Xaris Walvis Bay Power Plant and Gas Supply Facility

Environmental Management Plan

Power plant and Specific Associated Infrastructure

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PROJECT NAME	Environmental Management Plan for the Xaris Walvis Bay Power Plant and Gas Supply Facility: Power Plant
STAGE OF REPORT	Final
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LIST OF ACRONYMS AND ABBREVIATIONS

CM	Construction Manager
CO	Carbon monoxide
dB	decibels
DEA	Directorate of Environmental Affairs
EC	Environmental Coordinator
ECO	Environmental Control Officer
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMA	Environmental Management Act, No 7 of 1997
EMP	Environmental Management Plan
IFC	International Finance Corporation
mg/l	Milligrams per litre
NHC	National Heritage Council
NOx	Nitrogen oxides
PPM	Parts Per Million
SABS	South African Bureau of Standards

1 INTRODUCTION

This Environmental Management Plan (EMP) has been drafted as part of the Environmental Impact Assessment (EIA) which was conducted in terms of the Environmental Assessment for the development of a power plant and specific associated infrastructure, which is one of three components of a larger energy provision project. Its content has been tailored according to the Regulations of the Environmental Management Act, 2007 (Act No 7 of 2007) Regulation No 30 of 2011 listing No 8(j) (aa) (bb) (cc) as well as the relevant International Finance Corporation (IFC) Environmental, Health and Safety (EHS) Guidelines. This EMP aims to provide management measures to address the effects on the environment that have been identified in the EIA.

2 EMP IMPLEMENTATION – ROLES AND RESPONSIBILITIES

The roles and responsibilities of all parties involved in effectively managing the environment are set out below:

Table 1: Roles and responsibilities for EMP Implementation

POSITION	RESPONSIBILITY	FREQUENCY	REPORTING TO
Client	Accountable for all aspects of EMP compliance	Continuous	Government
Environmental Coordinator	Supervisory / Auditing EMP compliance	Monthly	Client
Contractor	Accountable for implementation of construction related mitigation measures in this EMP	Weekly	Client
Environmental Control Officer	Responsible for implementation and monitoring	Continuous	Contractor

Client

The client will take full responsibility for compliance to the EMP and will report to Directorate of Environmental Affairs on a continuous basis for the duration of the EMP implementation. Any incidents that may result in significant environmental degradation should be reported to the Directorate of Environmental Affairs immediately.

Environmental Coordinator

The Environmental Coordinator (EC) (as appointed by Xaris) will inspect the site on a monthly basis to ensure that all specifications are met. The duties of the environmental coordinator will be the following:

- Audit contractor environmental policies and procedures,
- Advise the construction team in respect of implementation of the environmental specifications,
- Conduct visits to ensure all work is aligned to the EMP,
- The environmental coordinator shall inspect the site during the monthly visits. All rehabilitation results (of excavation initiatives) will be included in a quarterly report,
- Conduct inspections of the rehabilitation area and give guidance regarding rehabilitation measures where required.

The Construction Manager / Contractor

The duties of the Construction Manager (CM) or his nominated authority are as follows:

- Familiarise themselves with the requirements of the EMP,
- Develop environmental policies and procedures to comply with the EMP,
- Monitor employees' and contractors' compliance with the environmental specifications and enforce adherence,
- Maintain a record of activities relevant to environmental management,
- The construction manager shall be responsible for monitoring and the enforcement of the environmental management specifications on a day-to-day basis. Any violation of the environmental specifications shall be recorded and the agreed on disciplinary measures taken.

Environmental Control Officer

The Environmental Control Officer will report directly to the Construction Manager regarding the day to day implementation of the EMP as well as all reporting all environmental incidents. The following lists his/her main duties:

- Effect all environmental policies and procedures to comply with the EMP,
- Report all possible environmental incidents and rectification measures to the Construction Manager,
- Communicate all environmental related incidents with the Environmental Coordinator and distribute internally to avoid repeats.

3 ENVIRONMENTAL MANAGEMENT REQUREMENTS

The following are management actions that should be adhered to by the proponent, Xaris Energy (Pty) Ltd "Xaris" at all times. These management requirements cover all actions of the construction and operational phases. All construction and maintenance activities should be carried out in line with this Environmental Management Plan (EMP), as may be applicable to the specific phase and activities carried out.

This section of the EMP details the various management processes mitigation measures, from the beginning of the project to its end (operational phase), concerning the effective management of all areas. The International Finance Corporation (IFC) Environmental, Health and Safety (EHS) Guidelines (General and relevant Industry Sector specific) even though not legally required in Namibia, have been integrated into the relevant chapters of this EMP.

The EMP is laid out as follows:

- Permit and legal requirements (**Table 2**);
- Planning and design management requirements (**Table 3**);
- Construction contract preparation management requirements (**Table 4**);
- Construction mitigation measures (see **Table 5** for overview);
- Operation and maintenance mitigation measures (**Table 6** and **Table 7**); and
- Monitoring requirements (**Table 9**, **Table 11** and **Table 12**).

3.1 PERMIT AND LEGAL REQUIREMENTS

Please refer to **Appendix C** of the **EIA** for **legislative and permit requirements** considered during this EMP. **Table 2** below is a summary of the pertinent permit and other active legal requirements needed.

Table 2: Legislation management requirements

THEME	LEGISLATION INSTRUMENT	MANAGEMENT REQUIREMENTS	CONTACT PERSON
Environmental	Environmental Management Act 7 of 2007 EIA Regulations (EIAR) GN 57/2007 (GG 3812)	The amendment, transfer or renewal of the Environmental Clearance Certificate	Dr Freddy Sikabongo/ Ms Saima Angula Tel: 061-284 2751
Labour	Labour Act 11 of 2007 Health and Safety Regulations (HSR) GN 156/1997 (GG 1617).	Adhere to all applicable provisions of the Labour Act and the Health and Safety regulations.	Labour Law Advice: Tel: 061-309 957
Noise	Road Traffic and Transport Act (No. 22 of 1999)	All vehicles should be compliant in terms of noise with the limits prescribed in Code of Practise SABS 0181: 1981 published by the South African Government Notice No. 463 of 9 July 1982.	Roads Authority: Tel: 061-322 6040
Water	Water Resources Management Act 13 of 2013	Water licences are required for water treatment and disposal	Elize Mbandeka Tel: 061-208 7141
Electricity	Electricity Act 2 of 2000	License required for electricity generation.	Electricity Control Board: Tel: 061-374 300
Archaeology	National Heritage Act 27 of 2004	All protected heritage resources discovered need to be reported immediately to the National Heritage Council (NHC) and require a permit from the NHC before they may be relocated.	Rev Salomon April Tel: (061) 244 375/ 385/594
National Parks	Nature Conservation Ordinance 4 of 1975	Acquire permission to conduct construction and operational activities in a national park.	Manie Le Roux Tel: 061-284 2523

THEME	LEGISLATION INSTRUMENT	MANAGEMENT REQUIREMENTS	CONTACT PERSON
Civil aviation	Aviation Act, Act 74 of 1962	Approval from the Directorate of Civil Aviation is required for the erection of overhead power lines at the power plant facility.	Ms Angelina Simana Paulo Tel: 061-702 212

3.2 PLANNING AND DESIGN PHASE

This phase contains elements that should be considered before construction of the power plant and its specific associated infrastructure commences. These management requirements are important to ensure that safe management of the environment is planned for the proposed construction activities. The **IFC EHS Guideline for Thermal Power Plants (2008)** and **Onshore Oil and Gas Facilities (2007)** have been used in drafting the management requirements below.

Table 3: Management requirements for the planning and design phase

ASPECT	MANAGEMENT REQUIREMENT
EMP Implementation	• Develop an effective strategy to accurately carry out the mitigation actions relevant to the construction, operation and maintenance and decommission activities in this environment. • Establish an applicable internal disciplinary/corrective action system for non-compliance or corrective action.
Financial Provisions	• Allocate appropriate budgetary allowances to develop proper construction planning and environmental rehabilitation actions through the compulsory development of plans and strategies to mitigate negative environmental and social impacts. • Ensure sufficient insurance provision for significant environmental losses • Allocate appropriate budgetary allowance for drafting a decommissioning and closure EMP.
Recruitment	Adhere to where applicable: • Adhere to Namibian legal provisions for the recruitment of labour (no discrimination based on gender, optimal use of local labour and SME's, etc.). • The recruitment process, as defined in the Client's policy, must be formal and organised. • Preference should be given to recruit those who live within the project area.
Stakeholder Communication	Communicate planned activities with affected parties through established community communication channels.
Health and Safety	• Adhere to all legal requirements pertaining to health and safety and consider these in terms of design. • The power plant facility should be designed and constructed according to internationally accepted standards (e.g. United States National Fire Protection Association) for the prevention and control of fire and explosion hazards. Designs should consider: o Leak detection and prevention; o Minimisation of ignition sources and o Safe distances between potential ignition sources; and flammable materials and between processing facilities and adjacent buildings.

ASPECT	MANAGEMENT REQUIREMENT
	• Relevant features of the power plant facility should be designed so as to incorporate necessary fire and explosion prevention and control measures. • The power plant facility should be classified into hazard areas, based on international good practice, and in accordance with the likelihood of release of flammable gases and liquids.

Air quality	• Water injection system for the control of NOx generated during turbine operation should be used.
	• The use of low NOx burners with other combustion modifications such as low excess air firing should be incorporated into the design of the power plant's combustion system.
	• Carbon monoxide (CO) catalysts should be utilised to control CO emissions, particularly where water injection systems are used.
	• Compile an Energy Efficiency and Green House Gas Emissions Plan which considers as a minimum the measures laid out in the **IFC EHS Guideline for Thermal Power Plants (2008: 7-8)**.
	• Stack height should be designed according to Good International Industry Practice as defined in the IFC General Environmental Health and Safety (EHS) Guidelines.
	• If maintenance and calibration can be ensured:
	  o install a system in the flue gas stacks for continuous monitoring of particulate matter and NOx emissions.
	  o If not, see **Table 11.**

Visual	An architect should be appointed to provide recommendations in terms of blending/ harmonising the colours and appearance of the power plant facility and associated infrastructure with the surrounding landscape, particularly from the perspective of Dune 7.
Water pipeline servitude	Identify all other infrastructure corridors (existing and future) and plan a detailed route to avoid unplanned crossings and to make appropriate design provisions (e.g. routing underneath existing pipelines).
Ownership of Farm 58	Pursue resolution with Ministry of Environment and Tourism and Walvis Bay Municipal Council in terms of land ownership and use rights of Farm 58.
Structural integrity	• Contact military base to ascertain frequency and magnitude of detonations and verify seismic activity. • If deemed a significant threat, apply relevant design modifications to the relevant structures. • Consider and incorporate into building design the effects of wind and soil corrosion.
Materials camp and lay-down	Suitable locations for the materials camp and lay-down areas should be identified with the assistance of the Environmental Co-ordinator and the following should be considered in selecting these sites:

ASPECT	MANAGEMENT REQUIREMENT
areas	• The areas designated for the proposed services infrastructure and power plant site should be used as far as possible, • Second choice should be degraded land, • Avoid sensitive areas (e.g. protected archaeological sites, rivers or drainage lines, vegetated areas).
Noise	In order to prevent, minimise and control occupational noise exposures the following should be carried out: • Noise areas (particularly those with noise levels >85 dB(A)) should be identified and designated as such; • Workers working in these areas should be required to wear noise protection equipment at all times; and • Workers in these areas should be individually tested by an ear specialist in order to source the most appropriate noise protection equipment.
Artificial wetland	An agreement between the Client and the owners of the Birds Paradise Business should be determined and agreed upon in writing with respect to the use of the water from the Municipal wastewater treatment plant and the sustainability of the artificial wetland. The terms of the agreement should be based on a rate of abstraction from the Municipal wastewater treatment plant. The rate determined should consider: • Interaction between the wetland and future Municipal spatial plan boundaries; • The rate of discharge at the time when the Birds Paradise Business was established; • The water quality of the artificial wetland (this should be maintained and not deteriorate).
Civil aviation	• Input and design approval should be obtained from the Directorate of Civil Aviation with respect to the designs of the applicable power plant components. • Designs to be completed according to internationally recognised codes and standards including International Electrotechnical Commission standards that addresses non-ionizing radiation emission standards.
RESPONSIBILITY AND TIMEFRAME	
EMP Implementation	• Responsibility: Client. • Timeframe: once-off
Financial Provisions	• Responsibility: Client. • Timeframe: once-off
Recruitment	• Responsibility: Client • Timeframe: once-off
Stakeholder	• Responsibility: Client

ASPECT	MANAGEMENT REQUIREMENT
Communication	• Timeframe: on-going for the duration of the entire project life cycle
Health and Safety	• Responsibility: Client • Timeframe: once-off
Air quality	• Responsibility: Client • Timeframe: once-off
Visual	• Responsibility: Client • Timeframe: once-off
Water pipeline servitude	• Responsibility: Client • Timeframe: once-off
Ownership of Farm 58	• Responsibility: Client • Timeframe: once-off
Structural integrity	• Responsibility: Client • Timeframe: once-off
Materials camp and lay-down areas	• Responsibility: Client • Timeframe: once-off
Noise	• Responsibility: Client • Timeframe: once-off
Civil aviation	• Responsibility: Client • Timeframe: once-off

3.3 CONSTRUCTION CONTRACT PREPARATION MANAGEMENT

This phase contains elements that should be considered whenever construction activities are outsourced to another company by the Client. It is further applicable to any related contract work, which may be employed by Xaris. These management requirements are important to ensure that the environment is appropriately protected while construction activity takes place. Continuous rehabilitation efforts form part of the construction phase as excavated and disturbed areas are rehabilitated to ensure proper operation and maintenance of the power plant and pipeline. These activities are therefore considered as part of the construction phase.

Table 4: Construction contract preparation management requirements

ASPECT	MANAGEMENT REQUIREMENTS
EMP implementation	Relevant Chapters of this EMP should be included in the tender documents for all development so that tenderers can make provision for its implementation.
Financial provision	• Financial provision for the compilation of a Waste Management Plan should be included as a cost item within tenders concerning construction operations. • Financial provision for the facilitation of an induction programme for senior and casual construction personnel as well as subcontractors and associated personnel should be included as a cost item within tenders concerning all construction activities. • Financial provision for the compilation of a Vegetation Management Plan should be included as a cost item within construction tender documents. • Financial provision for the drafting of a Communication Plan should be included as a cost item within construction tender documents. • Financial provision for a Health and Safety Plan requirements, ablutions etc. and including any other items in this EMP.
Recruitment	If applicable: • Provisions designed to maximise the use of local labour should be included within tenders concerning construction operations. • A provision stating that all unskilled labour should be sourced from the area should be included within tenders concerning constructions operations. • Specific recruitment procedures ensuring local firms enjoy preference during tender adjudication should be included within tenders concerning construction operations.

ASPECT	MANAGEMENT REQUIREMENTS
RESPONSIBILITY AND TIMEFRAME	
EMP implementation	• Responsibility: Client. • Timeframe: once-off
Financial provision	• Responsibility: Client. • Timeframe: once-off
Recruitment	• Responsibility: Client • Timeframe: once-off

3.4 CONSTRUCTION MITIGATION MEASURES

Table 5, below, provides a large scale overview of all the major environmental management themes pertaining to both generic and site-specific construction mitigation measures. **Table 5** serves to act as quick reference, for the detailed mitigation measures that follow below, for the implementation of the construction component of this EMP.

Table 5: Overview of generic and site-specific construction mitigation measures

THEME	OBJECTIVE	MITIGATION MEASURES	
		GENERIC	SITE-SPECIFIC
Waste management	Avoid and where not possible minimise all pollution associated with construction.	Section A	N/A
Excavations	Ensure topsoil protection and post-construction rehabilitation.	Section B	N/A
Health and safety	Safeguard health and safety of labourers and general public.	Section C	Section C
Dust and noise	Avoid and where not possible minimise dust and noise associated with construction.	Section D	Section D
Environmental training and awareness	Awareness creation regarding the provisions of the EMP as well as importance of safeguarding environmental resources.	Section E	N/A
Environmental conservation	Minimise construction activity footprint and safeguard biodiversity in ecologically sensitive areas.	Section F	Section F
Employment/ Recruitment	Minimise negative conflict through legal and fair recruitment practices.	Section G	N/A
Stakeholder communication	Provide a platform for stakeholders to raise grievances and receive feedback and hence minimise negative conflict.	Section H	N/A
Socio-economic and Miscellaneous	Ensure due consideration is given to matters regarding the cultural and general wellbeing of the affected community and matters incidental thereto.	Section I	N/A

SECTION A: WASTE MANAGEMENT

ASPECT	MITIGATION MEASURE
GENERIC MITIGATION MEASURES	

Waste management plan	• The Contractor should compile a Waste Management Plan, which should document:
	  o The waste strategy;
	  o Storage (including facilities and locations) and handling procedures;
	  o A waste tracking mechanism to track waste consignments from the originating location to the final waste treatment and disposal location.
	• By way of additional guidance, the Waste Management Plan should address as a minimum the mitigation measures included in the table rows below.

Hazardous waste	• All heavy construction vehicles and equipment on site should be provided with a drip tray and sealable transport container.
	  o Drip trays are to be transported with vehicles wherever they go.
	  o Drip trays should be cleaned daily and spillage handled, stored and disposed of as hazardous waste.
	• Construction vehicles with hydrocarbon leaks should be removed from site and repaired to prevent oil leakages.
	• Maintenance and washing of construction vehicles should be take place only at a designated workshop area.
	  o The workshop floor should be lined with concrete.
	  o The workshop should have an oil-water separator for collect run-off from washing.
	• Spilled concrete (wet or dry) should be treated as hazardous waste and disposed of by the end of each day in the appropriate hazardous waste containers.
	• All hazardous substances (e.g. fuel or chemicals) should be stored separately, according to safety regulations in a specific location on an impermeable surface that is bunded.

Sewage and grey water	• Do not allow the sewage to be discharged directly onto open soil.
	• All sewage from temporary toilets must be removed regularly and disposed of at a recognised (municipal) sewage treatment facility.
	• Water collected from temporary washing facilities at the campsite (wash basins and showers) (grey water), should not be left standing for long periods of time as this promotes parasite and bacterial proliferation. Grey water should be recycled:
	  o Used for dust suppression;
	  o Used to clean equipment.
	• If grey water will not be recycled it should be removed along with the sewage as stated above.

ASPECT	MITIGATION MEASURE
General waste	• The construction site should be kept tidy at all times. All domestic and general construction waste produced on a daily basis should be cleaned and contained daily. • No waste may be buried or burned. • Waste containers (bins) should be emptied regularly and removed from site to a recognised (municipal) waste disposal site. All recyclable waste needs to be taken to the nearest recycling depot where practical. • A sufficient number of separate waste containers (bins) for hazardous and domestic/general waste must be provided on site. These should be clearly marked as such. • Construction labourers should be sensitised to dispose of waste in a responsible manner and not to litter. • No waste may remain on site after the completion of the project.
SPECIFIC MITIGATION MEASURES	
N/A	N/A
RESPONSIBILITY AND TIMEFRAME	
Waste management plan	• Responsibility: Contractor. • Timeframe: once-off
Hazardous waste	• Responsibility: ECO • Timeframe: Continuous (daily).
Sewage and grey water	• Responsibility: ECO • Timeframe: Continuous (daily). Note the following exceptions: o Sewage removal should be done weekly.
General waste	• Responsibility: ECO • Timeframe: Continuous (daily). Note the following exceptions: o Solid waste removal should be done weekly.

SECTION B: EXCAVATIONS

A borrow-pit may be required for ad-hock soil requirements associated with the concrete sleeve construction for roads and waterways of related crossings.

ASPECT	MITIGATION MEASURE
GENERIC MITIGATION MEASURES	
Borrow pits	Registered building suppliers and/or existing borrow-pits (with valid ECCs and EMPs) in the area is to be used as a priority.
Topsoil	• The Contractor should adhere to prescribed measures emanating from the borrow-pit investigation (if applicable) and the design for excavations and disposal of spoil material. • When excavating, topsoil should be stockpiled in a demarcated area. • Stockpiled topsoil should be spread evenly across adjacent areas after construction, but should spread to a thickness not exceeding 1.2 m.
Rehabilitation	All excavated areas (including exhausted borrow pits (if applicable)) need to be rehabilitated as follows: • Excavated areas may only be backfilled with clean or inert fill. No material of hazardous nature (e.g. sand removed with an oil spill) may be dumped as backfill. • Rehabilitated excavated areas need to match the contours of the existing landscape. • The rehabilitated areas should not be higher (or lower) than nearby drainage channels. This ensures the efficiency of revegetation and reduces the chances of potential erosion. • Topsoil is to be spread across excavated areas evenly.
SPECIFIC MITIGATION MEASURES	
N/A	N/A
RESPONSIBILITY AND TIMEFRAME	
Borrow pits	• Responsibility: Contractor. • Timeframe: once-off
Topsoil	• Responsibility: Contractor. • Timeframe: once-off
Rehabilitation	• Responsibility: Contractor. • Timeframe: continuous (daily/weekly) during excavations

SECTION C: HEALTH AND SAFETY

The **IFC EHS Guideline for Thermal Power Plants (2008)** and **Onshore Oil and Gas Facilities (2007)** have been used in drafting the mitigation measures below.

ASPECT	MITIGATION MEASURE
GENERIC MITIGATION MEASURES	
HIV/AIDS and TB training	The Contractor should approach the Ministry of Health and Social Services (or private services provider) to co-opt a health officer to facilitate HIV/AIDS and TB education programmes periodically on site during the construction phase.
HIV/AIDS	• Provide condoms to migrant workers. • Voluntary screening for HIV status of employees.
TB	Employees should be screened pre-employment and on a regular basis during the construction phase for TB.
Road Safety Management Plan	Develop and maintain a Road Safety Management Plan which should as a minimum address the mitigation measures detailed in the row below.
Road safety	• Demarcate construction routes clearly. • Off-road (outside the footprint area) driving should not be allowed. • All vehicles that transport materials or staff to and from the site must be road worthy. • Drivers that transport materials should have a valid driver's license and should adhere to all traffic rules. • Loads upon vehicles should be properly secured to avoid items falling off the vehicle. • Appropriate advance warning road signage should be clearly displayed where necessary.

Safety Around Excavated and Work Areas	• Excavations should be left open for an absolute minimum time.
	• Excavate as short lengths of trenches and box areas as possible for services or foundations in such a way that the trench will not be left unattended for more than 24 hours.
	• Demarcate the following areas with danger tape:
	  o All excavation works;
	  o Soil and other building material stockpiles; and
	  o Temporary waste stockpiles
	• Provide additional warning signage in areas of movement and in "no personnel" areas where workers are not active.
	• Work areas must be set out and isolated with danger tape on a daily basis.
	• All building materials and equipment are to be stored only within set out and demarcated work areas.

ASPECT	MITIGATION MEASURE
	• Only construction personnel will be allowed within these work areas. • 2 fire extinguishers should be available at each fuel storage area and temporary cooking facilities. • Comply with all mitigation measures laid out in **Section A** (Waste Management mitigation details).

Sanitation	• Separate toilets and showers should be available for men and women and should clearly be indicated as such.
	• Portable toilets (i.e. easily transportable) should be available at the construction site(s):
	  o 1 toilet for every 25 females.
	  o 1 toilet for every 50 males.
	  o Sewage waste needs to be removed on a regular basis to an approved (municipal) sewage disposal site. Alternatively, it can be transferred into sealable containers and stored until it can be removed.
	  o Workers responsible for cleaning the toilets should be provided with latex gloves and masks.

Fire and Explosion Prevention Plan	Develop a Fire and Explosion Prevention Plan which should include the mitigation measures in the row below as a minimum.
Fire and explosion prevention	• Potential ignition sources should be identified and managed. • Prepare and implement a fire alarm system. • Prepare and implement an active fire protection system. • Prepare and implement a Fire Response Plan. • Conduct fire safety training. • No open fires may be made anywhere on site. • The Contractor must supply appropriate fuel for cooking and/or heating purposes installed according to the relevant safety standards.
General	• Appropriately rated and fitted Personal Protective Equipment should be provided for each worker individually. • Dust protection masks should be provided to workers if required when working in in dusty conditions. • Potable water should be provided to workers. • No person should be allowed to smoke close to any fuel storage facilities or portable toilets (if toilets are chemical toilets – the chemicals are flammable). • No workers should be allowed to drink alcohol during work hours. • No workers should be allowed on site if under the influence of alcohol.
SPECIFIC MITIGATION MEASURES	

ASPECT	MITIGATION MEASURE
General	Safety fences and other methods to prevent people or animals from falling into open trenches dug for the water pipelines should be erected in sensitive locations and within 500 m of residential areas (mostly near the Municipal wastewater treatment plant).
RESPONSIBILITY AND TIMEFRAME – GENERIC MITIGATION MEASURES	
HIV/AIDS and TB training	• Responsibility: Contractor. • Timeframe: continuous (monthly)
HIV/AIDS	• Responsibility: Contractor. • Timeframe: continuous (monthly)
TB	• Responsibility: Contractor. • Timeframe: continuous (monthly)
Road Safety Management Plan	• Responsibility: Contractor. • Timeframe: once-off
Road Safety	• Responsibility: Contractor. • Timeframe: continuous (daily)
Safety Around Excavated and Work Areas	• Responsibility: Contractor. • Timeframe: continuous (daily).
Sanitation	• Responsibility: Contractor. • Timeframe: continuous (daily).
Fire and Explosion Prevention Plan	• Responsibility: Contractor. • Timeframe: once-off
Fire and explosion prevention	• Responsibility: Contractor. • Timeframe: once-off. Note the following exceptions: o Management of open fires – continuous (daily) o Provision of fuel for cooking and heating – continuous (monthly)
General	• Responsibility: Contractor. • Timeframe: continuous (daily)
RESPONSIBILITY AND TIMEFRAME – SPECIFIC MITIGATION MEASURES	
General	• Responsibility: Contractor. • Timeframe: continuous during excavations (daily)

SECTION D: DUST AND NOISE

ASPECT	MITIGATION MEASURE
GENERIC MITIGATION MEASURES	
Dust suppression	• A watering truck should be used on gravel roads with the most heavy vehicle movement as required for dust suppression. • Use chemical stabilisation to reduce dust entrainment on paved or unpaved roads from the movement of construction vehicles, trucks and equipment. • Implement strict vehicle speed limits and control the amount of traffic. • All open storage piles, waste and building materials are covered or stored in closed off skips, container, bins or temporary roofed shelters. Increase the moisture content of open storage piles in the case where open storage piles cannot be covered or sheltered from prevailing winds • Any spillage of sand or other materials should be cleaned up immediately (vacuum sweeping) and not left unattended to.
Work hours and noise	Work hours should be restricted to between 08h00 and 17h00 where construction involving the use of heavy equipment, power tools and the movement of heavy vehicles is less than 500 m from residential areas.
SPECIFIC MITIGATION MEASURES	
Vehicle noise	Only vehicles with low noise emissions be used during construction. These vehicles should comply with the Namibian Road Traffic Regulations for noise level emissions.
Training	All construction personnel should be given noise pollution sensitivity training.
Monitoring	Monitoring should be conducted as laid out in **Chapter 0.**
RESPONSIBILITY AND TIMEFRAME – GENERIC MITIGATION MEASURES	
Dust suppression	• Responsibility: Contractor. • Timeframe: continuous during excavations (daily)
Work hours and noise	• Responsibility: Contractor. • Timeframe: continuous (daily)
RESPONSIBILITY AND TIMEFRAME – SPECIFIC MITIGATION MEASURES	
Vehicle noise	• Responsibility: Contractor. • Timeframe: once-off
Training	• Responsibility: Contractor. • Timeframe: once-off
Monitoring	• Responsibility: Client. • Timeframe: continuously (quarterly).

SECTION E: ENVIRONMENTAL TRAINING AND AWARENESS

ASPECT	MITIGATION MEASURE
GENERIC MITIGATION MEASURES	
Environmental Induction (Training)	All construction workers are to undergo environmental induction (training) which should include as a minimum the following: • Explanation of the importance of complying with the EMP. • All safety procedures, together with provision of appropriate tools and equipment; • Discussion of the potential environmental impacts of construction activities. • Employees' roles and responsibilities, including emergency preparedness. • Explanation of the mitigation measures that must be implemented when particular work groups carry out their respective activities. • Explanation of the specific mitigation measures within this EMP especially unfamiliar provisions.
SPECIFIC MITIGATION MEASURES	
N/A	N/A
RESPONSIBILITY AND TIMEFRAME	
Environmental Induction (Training)	• Responsibility: Contractor. • Timeframe: continuous (quarterly)

SECTION F: ENVIRONMENTAL CONSERVATION

ASPECT	MITIGATION MEASURE
GENERIC MITIGATION MEASURES	
Soil and groundwater conservation	• Contaminated water (with hydrocarbons) should not be allowed to be disposed of on open soil or within excavated areas. • Soil should be stockpiled for a minimum of time. • Soil removed from excavated areas should be separately stored and replaced in the same sequence as removed: o Topsoil and subsoil should be separated, o Soil stockpile heights and side slope gradients should be kept low (1:3 ratio), o Stockpile areas should be kept away from concrete mixing activities or any chemical processes (such as painting).
Materials camp and lay-down areas	Comply with selection of designated materials camp and laydown areas as decided by the Client (see **Table 3**)
SPECIFIC MITIGATION MEASURES	
Dune vegetation	Avoid as far as possible destruction of any dune vegetation (particularly *salsola* bushes these stabilise the soil and provide habitat to desert life).
RESPONSIBILITY AND TIMEFRAME – GENERIC MITIGATION MEASURES	
Soil and groundwater conservation	• Responsibility: Contractor. • Timeframe: continuous (daily)
Materials camp and lay-down areas	• Responsibility: Contractor. • Timeframe: once-off
RESPONSIBILITY AND TIMEFRAME – SPECIFIC MITIGATION MEASURES	
Dune vegetation	• Responsibility: Contractor. • Timeframe: continuous (daily)

SECTION G: EMPLOYMENT/RECRUITMENT

ASPECT	MITIGATION MEASURE
GENERIC MITIGATION MEASURES	
Legislation	Adhere to the legal provisions in the Labour Act for the recruitment of labour (target percentages for gender balance, optimal use of local labour and SME's, etc.) in the Contract.
Recruitment	The Contractor should compile a formal recruitment process including the following provisions as a minimum: • The Contractor may request assistance from the local authority (local council, or municipality) with a recruitment strategy. • Recruitment should not take place at construction sites and should be conducted at the site offices in a formal manner. • Ensure that all sub-contractors are aware of recommended recruitment procedures and discourage any recruitment of labour outside the agreed upon process. • Contractors should give preference in terms of recruitment of sub-contractors and individual labourers to those from the project area and only then look to surrounding towns. • Clearly explain to all job-seekers the terms and conditions of their respective employment contract (e.g. period of employment etc.) – make use of interpreters when necessary.
SPECIFIC MITIGATION MEASURES	
N/A	N/A
RESPONSIBILITY AND TIMEFRAME	
Legislation	• Responsibility: Contractor. • Timeframe: continuous during recruitment period.

Recruitment	• Responsibility: Contractor.
	• Timeframe:
	  o Once-off for preparing the recruitment process
	  o Continuous during the recruitment period.

SECTION H: STAKEHOLDER COMMUNICATION

ASPECT	MITIGATION MEASURE
GENERIC MITIGATION MEASURES	
Communication plan	The Client should draft a Communication Plan (which shall be binding once signed by all relevant parties), should outline as a minimum the following: • How stakeholders, who require ongoing communication for the duration of the construction period, will be identified and recorded and who will manage and update these records; • How these stakeholders will be consulted on an ongoing basis; • Make provision for grievance mechanisms – i.e. how concerns can/ will be lodged/ recorded and how feedback will be delivered as well as further steps of arbitration in the event feedback is deemed unsatisfactory.
Stakeholder/ community consultation	• The Contractor should liaise with the Client regarding all issues related to community consultation and negotiation before construction commences. • The Contractor should list the stakeholders of the project and their contact details with whom ongoing communication would be required for duration of the contract. This list, together with the Communication Plan should be agreed upon and given to the CM before construction commences. • All people on the stakeholders list should be informed about the availability of the Communication Plan in writing by the CM prior to the commencement of construction activities. • A procedure should be put in place to ensure that concerns raised have been followed-up and addressed.
Community Liaison Officer	• The Contractor should appoint a Community Liaison Officer from the construction team to liaise between the Contractor, stakeholders, and the Client. • All communication with the stakeholders should take place through the Community Liaison Officer.
Monthly (or quarterly) site meetings	• The Contractor shall report on the status of the implementation of all provisions of the EMP at site meetings. • Key representatives from the above mentioned list should be invited to attend monthly (or quarterly, if applicable) site meetings to raise any concerns and issues regarding project progress.
General communication matters	A copy of the EMP must be available at the site office and should be accessible to all stakeholders as required.

SPECIFIC MITIGATION MEASURES	
N/A	N/A
RESPONSIBILITY AND TIMEFRAME	
Communication plan	• Responsibility: Client. • Timeframe: once-off.

Community Liaison Officer	• Responsibility: Contractor.
	• Timeframe:
	  o Appointment: once off
	  o Communication: continuous.

Monthly (or quarterly) site meetings	• Responsibility: Contractor. • Timeframe: once-off.

Stakeholder/ community consultation	• Responsibility: Contractor.
	• Timeframe:
	  o Once-off appointment
	  o Continuous communication between Community Liaison Officer and stakeholders/ community.

General communication matters	• Responsibility: Contractor. • Timeframe: continuous (daily).

SECTION I: SOCIO-ECONOMIC AND MISCELLANEOUS

ASPECT	MITIGATION MEASURE
GENERIC MITIGATION MEASURES	
Archaeology	• Should a heritage site or archaeological site be uncovered or discovered during the construction phase of the project, a "chance find" procedure should be applied in the order they appear below: o If operating machinery or equipment stop work; o Demarcate the site with danger tape; o Determine GPS position if possible; o Report findings to foreman; o Report findings, site location and actions taken to superintendent; o Cease any works in immediate vicinity; o Superintendent to visit site and determine whether work can proceed without damage to findings; o Determine and demarcate exclusion boundary; o Site location and details to be added to the project's Geographic Information System (GIS) for field confirmation by archaeologist; o Inspect site and confirm addition to project GIS; o Advise the National Heritage Council (NHC) and request written permission to remove findings from work area; and o Recovery, packaging and labelling of findings for transfer to National Museum. • Should human remains be found, the following actions will be required: o Apply the chance find procedure as described above; o Schedule a field inspection with an archaeologist to confirm that remains are human; o Advise and liaise with the NHC and Police; and o Remains will be recovered and removed either to the National Museum or the National Forensic Laboratory.
SPECIFIC MITIGATION MEASURES	
N/A	N/A
RESPONSIBILITY AND TIMEFRAME	
Archaeology	• Responsibility: Contractor. • Timeframe: continuous during excavations (as and when encountered).

3.5 OPERATION AND MAINTENANCE PHASE

The operational phase mitigation measures are focussed on maintenance procedures of the pipeline. No additional activities have been identified which require interventions and environmental management requirements. The mitigation measures as indicated below should be adhered to.

Table 6: General operation and maintenance phase mitigation measures

ASPECT	MITIGATION MEASURE
EMP implementation	If any construction is to be conducted as part of maintenance works for the services infrastructure within the project area please refer to the construction mitigation measures of this EMP (**Chapter 3.4**).
Water pipeline	Maintenance and monitoring of the wastewater treatment plant pipelines should be undertaken to detect and prevent the wasting of water.
Environmental training and awareness during operation	• All permanently employed staff should undergo training, as informed by this EMP, appropriate to their respective scopes of work • All appointed maintenance contractors should be instructed to conduct the necessary health, safety and environmental training, as informed by this EMP, applicable to their respective work.
Wastewater quality	• Discharge of wastewater should comply with water quality standards in **Table 8**. • Wastewater quality should be monitoring as outlined in • **Table** 9. • If the water quality of the discharge wastewater exceeds the wastewater quality guideline values laid out in **Table 8**, the relevant project components and additional mitigation measures need to be evaluated and adjusted accordingly to ensure compliance. • If it becomes unreasonable to maintain the recommended wastewater quality of the discharge water: o notice of decommissioning should be given to the Walvis Bay Municipality (see **Table 13**); and o alternatives such as discharging into the ocean should be investigated as part of a separate EIA process.
Air quality	• Maintain the system installed in the flue gas stack for continuous monitoring of particulate matter and NOx (**not applicable if maintenance cannot be ensured**). • Operation and maintenance of power plant components should be conducted according to design/manufacturers' specifications. • An air quality monitoring programme should be compiled and should consider the following elements in line with **IFC's General EHS Guidelines for Air Emissions and Ambient Air Quality (2007)** as well as the provisions contained in **Table 11**: o Monitoring parameters;

ASPECT	MITIGATION MEASURE
	○ Baseline calculations; ○ Monitoring type and frequency; ○ Monitoring locations; and ○ Sampling and analysis methods. • If emissions exceed the air quality guideline values laid out in **Table 10**, the relevant combustion components and additional mitigation measures need to be evaluated and adjusted accordingly to ensure compliance.
Noise	• In line with the IFC guidelines for noise reduction in new developments the following is recommended: ○ Equipment should be selected with lower sound power levels where practical. ○ Install suitable mufflers on engine exhausts and compressor components where required. ○ Where possible and required, install acoustic enclosures for equipment to stop noise at the source. The noise levels of the gas turbine units should be attenuated. • Monitoring should be conducted as laid out in **Chapter 0**. Where recorded values exceed values predicted in the Noise Impact Assessment (see ***APPENDIX C*** of EIA Report) equipment used and additional noise mitigation should be evaluated and adjusted accordingly to ensure compliance.
Corrosion	Compile plan for maintenance related to the effects of wind and soil corrosion of power plant facilities.
RESPONSIBILITY AND TIMEFRAME	
EMP implementation	• Responsibility: Environmental Coordinator. • Timeframe: as indicated in **Chapter 3.4**.
Water pipeline	• Responsibility: Environmental Coordinator. • Timeframe: continuous (as and when required).
Environmental training and awareness during operation	• Responsibility: Environmental Coordinator. • Timeframe: continuous (monthly).
Wastewater quality	• Responsibility: Environmental Coordinator. • Timeframe: ○ Continuous (monthly). ○ Adjusting project component and mitigation – as required. ○ Decommissioning and EIA – once off.
Air quality	• Responsibility: Environmental Coordinator. • Timeframe:

ASPECT	MITIGATION MEASURE
	○ Maintenance and operation – continuous (monthly). ○ Compiling programme – once-off. ○ Adjusting project components and mitigation – as required.
Noise	• Responsibility: Environmental Coordinator. • Timeframe: once-off.
Corrosion	• Responsibility: Environmental Coordinator. • Timeframe: ○ Design recommendations – once-off. ○ Adjusting project components and mitigation – as required.

The occupational health and safety considerations are essential to the sustainability of the operation of the power plant facility. **Table 7** below details mitigation measures specifically related to occupational health and safety. It should be noted the **IFC EHS Guideline for Thermal Power Plants (2008)** and **Onshore Oil and Gas Facilities (2007)** were used in compiling the table below.

Table 7: Occupational health and safety mitigation measures during operation and maintenance phase

ASPECT	MITIGATION MEASURE
Health and Safety Committee	A Health and Safety Committee should be formed to manage all the operational occupational health and safety training and procedures listed below.
General Health and Safety Plan	An operational Health and Safety Plan should be drafted and should include as a minimum the following: • A formal Permit To Work system should be developed for the power plant facility, which should address the following: ○ Procedures for carrying out potentially hazardous work; ○ Authorisation system for carrying out designated hazardous work; ○ Effective communication of the work to be carried out, including hazards involved; and ○ Safe isolation procedures to be followed before commencing work. • A lockout/ tagout procedure for equipment should be implemented to ensure all equipment is isolated from energy sources before servicing or removal. • Training of relevant employees in terms of plan implementation.
Medical provision	The power plant facility should be equipped, at a minimum, with specialised first aid providers (industrial pre-hospital care personnel) and the means to provide short-term remote patient care.
Fire protection	The power plant should be operated according to the applicable international standards (e.g. United States National Fire Protection

ASPECT	MITIGATION MEASURE
	Association) for the prevention and control of fire and explosion hazards.
Road safety	An operational Road Safety Management Plan should be compiled to cover all operational transportation and road related matter including (but not limited to): • Training of passenger transport drivers; • Speed limits and enforcement; and • Vehicle maintenance and safety equipment.
Emergencies	• An emergency response team should be trained and established for the power plant facility and should address the following: o Potential emergencies; o Rescue injured persons; o Perform emergency actions; and o Co-ordinate actions with other agencies and organisations that may be involved in emergency response. • Emergency equipment should be provided and escape routes clearly marked for all areas of the power plant facility. • Exercises in emergency preparedness should be carried out in accordance with international best practice[1]. • An Emergency Response Plan should be compiled and implemented when necessary that contains as a minimum: o A description of the response organisation (structure, roles, responsibilities and decision makers); o Description of response procedures (details of response equipment and location, procedures, training requirements, duties, etc.); o Descriptions and procedures for alarm and communications systems; o Description of on-site first aid supplies and available backup medical support; o Evacuation procedures; and o Emergency Medical Evacuation procedures for injured or ill personnel. o Training of relevant employees in terms of plan implementation..
EMF exposure	An Electromagnetic Field (EMF) safety programme should be compiled and implemented and should as a minimum address the following: • Identification of potential exposure levels in the workplace; • Training of workers in the identification of occupational EMF levels and hazards; • Identification and establishment of safety zones to differentiate

[1] See IFC EHS Guideline – Onshore Oil and Gas Development

ASPECT	MITIGATION MEASURE
	between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to trained workers; • Implementation of action to address potential or confirmed exposure levels that exceed reference occupational exposure levels developed by international organisations like the International Commission on Non-Ionizing Radiation Protection. These plans may include: o Limiting exposure time through wok rotation; and o Increasing the distance between the source and the worker.
RESPONSIBILITY AND TIMEFRAME	
Health and Safety Committee	• Responsibility: Client. • Timeframe: once-off.
General Health and Safety Plan	• Responsibility: Environmental Coordinator. • Timeframe: o Once-off to compile plan. o Continuous for implementation training (quarterly).
Medical provision	• Responsibility: Environmental Coordinator. • Timeframe: once-off.
Fire protection	• Responsibility: Environmental Coordinator. • Timeframe: continuous during operation.
Medical provision	• Responsibility: Environmental Coordinator. • Timeframe: once-off.
Emergencies	• Responsibility: Environmental Coordinator. • Timeframe: Once-off for all mitigation measures except the following: o Continuous emergency preparedness exercise as indicated in the applicable IFC EHS Guideline o Continuous for plan implementation training (monthly).
EMF exposure	• Responsibility: Environmental Coordinator. • Timeframe: o Once-off to compile programme; o Continuous training of workers (quarterly). o Once-off implementation of plans
Noise	• Responsibility: Environmental Coordinator. • Timeframe: Once-off

3.6 MONITORING

Continued monitoring of certain mitigation measures included in this EMP should be conducted during the construction and operational phases.

3.6.1 WATER QUALITY

Monitoring requirements described in **Table 9** below relate to any waste water produced within the power plant facility (this may include, but not limited to oil separated water, site drainage and cooling water) that will be discharged to Municipal wastewater treatment plant. Wastewater discharged to the Municipal treatment plant should meet IFC water quality parameters as defined in the **IFC EHS Guideline for Thermal Power Plants (1998 & 2008)** and **Onshore Oil and Gas Facilities (2007)** and extracted to **Table 8** below:

Table 8: IFC Effluent water quality guidelines

PARAMETER	mg/l (except pH & Temp)	PARAMETER	mg/L
pH	6 - 9	Chromium	0.5
BOD	25	Copper	0.5
COD	125	Iron	1
TSS	35	Zinc	1
Phenols	0.5	Lead	0.5
Sulfides	1	Cadmium	0.1
Total res. chlorine	600 - 1200	Mercury	0.005
Temperature increases	≤ 3 °C of receiving water at discharge point.	Arsenic	0.5

Table 9: Waste water quality monitoring requirements

ASPECT	MONITORING REQUIREMENT	FREQUENCY	REPONSIBILITY
Process water quality	Test quality of used turbine wash-water discharged to Ministry of Agriculture Water and Forestry approved discharge point.	Monthly	Environmental Coordinator
Discharge of brine to artificial wetland	Monitor total dissolved solids, freshwater and freshwater/saline water interface levels along the wetland boundary as defined in the 2030 Walvis Bay Spatial Development Framework, over time. This will serve as an early warning system to minimise impact on vegetation and wetland and provide information necessary for water balance optimisation.	Monthly	Environmental Coordinator
	Monitor the volume of semi-purified effluent released to the wetland.	Monthly	Environmental Coordinator
	Conduct visual inspection of the salt deposits with the use of fixed point photography.	Every six months	Environmental Coordinator

3.6.2 AIR QUALITY

Nitrogen oxides (NOx) produced during the combustion process, should adhere to the IFC emissions guidelines as defined in **IFC EHS Guideline for Thermal Power Plants (2008)** and extracted to **Table 10** below for combustion turbines. However, given the fact that water resources are limited, the limit value of 25 ppm NOx emissions should be subject to optimisation. In the event that the limit value needs to be optimised, the emissions should not exceed the World Health Organisation Air Quality Guideline (Global Update 2005) values for NOx emissions (i.e. 40 µg/m^3 annual mean or 200 µg/ m^3 1-hour mean) (as supported by the Air Quality Impact Assessment – see ***APPENDIX D*** of the EIA Report).

Table 10: Emissions guidelines (in mg/Nm³or as indicated) for combustion turbines

Fuel	Particulate matter		Sulphur dioxide (SO2)		Nitrogen oxides	Dry gas, excess O2 content
	Non Degraded Airshed	Degraded airshed	Non Degraded airshed	Degraded airshed		
Natural Gas	N/A	N/A	N/A	N/A	51 (25 ppm)	15%
Other Fuels	50	30	Use of 1% or less Sulphur (S) fuel	Use of 0.5% or less S fuel	152 (74 ppm)	15%

Table 11 below contains additional monitoring requirements as defined in **IFC EHS Guideline for Thermal Power Plants (1998 & 2008)** with respect to air quality and should be adhered to once the power plant is operational.

Table 11: Air quality monitoring requirements

ASPECT	MONITORING REQUIREMENT	FREQUENCY	REPONSIBILITY
Combustion	If an automatic monitoring system is not installed in flue gas stacks, surrogate performance monitoring should be carried out for NOx (i.e. combustion temperature and excess oxygen level need to be maintained within the optimal band in which particulate matter and NOx emissions are minimised)	Continuous (monthly)	Environmental Coordinator
	Direct measurements of the concentration of emissions in samples of flue gas should be performed. At least three data sets for direct emissions measurements should be used, based on an hourly rolling average.	Annually	Environmental Coordinator

3.6.3 NOISE

It is recommended that the noise monitoring be conducted by an appointed noise specialist during the construction and operation phases in order to verify predictions made based on sound power levels that were provided during the Environmental Assessment by the Client.

Table 12: Construction and operation phase noise monitoring requirements

ASPECT	MONITORING REQUIREMENT	FREQUENCY	REPONSIBILITY
Construction phase noise	Noise monitoring be conducted during the construction phase along the power plant site boundary.	Once-off	Environmental Coordinator
Operation phase noise	Noise monitoring be conducted during the operation phase along the power plant site boundary.	Biannually	Environmental Coordinator

3.7 DECOMMISSIONING AND CLOSURE

This EMP does not cover the mitigation measures concerned with the decommissioning and closure of the power plant and its specific associated infrastructure. A contingency budgetary allowance should be allowed for this during the planning and design phase (**Table 3**).

Table 13: Decommissioning and closure mitigation measures

ASPECT	MITIGATION MEASURE
Closure	Should closure be considered, a closure plan and related EMP should be drafted and submitted to the DEA.
Artificial wetland	The Client should inform the Walvis Bay Municipality 2 years in advance if the wastewater treatment plant, in whole or in part (for whatever reason) is to be decommissioned in order to allow the Municipality sufficient time to implement a strategy for maintaining the size of the wetland.
RESPONSIBILITY AND TIMEFRAME	
Closure	• Responsibility: Client. • Timeframe: once-off.
Artificial wetland	• Responsibility: Client. • Timeframe: once-off.

4 CONCLUSIONS AND RECOMMENDATIONS

No decommissioning phase has been incorporated into the EMP for the power plant and specific associated infrastructure. Should the overall project be decommissioned, or the water pipelines need to be replaced, for whatever reason, a specific Environmental Management Plan with decommissioning specific management measures will have to be drafted (**Table 13**). The costs for the drafting of this plan should be done during the planning and design phase (**Table 3**). This EMP has been drafted for the purposes of Environmental Clearance under Namibian law and have incorporated the following Industry specific IFC Guidelines documents:

- Environmental, Health, and Safety Guidelines for Thermal Power Plants;
- Environmental Health, and Safety Guidelines for Onshore Oil and Gas Development.