth medium.
- To avoid soil contamination through appropriated deposition of ash material.
- To avoid soil contamination through prevention and mitigation of fuel and oil spills.

7.3.2 Action Plan

TABLE 7-4: SOIL MP

7.3	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible entity	Phase	Implementation & Frequency
7.3.1	Loss of the natural functioning of the soil as growth medium	7.3.1.1	Prevent mixing of high quality topsoil (A and B-horizons) with low quality underlying material.	NamPower and Contractors	Construction	During the clearing activities prior to construction commencing
		7.3.1.2	Utilize the material beneficially for landscaping on the site, where possible.	NamPower and Contractors	Construction	During the clearing activities prior to construction commencing
7.3.2	Soil compaction	7.3.2.1	Restrict vehicular movement to areas of development of the proposed Otjikoto Biomass Power Station and associated infrastructure, the powerline servitude and the dedicated access road as far as possible.	NamPower and Contractors	Construction and operations	Ongoing

7.3.3	Soil contamination through fuel and oil spills	7.3.3.1	Refer to General MP (Spill Prevention and Management”).	NamPower and Contractors	Construction and operations	
7.3.4	Soil contamination through deposition of ash material	7.3.4.1	Analysis of fly ash and bottom ash once the plant is operational to compare with the samples analysed for the EIA.	NamPower	Operations	Prior to ash disposal / re-use
		7.3.4.2	Care should be taken to ensure that aerial distribution of material from the ash dump is avoided, or mitigated as far as possible.	NamPower	Operations	Ongoing
		7.3.4.3	Mitigate impacts should NamPower decide to implement the option of ash disposal at the Biomass Power Station site (refer to the Groundwater MP).	NamPower	Operations	Prior to ash disposal / re-use
		7.3.4.4	<p>The ash should preferably be used for alternative applications or disposed of at an approved municipal landfill, as discussed below (also refer to section 5.5 of the EIA Report and the Soil Specialist Report for further details):</p> <ul style="list-style-type: none"> a) Use as fertilizer at irrigation farms in the nearby area. Agreements between NamPower and the farms’ owners are required. Also, irrigations farms’ EMP commitments will need to be taken into consideration and amended, where required. b) Taking the ash back to the farms / areas where bush was harvested i.e. for use as a fertilizer. Agreements between NamPower and the farms’ owners will be required. However, further soil analysis will need to be done on the farms to determine the benefits of using the ash as a fertiliser (refer to the Groundwater MP). c) Cover the tailings storage facilities at the DPMT (Tsumeb) Smelter or use in other land remediation projects blending with soils. Agreement between NamPower and DPMT will be required. DPMT’s EMP commitments will also need to be taken into consideration and amended, where required. d) Cover exiting waste at approved (municipal) general waste facilities i.e. landfill sites or normal disposal at these facilities. 	NamPower	Operations	Prior to ash disposal / re-use

			<p>Agreement between NamPower and the Town Council Managing the landfill site e.g. Tsumeb Town Council, will be required. Also, the landfill site's EMP commitments will need to be taken into consideration and amended, where required.</p> <p>e) Utilise the ash for brick making, cement manufacturing or road construction, etc. Further investigations on the practicality of this will need to be done by NamPower and the potential interested parties identified and consulted.</p>			
7.3.5	Soil contamination through the generation of SOx and NOx	7.3.5.1	<p>Impacts from SOx and NOx during biomass combustion will first be observed in the air and water before it is observed in the soil. Monitoring of these constituents in the soil should be conducted at least every five years and compared to the baseline concentrations.</p>	NamPower	During operations and after decommissioning	At least every five years and after decommissioning
7.3.6	Loss of the natural functioning of the soil as growth medium	7.3.6.1	<p>Re-vegetation of the footprint with a grass mixture dominated by local species.</p>	NamPower and Contractors	After decommissioning	After the decommissioning of the infrastructure

7.4 GROUNDWATER MP



7.4 GROUNDWATER MANAGEMENT PLAN

7.4.1 Objectives

- To prevent over abstraction of groundwater and determining impacts on the underlying Tsumeb aquifer.
- To prevent contamination of groundwater from pollutants at the Otjikoto Biomass Power Station and associated activities, i.e. hydrocarbons, water discharge of brine from treatment activities, and leaching of the ash constituents.

7.4.2 Action Plan

TABLE 7-5: GROUNDWATER MP

7.4	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible entity	Phase	Implementation & Frequency
7.4.1	Impacts of groundwater over-abstraction on the underlying aquifer	7.4.1.1	Abstraction permit from DWAF required.	NamPower	Construction and operations	Prior to any water abstraction activities
		7.4.1.2	Monitoring of the planned wells onsite and flow meters must be installed to ascertain the volumes pumped per month and per year.	NamPower	Construction and operations	Prior to any water abstraction activities
7.4.2	Contamination of groundwater from pollutants such as hydrocarbons, concrete mixes, paints, grease, etc.	7.4.2.1	Spill prevention and management (Refer to General MP)	NamPower & EPC contractor	Construction and operations	Continuous
		7.4.2.2	Lining of the sewage ponds.	NamPower & EPC contractor	Construction and operations	Prior to use of ponds.
		7.4.2.3	Consider the new regulations of the Water Resources Management Act of 2013 and follow as best practice, until the Act is officially enacted.	NamPower & EPC contractor	Construction and operations	Ongoing

		7.4.2.4	A dedicated storage facility with an impermeable bund concrete base and a sealed wall must be constructed and storage tanks should be erected above ground for the storage of sewage.	NamPower & EPC contractor	Construction and operations	Prior to start of operations
		7.4.2.5	No discharge of untreated sewage into the environment.	NamPower & EPC contractor	Construction and operations	Ongoing
		7.4.2.6	Drilling of monitoring boreholes and regular sampling at monitoring boreholes (as per section 9.2.2).	NamPower & EPC contractor	Construction and operations	Prior to relevant activities commencing
7.4.3	Over abstraction of groundwater for the Otjikoto Biomass Power Station, impacting on the underlying Tsumeb aquifer	7.4.3.1	Process water should be recycled where possible and re-used.	NamPower	Operations	Ongoing
		7.4.3.2	Pump testing of the existing functional borehole at the NamPower substation as an option for water supply.	NamPower	Operations	Prior to start of operations
7.4.4	Seepage of effluent i.e. discharged brine, from the water treatment plant	7.4.4.1	Wastewater to be safely stored before it is disposed of at designated and licensed disposal sites.	NamPower	Operations	Ongoing
		7.4.4.2	Brine and contaminated water should be collected and stored in sealed evaporation ponds. The residue should be regularly scraped up and disposed of at an appropriate site and on a regular basis to avoid piling up and overflows if stored in tanks.	NamPower	Operations	Ongoing
		7.4.4.3	Set up a Groundwater Protection Plan with a procedure on disposing of waste, including disposing at the approved disposal sites and on a regular basis. The effluent must either be allowed to evaporate and the crystallised salts be disposed of at a municipal landfill, or the effluent must be treated until it reaches concentrations safe for environmental discharge as stipulated in the Water Specialist Report.	NamPower	Operations	Prior to relevant activities commencing
7.4.5	Leaching of ash constituents	7.4.5.1	Leaching of ash constituents from the onsite storage/disposal piles, impacting on the underlying aquifer (refer to Soil MP 7.3.4).	NamPower	Operations	Prior to relevant

	from the onsite storage/disposal piles, impacting on the underlying aquifer					activities commencing
		7.4.5.2	<p>Should NamPower decide to implement this option of ash disposal at the Biomass Power Station site the following should be undertaken:</p> <ul style="list-style-type: none"> a) Development of a Stormwater Management Plan for determining measures to prevent groundwater contamination from the ash stockpile (also see the Surface Water MP). b) Analysis of ash to be conducted once the plant is operational to be compared with the samples analysed for the EIA. c) Groundwater monitoring should be undertaken monthly. 	NamPower	Operations	Prior to ash disposal / re-use Ongoing
		7.4.5.3	The ash should preferably be used for alternative applications or disposed of at an approved municipal landfill (as discussed in the Soil MP).			

7.5 SURFACE WATER MP



7.5 SURFACE WATER MANAGEMENT PLAN

7.5.1 Objectives

- To prevent pollution of surface water runoff and related health impacts on third parties from pollutants at the Otjikoto Biomass Power Station and associated infrastructure and activities, i.e. hydrocarbons, discharged brine from water treatment activities, and leaching of the ash constituents.

7.5.2 Action Plan

TABLE 7-6: SURFACE WATER MP

7.5	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible entity	Phase	Implementation & Frequency
7.5.1	Contamination of surface water pollutants, i.e. hydrocarbons, discharged brine from water treatment activities, and leaching of the ash constituents	7.5.1.1	Stormwater Management Plan to be developed to determine the extent of contact water runoff and how to contain the polluted water on site and to divert clean water around the site.	NamPower	Design	Prior to construction
		7.5.1.2	Stormwater runoff must incorporate an oil interceptor as mitigation prior to discharging from site, due to possible oil leaks from vehicles on the site road washing into the stormwater attenuation system.	NamPower	Design, construction & operations	Prior to construction
		7.5.1.3	The Stormwater Management Plan shall prevent ash runoff into the surface water that could reach surface drainage.	NamPower	Design and operations	Prior to construction
7.5.2	Contamination of surface water from	7.5.2.1	Spill prevention and management (refer to General MP).	NamPower	Operations	During construction, and operations

	pollutants such as hydrocarbons, concrete mixes, paints, grease, etc.	7.5.2.2	Effective site supervision to ensure no blocking of stormwater infrastructure and efficient storage of contact water. Solids should be removed from stormwater ponds at end of each rainy season, and disposed of at suitable waste sites, such as municipal landfill sites.	NamPower	Operations	Ongoing
		7.5.2.3	Once off sampling of runoff water, prior to discharge from site, during a rain event to confirm containment of pollution sources. The water will be sampled and compared to general standards for effluent discharge into the environment, as given in Section 9.2.3.	NamPower	Operations	Once off (during rain event)
7.5.3	Contamination of surface water from ash being stored at the Otjikoto Biomass Power Station ending up in the runoff	7.5.3.1	<p>Should NamPower decide to implement this option of ash disposal at the Biomass Power Station site the following will apply:</p> <ul style="list-style-type: none"> a) Dispose or remove of ash on a regular basis to prevent it from piling and increasing as a threat. b) Stormwater Management Plan to be developed to prevent ash runoff into the surface water. c) Refer to Soil MP and Groundwater MP. 	NamPower	Operations	Prior to ash disposal / reuse. Ongoing

7.6 ARCHAEOLOGY MP



7.6 ARCHAEOLOGY MANAGEMENT PLAN

7.6.1 Objectives

- To prevent the unacceptable loss of archaeological resources.

7.6.2 Action Plan

TABLE 7-7: ACTIONS RELATING TO ARCHAEOLOGY

7.6	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible entity	Phase	Implementation & Frequency
7.6.1	Damage to archaeological resources	7.6.1.1	Contractors working on the site shall be made aware that under the National Heritage Act any items protected under the definition of heritage i.e. cairns, graves, etc., found in the course of the project must be reported to the National Heritage Council.	NamPower and Contractors	Construction	During the clearing activities
		7.6.1.2	Limit activities, infrastructure and related disturbance to what is absolutely necessary.	NamPower and Contractors	Construction	During the clearing activities
		7.6.1.3	Avoid disturbance of the cairn, located east of the eastern perimeter fence of the NamPower substation and the prominent rock outcrop west of the NamPower substation. These features are outside the proposed Otjikoto Biomass Power Station site.	NamPower and Contractors	Construction	During the clearing activities
		7.6.1.4	NamPower will ensure that all archaeology and cultural heritage procedures recognised by the National Heritage Council of Namibia (NHC) are complied with for all activities related to the construction of the Otjikoto Biomass Power station and construction and reallocation of the transmission lines.	NamPower and Contractors	Construction	During the clearing activities

7.6.2	Chance Finds	7.6.2.1	If there are any chance finds of archaeological sites that have not been identified during the bush clearance and others construction activities, NamPower and their contractors will follow the Chance Find Procedure. The key component of the Procedure is to ensure that the site remains undisturbed until a specialist (archaeologist or cultural heritage professional) has assessed the site, assessed the potential damage, advised on the necessary management steps, and advised on the requirements for authority consultation and permitting.	NamPower and Contractors	Construction	Chance find
		7.6.2.2	Ensure that all archaeology and cultural heritage are recorded and preserved in situ, and to provide field data to the National Heritage Council of Namibia (NHC).	NamPower and Contractors	Construction	Chance find

7.7 NOISE MP



7.7 NOISE MANAGEMENT PLAN

7.7.1 Objectives

- To prevent an unacceptable increase in disturbing noise and limit nuisance noise at sensitive receptors as far as practically possible.

7.7.2 Action Plan

TABLE 7-8: NOISE MP

7.7	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible entity	Phase	Implementation & Frequency
7.7.1	Noise pollution at receptors	7.7.1.1	Design the plant to comply with the IFC and World Bank guidelines of 55dB L _{Aeq} for daytime and 45dB L _{Aeq} at night-time at the closest third party receptors.	NamPower	Design	Prior to construction
7.7.2	Noise pollution minimisation	7.7.2.1	With respect to noise reduction and control strategies during construction, in the event of excessive noise being monitored and/or complaints received from third parties, the IFC Environmental, Health and Safety (EHS) Guidelines recommend the following: (a) Planning activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance; (b) Using noise control devices, such as temporary noise barriers and deflectors for impact and blasting activities, and exhaust muffling devices for combustion engines; and (c) Avoiding or minimising project transportation through community areas.	NamPower & Contractors	Construction	Excessive noise is monitored of complaints are raised
		7.7.2.2	The adoption of Best Practicable Means (such as those recommended above) is usually the most effective means of controlling noise from construction sites.			

7.7.3	Noise monitoring	7.7.3.1	Undertake noise monitoring during construction and operations of the plant (see section 9.2.4).	NamPower & Contractors	Construction and operations	See section 9.2.4
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7.8 TRAFFIC MP



7.8 TRAFFIC MANAGEMENT PLAN

7.8.1 Objectives

- To minimise the impact on road transport infrastructure.
- To minimise the impact on the DR 3007.
- To minimise the impact on the TR 1/10 and DR 3007 intersection.

7.8.2 Action Plan

TABLE 7-9: TRAFFIC MP

7.8	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible entity	Phase	Implementation & Frequency
7.8.1	Impact on road capacity and road condition/deterioration – TR 1/10	7.8.1.1	Promote basic road safety behaviour for NamPower employees and contractors through training and awareness. Refer to 'Environmental Awareness and Training' in the General MP.	NamPower & Contractor	Construction and operations	Prior to construction
7.8.2	Impact on road capacity and road condition/deterioration – including the DR 3007	7.8.2.1	Refer to the Traffic MP in the Harvesting and Transport of Biomass EMP.	NamPower	Operations	Ongoing
7.8.3	Impact on the TR 1/10 and DR 3007 Intersection	7.8.3.1	Upgrade the intersection, a typical layout is attached in the Traffic Specialist Report (Appendix 13 of the EIA Report.	NamPower in liaison with the Roads Authority	Construction and operations	Prior to construction
		7.8.3.2	Surface the road to the Otjikoto Biomass Power Station entrance i.e. approximately 215 m section.	NamPower in liaison with the Roads Authority	Construction and operations	Prior to construction

		7.8.3.3	The grass on the road shoulders at the approaches to the TR 1/10 and DR 3007 intersection should be kept short to ensure sight distance to the intersection is maintained.	NamPower in liaison with the Roads Authority	Construction and operations	Prior to construction and ongoing
7.8.4	Emergency situations	7.8.4.1	Normal national regulations will apply to any road accident on national or public roads.	NamPower & Contractor	Construction and operations	Ongoing
7.8.5	Impact on road capacity and road condition/deterioration – TR 1/10	7.8.5.1	The traffic impacts will be exaggerated if trucks platoon and arrive in fleets, especially during peak hours. NamPower must play an active role in the scheduling of the biomass transport to ensure peak arrival is kept to an absolute minimum.	NamPower	Operations	Ongoing

7.9 AIR QUALITY MP



7.9 AIR QUALITY MANAGEMENT PLAN

7.9.1 Objectives

- The main objective of the proposed air quality management measures for the project is to ensure that operations result in ambient air concentrations that are within the relevant ambient air quality limits at nearby AQSRs. Although the impact assessment for the proposed Otjikoto Biomass Power Station showed low impacts, it is advisable to adopt good practice control measures onsite to avoid dust generating problems.

7.9.2 Action Plan

TABLE 7-10: AIR QUALITY MP

7.9	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible entity	Phase	Implementation & Frequency
7.9.1	Air pollution – Power Station design	7.9.1.1	<p>The plant should be designed to meet the WBG IFC and SA MES emission limits as set out in The following are the recommended emission limits as proposed by the air quality specialists. NamPower may choose emission limits that are more stringent within their specifications but may not specify emission limits that exceed the values in the table below.</p> <p>Table 7-11 below, and with a maximum 75m stack height that will provide good air dispersion without building influences to ensure minimal ground level impacts.</p> <p>Should NamPower’s Technical advisers or EPC Contractor propose other emission control technologies and a different stack height during the detail design stage of the project, the Air Quality Study would need to be revised to incorporate these possible changes to the plant design ensuring the potential impacts, relating to the</p>	NamPower	Design / planning	Prior to construction

			ground level concentrations (GLCs), are no worse than those assessed in the EIA.			
		7.9.1.2	Although the impact assessment for the proposed power plant showed low impacts, it is advisable to adopt good practice control measures onsite to avoid dust generating problems. See sections below.	NamPower		Prior to construction
7.9.2	Air pollution – general	7.9.2.1	<u>Paved Roads</u>	NamPower & Contractors	Construction and operation	As and when required depending on site conditions
			Sweepers can be employed to clean paved road surfaces within the project area. Typical efficiencies of up to 90% can be achieved provided good management measures are practiced.			
		7.9.2.2	<u>Windblown dust</u>	NamPower & Contractors	Rehabilitation of areas post construction	As and when required depending on site conditions
			The suitability of the dust control techniques indicated will depend on the specific source to be addressed, and will vary between dust spillage, material storage and open areas. The following methods for reducing windblown dust is recommended: (a) Primary rehabilitation (b) Vegetation established but not demonstrated to be self-sustaining. Weed control and grazing control (c) Secondary rehabilitation (d) Re-vegetation (e) Fully rehabilitated vegetation			
7.9.2.3	<u>Material Handling</u>	NamPower & Contractors	Operations	As and when required depending on site conditions		
			Good operational practices frequently represent the most cost effective and efficient means of reducing emissions. The variation of the height from which tipping occurs to suit the height of the storage pile would limit drop heights and therefore reduce the potential for the entrainment of fines by the wind.			

7.9.3	Emissions monitoring	7.9.3.1	<p>Bi-annual emissions monitoring shall be done to ensure that combustion emissions due to the Power Station are below the emission concentrations stipulated in The following are the recommended emission limits as proposed by the air quality specialists. NamPower may choose emission limits that are more stringent within their specifications but may not specify emission limits that exceed the values in the table below.</p> <p>Table 7-11 (see section 9.2.5 for more details on the monitoring requirements).</p>	NamPower	Operations	See section 9.2.5
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The following are the recommended emission limits as proposed by the air quality specialists. NamPower may choose emission limits that are more stringent within their specifications but may not specify emission limits that exceed the values in the table below.

TABLE 7-11: RECOMMENDED POWER STATION EMISSION LIMITS

Pollutant	Emission limit (mg/Nm ³) Based on 6% O ₂ on dry gas, under normal conditions of 276K and 101.3 kPa	Source
PM	50	WB IFC, 2017
SO ₂	683.5	SA MES, 2013
NO _x	500	WB IFC, 2017
HCl	No Limit but should be <300 mg/Nm ³	Plant design

7.10 THIRD PARTY HEALTH MP



7.10 THIRD PARTY HEALTH RISK

7.10.1 Objectives

- To avoid health risks to third parties

7.10.2 Action Plan

TABLE 7-12: THIRD PARTY HEALTH RISK MP

7.10	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible entity	Phase	Implementation & Frequency
7.10.1	Health risk	7.10.1.1	Refer to Air Quality MP for more details.	NamPower	Operations	Ongoing
		7.10.1.2	A complaints register should be kept in order to become aware of any health complaints perceived by nearby residents. These should be investigated.	NamPower	Operations	Ongoing
		7.10.1.3	Record the visibility of the plume from the stack in a site log. Should complaints be received from third parties relating to the unlikely event of dark smoke being emitted from the stack, CCTV could be installed. CCTV coverage of the stack could show that under certain weather conditions there will be condensation due to flue gas from the stack.	NamPower	Operations	Ongoing

7.11 VISUAL MP



7.11 VISUAL MANAGEMENT PLAN

7.11.1 Objectives

- To avoid negative visual impacts to third parties.

7.11.2 Action Plan

TABLE 7-13: VISUAL MP

7.11	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible entity	Phase	Implementation & Frequency
7.11.1	Structures and associated infrastructure	7.11.1.1	Paint buildings and structures with colours that reflect and compliment the natural colours of the surrounding landscape. To further reduce the potential of glare, the external surfaces of buildings and structures should be textured to create interplay of light and shade.	NamPower	Construction	Detailed design, to be implemented during Construction
7.11.2	Lighting	7.11.1.2	<p>The following are measures that must be considered in the lighting design of the Otjikoto Biomass Power Station project:</p> <p>(a) Install light fixtures that provide precisely directed illumination to reduce light spillage beyond the immediate surrounds of the site.</p> <p>(b) If high pole top security lighting along the periphery of the site is used, it should be directed and designed with the intended purpose in mind. General lighting and light spillage should be avoided.</p>	NamPower	Construction and operation	Detailed design, to be implemented during Construction

			<p>(c) For other areas, beyond perimeter and security lights, they should be activated on motion sensing and be operated on a timer where practical.</p> <p>(d) For operational purposes lights may be required for a safe working environment. These lights should be carefully directed, preferably away from sensitive viewing areas but still ensuring safe work conditions.</p> <p>(e) Minimise the number of light fixtures to the minimum, including security lighting.</p> <p>(f) With the construction of the proposed facilities security lighting should only be used where necessary and carefully directed, preferably away from sensitive viewing areas.</p> <p>(g) Wherever possible, lights should always be directed downwards to avoid illuminating the sky.</p>			
7.11.3	Planning and site development		Refer to Soil MP (7.3.1.1).	NamPower	Construction and operation	Ongoing
7.11.4	Earthworks		Earthworks should be executed in such a way that only the footprint and a small construction buffer zone around the proposed activities is exposed. In all other areas, the indigenous vegetation should be retained, especially along the periphery of the site.	NamPower & Contractor	Construction and operation	Site preparation

7.11.5	Landscaping and ecological approach		Should new vegetation be introduced to the site, an ecological approach to rehabilitation and vegetative screening measures, as opposed to a horticultural approach to landscaping should be adopted. For example, communities of indigenous plants enhance biodiversity and blend well with existing vegetation. This approach can significantly reduce long term costs as less maintenance would be required over conventional landscaping methods	NamPower & Contractor	Construction, operation and decommissioning	Ongoing
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7.12 SOCIO-ECONOMIC MP



7.12 SOCIO-ECONOMIC MANAGEMENT PLAN

7.12.1 Objectives

- To maximise economic benefits to electrical consumers WHILST maximising benefits to the local economy.
- To maximise job creation and skills development during construction, operations and through the supply chain.
- To minimise in-migration and manage the impacts thereof.
- To manage the need for land and housing.
- To manage the need and demand for improved health care and education services.
- To promote safety and security in the local communities.

7.12.2 Action Plan

TABLE 7-14: SOCIO-ECONOMIC MP

7.12	ISSUE	Item	Management, Mitigation and monitoring Actions	Implementation Programme		
				Responsible entity	Phase	Implementation & Frequency
7.12.1	Economic impacts associated with the Otjikoto Biomass Power Station	7.12.1.1	NamPower and all contractors shall encourage the use of small and medium sized enterprises in supplying goods and services to the Project.	NamPower	Construction and operations	Ongoing
7.12.2	Job creation and skills development	7.12.2.1	Ensure that strategies and programmes are in place prior to construction which maximise use of the local labour force during construction and operations.	NamPower	Construction and operations	Prior to commencing construction
		7.12.2.2	NamPower will ensure its human resources policy is implemented which targets and encourages women for training and recruitment and supports female employees to perform well in the workplace, for the operation of the Otjikoto Power Station.	NamPower		Prior to commencing construction

		7.12.2.3	Promote continuous learning programmes to diversify and upgrade skills of employees and ensure that skills gained on the job are documented and accredited wherever possible.	NamPower	Construction and operations	Ongoing
7.12.3	Community resilience in Tsumeb to population in-migration	7.12.3.1	Build up local skills prior to and during construction to maximise the local labour force.	NamPower	Construction and operations	Prior to commencing construction
		7.12.3.2	Give employment preference to local and Oshikoto Region residents, particularly to women, members of the San communities and residents on group resettlement farms, to reduce the influx of workers and whole families into the project area.	NamPower	Construction and operations	Prior to commencing construction
		7.12.3.3	Implement the NamPower Recruitment Policy to reduce in-migration;	NamPower	Construction and operations	Prior to commencing construction
		7.12.3.4	Inform the public about the employment policies and procedures and when vacancies have been filled to reduce potential migrants.	NamPower	Construction and operations	Ongoing
		7.12.3.5	Refer to General MP regarding ongoing Stakeholder communications.	NamPower	Construction and operations	Refer to General MP
		7.12.3.6	Construction workers to live locally in Tsumeb to boost the local economy, as far as practically possible.	NamPower	Construction and operations	Ongoing
		7.12.3.7	NamPower should encourage home ownership by employees.	NamPower	Construction and operations	Ongoing
		7.12.3.8	Ensure contractors have a comprehensive HIV, AIDS, TB and general hygiene (considering Covid-19 requirements) workplace policy and wellness programme which will detail HIV prevention measures in the workplace such as condoms and enable easy access to AIDS treatment, care and support for employees.	NamPower	Construction and operations	Prior to commencing construction Ongoing

		7.12.3.9	Promote public health and safety by supporting the Ministry of Health and other stakeholders' initiatives to reduce the spread of communicable diseases such as sexually transmitted diseases, including HIV, TB and malaria, by organising awareness programmes, ensuring that codes of conduct for workers are implemented and adhered to, and by promoting healthy lifestyles and in their health campaigns.	NamPower	Construction and operations	Ongoing
		7.12.3.10	Develop a relevant Corporate Social Responsibility Programme	NamPower	Construction and operations	Prior to commencing construction
		7.12.3.11	Refer to General MP (7.1.2).	NamPower	Construction and operations	Refer to General MP
		7.12.3.12	Support partnerships that encourage a sense of community and those combat social ills, e.g. multi-purpose community & skills development centres; sports tournaments, social clubs, youth clubs, activities that promote women's empowerment and gender equality and community policing.	NamPower and Contractors	Construction and operations	Ongoing
		7.12.3.13	"Liaise with the Tsumeb Town Council to provide input into any "In-Migration" Management plan.	NamPower	Construction and operations	Ongoing
7.12.4	Emergency situations	7.12.3.14	See Stakeholder Communication section in the General MP.	NamPower and Contractors	Construction and operations	Refer to General MP

7.13 CLIMATE CHANGE



7.13 CLIMATE CHANGE ADAPTION AND MANAGEMENT MEASURES

Climate change management includes both mitigation and adaptation. The main aim of mitigation is to stabilise or reduce Green House Gas (GHG) concentrations as a result of anthropogenic activities. This is achievable by reducing emissions and enhancing sinks through human intervention.

The proposed Otjikoto Biomass Power Station will provide a source of renewable power which will offset need for power derived from fossil fuel sources.

One way to keep GHG emissions to a minimum would be to ensure there is minimal fuel use; this can be achieved by ensuring the vehicles and equipment are maintained through an effective inspection and maintenance program. A measure of reducing the project's impact is to limit the removal of vegetation in the immediate vicinity of Otjikoto Biomass Power Station and to ensure that that as much as possible indigenous revegetation occurs surrounding the Otjikoto Biomass Power Station area.

8. PARTIES RESPONSIBLE FOR EMP IMPLEMENTATION

This section describes the roles and responsibilities for implementation of the various management actions.

8.1 OTJIKOTO BIOMASS POWER STATION AND POWERLINE CONSTRUCTION AND OPERATIONS

8.1.1 NamPower

Project Manager and Power Station Superintendent

The NamPower Biomass Power Project Manager (design and construction phases) and the Otjikoto Biomass Power Station Superintendent (operational phase) have overall responsibility for environmental management of the Otjikoto Biomass Power Station and for ensuring this EMP is implemented.

To assist the Project Manager and Power Station Superintendent, NamPower will have an Environmental Officer that will be dedicated to managing and monitoring the environmental issues associated with the plant's activities.

The Power Station Superintendent must ensure the Environmental Management Plan is included in all contracts and to ensure that contractors adhere to the conditions of the EMP.

Contract documents should consider the inclusion of work stoppage for non-conformance to the EMP at the discretion of the Project Manager, or to link the sign-off of the Contract to a retainer clause. The client retains part of the contract fees until NamPower's appointee e.g. Environmental Officer has signed off the clearance certificate, indicating satisfaction with the rehabilitation of the Contractor's work and laydown area.

Safety, Health and Environment and Wellness (SHEW) Section

The Otjikoto Biomass Power Station's Environmental Officer will be responsible for assisting the Power Station Superintendent and various other managers in all environmental and community issues, and specifically to ensure that the commitments as set out in this EMP are implemented during the design, operations, decommissioning, and closure phases.

In addition to the above, the Environmental Officer is responsible for ensuring that all persons involved with the Otjikoto Biomass Power Station comply with this EMP.

The Environmental Officer will be responsible for the following aspects related to compliance of this EMP:

- Regular inspections and auditing compliance to this EMP and any other relevant legal requirements e.g. permits and authorisations.
- Conduct environmental awareness training during induction training and on an ad hoc basis thereafter.
- Conduct scheduled monitoring as outlined in section 9 as well as any additional monitoring required by permit and authorisations issued to NamPower by relevant authorities.

- Ensure compliance to this EMP and permits and authorisations issued to NamPower by relevant authorities. Ensure responsibilities and target dates are developed for each one of the commitments in this EMP. This will be through the following mechanisms:
 - Design requirements;
 - Construction tender documents and contracts; and
 - Management system / procedure.
- Submit required information to relevant authorities such as reporting related to monitoring and with regard to compliance with the EMP, permit, and relevant authorisations.
- Liaise with NamPower Management and various external stakeholders, such as authorities and interested and affected parties, on environmental management as required.

8.1.2 Contractors

All contractors and their sub-contractors and employees will be contractually required to comply with the various commitments in this EMP. This requirement will be included in the respective EPC contracts.

During the operational phase, Operations and Maintenance (O&M) contracts will be put in place for the O&M of the plant, which will include the implementation of the EMP.

Environmental Officers, appointed by the Contractors, will be responsible for co-ordinating the implementation of the EMP. Other responsibilities will include:

- Inspections and auditing.
- Provide environmental awareness training to all employees and temporary workers.
- Implement the monitoring plan on site.
- Ensure compliance to this EMP.
- Ensure compliance to any authorisations issued to NamPower.
- Regular reporting as required by any authorisations issued to NamPower.
- Implement and manage the stakeholder complaints and grievance procedure.
- Stakeholder engagement.

8.2 EXTERNAL SPECIALISTS

NamPower may appoint external environmental specialists, as and when required, to assist with the implementation of certain commitments made in the various management plans.

An independent auditor will also assess compliance against the EMP at least every third year.

9. MONITORING AND AUDITING FOR THE OTJIKOTO BIOMASS POWER STATION

9.1 AUDITING COMPLIANCE OF THE EMP

The commitments contained in this EMP will, once an Environmental Clearance Certificate has been obtained, be NamPower's contractual agreement with the Namibian authorities for sound environmental management. All employees, contractors and sub-contractors and any visitors to site will be expected to comply with the commitments contained in this EMP.

9.1.1 Audits and Inspections

The Environmental Officer will conduct internal management audits against the commitments in the EMP. During the construction phase, these audits will be conducted once a month. In the operation phase, these audits will be conducted on a quarterly basis. The audit findings will be documented for both record keeping purposes and for informing continual improvement.

In addition, an independent professional will conduct an EMP performance assessment at least once a year for the Bi-Annual Report. Compliance with the provisions of the EMP and the adequacy of the EMP relative to the onsite activities will be assessed in this report.

The Environmental Officer will conduct daily inspections during construction and weekly inspections during operations.

9.1.2 Submission of information

Monitoring reports will be provided to the relevant authorities as per the permits and authorisations issued by the relevant departments and Ministries.

9.2 MONITORING

The management plans in Section 7 have covered various aspects of the proposed monitoring. This section both augments those requirements and sets further detail where relevant. NamPower and/or the contractors will develop detailed monitoring procedures including the relevant monitoring commitments spelled out in this EMP.

As a general approach, the monitoring procedures will comprise the following:

- A formal procedure;
- Appropriately calibrated equipment – regular inspections and calibration of equipment will be undertaken in line with the manufacturers requirements;
- Where samples require analysis, they will be preserved according to laboratory specifications;
- Where practical, an accredited, commercial laboratory will undertake sample analyses;
- Parameters to be monitored can be identified in consultation with a specialist in the field and/or the relevant authority;
- If necessary, following the initial monitoring results, certain parameters may be removed from the monitoring programme in consultation with a specialist and where appropriate the relevant authority;
- Monitoring data will be stored in a structured database;
- Data will be interpreted and reports on trends in the data will be compiled on a quarterly basis; and
- Both the data and the reports will be kept on record for the life of Otjikoto Biomass Power Station.

As a general comment, if monitoring points become damaged or redundant then they should be replaced with new points.

9.2.1 Biodiversity monitoring

General to all biodiversity

- Monitor the clearing of vegetation prior to construction to ensure that the requirements stipulated in section 7.2 are adhered to.
- Monitor management adherence to waste management requirement frequently (see General MP).
- Monitor quantities of waste material production such as ash, air emission concentrations, wastewater, and other effluent production and quality.

Birds

- Quarterly monitoring is considered essential and, should the results indicate that bird collisions are taking place on either the powerline and/or its stay wires, or on any other structures, mitigation should be applied in the form of increasing the visibility of the relevant section (contact NamPower for details of marking procedures).
- Ensure that the entire powerline route, including on the Otjikoto Biomass Power Station site, is monitored in an acceptable way for any signs of bird mortalities resulting from the construction and operation of the line; ideally, regular dedicated monitoring patrols should be carried out once a month for at least the first year after construction, and thereafter at least once per quarter. Promote awareness about the need for reporting powerline collision incidents and clarify the reporting procedures.
- Record all bird mortalities on powerline structures on a standardised form, with the GPS coordinates and powerline structure and other details, and photographs of the carcass (especially the head of the bird), powerline structure, and general habitat; forward a copy of each report to the NamPower/NNF Strategic Partnership for further investigation.
- Record road mortalities and any other mortalities of birds at the plant site, together with photographs and other relevant information.
- Monitor perching activities of live birds on powerline and other structures at the Otjikoto Biomass Power Station site.
- Monitor nesting activity on powerline and other structures and, if it becomes a problem, address by means of appropriate mitigation measures e.g. removal of nesting material outside the nesting season.
- Record road mortalities and any other mortalities of birds at the plant site, together with photographs and other relevant information.

9.2.2 Groundwater monitoring

- Establishment of a groundwater quality and groundwater level monitoring plan with a monitoring network of boreholes for early detection. Monitoring of groundwater should be undertaken both upstream and downstream of the planned Otjikoto Biomass Power Station operations. Monitoring should be undertaken quarterly and after plant closure i.e. 2 additional quarterly samples and should include the following:
 - Monitoring wells and flow meters must be installed to ascertain the volumes pumped per month and per year;
 - Measurement of resting water levels;
 - Analyse water for major ions, total metals, hydrocarbons, and biological analysis to include bacteria such as but not limited to, e-coli. The list of parameters is given in the Water Specialist report (Appendix 11 of the EIA Report).

9.2.3 Surface water monitoring

- Once off sampling of runoff water, prior to discharge from site, during a rain event to confirm containment of pollution sources. The water will be sampled for general standards for effluent discharge into the environment as given in Table 9-1 below.

TABLE 9-1: GENERAL STANDARDS FOR WASTEWATER DISCHARGE INTO THE ENVIRONMENT

Determinants	Maximum allowable levels
pH	5,5% – 9,5%
Dissolved oxygen	A saturation of at least 75%
Typical faecal coli	Number of typical coli should be counted /100ml
Temperature	35 °C
Chemical oxygen demand	75 mg/l
Oxygen absorbed	10 mg/l
Biological oxygen demand	No value given
Total dissolved solids	Not more than 500 mg/l than the TDS of the inlet water
Total suspended solids	25 mg/l
Sodium	Not more than 90 mg/l sodium concentration of the inlet water
Fats, oil and grease	2,5 mg/l (gravimetric method)
Chlorine, residual	0,1 mg/l as Cl
Free and saline ammonia	10 mg/l as N
Arsenic	0,5 mg/l as As
Boron	1,0 mg/l as B
Chromium, hexavalent	0,05 mg/l as Cr (VI)
Chromium, total	0,5 mg/l as Cr
Copper	1,0 mg/l as Cu
Lead	1,0 mg/l as Pb
Sulphide	1,0 mg/l as S
Fluorine	1,0 mg/l as F
Zinc	5,0 mg/l as Zn
Phenolic compounds	0,1 mg/l as phenol
Cyanide and related compounds	0,5 mg/l as CN

9.2.4 Noise monitoring

Undertake noise monitoring during construction of the Otjikoto Biomass Power Station to verify construction noise levels, as recommended by the IFC and World Bank EHS Guidelines. This shall be done once prior to the construction activities, to confirm the baseline, and once during construction, as well as in the event of complaints received, as required.

Undertake noise monitoring during operation of the Otjikoto Biomass Power Station to verify operational noise levels, as recommended by the IFC and World Bank EHS Guidelines as well as in the event of complaints received, as required.

The noise monitoring campaigns should be conducted at a minimum at the two positions where the baseline monitoring was undertaken during the EIA process.

Noise monitoring will be undertaken by a suitably qualified and experienced person, using a Type 1 or Type 2 sound level meter conforming to all appropriate IEC standards, which will be field calibrated before and after each monitoring period. The sound level meters will be positioned such that the microphone is located 1.2 to 1.5 m above the ground level in free-field conditions, i.e. at least 3.5 m from the nearest vertical reflecting surface.

A note of the prevailing weather conditions will be made at the time of monitoring. Noise levels will be measured during favourable weather conditions, i.e. wind speeds less than 5 m/s and avoiding periods of rainfall, to minimise interference to the measurements. An effective microphone windshield will be used.

9.2.5 Air Quality monitoring

BI-ANNUAL EMISSIONS MONITORING SHALL BE DONE TO ENSURE THAT COMBUSTION EMISSIONS DUE TO THE OTJIKOTO BIOMASS POWER STATION ARE BELOW THE LIMITS STIPULATED IN The following are the recommended emission limits as proposed by the air quality specialists. NamPower may choose emission limits that are more stringent within their specifications but may not specify emission limits that exceed the values in the table below.

Table 7-11 in the Air Quality MP.

9.2.6 Soil monitoring

- Quarterly inspections of soil stockpiles and bi-annual inspections of rehabilitated areas will be undertaken to ensure that the topsoil management plan is being properly implemented (see Soil MP).
- Impacts from ash during biomass combustion will first be observed in the air and water before it is observed in the soil. Monitoring of these constituents in the soil should be conducted at least every five years and compared to the baseline concentrations.

APPENDIX A: EMERGENCY RESPONSE PLAN TEMPLATE

AFRICAN OFFICES

South Africa

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