



Xaris Walvis Bay Power Plant and Gas Supply Facility

Environmental Management Plan Marine Components

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| PROJECT NAME | Proposed Xaris Walvis Bay Power Plant and Gas Supply Facility: Marine Component |
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LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---------------------|--|
| ballast | Material in ship to steady it. |
| BCLME | Benguela Current Large Marine Ecosystem |
| BID | Background Information Document |
| Class | Pressure rating of the typical pipe |
| CFCs | chlorofluorocarbons |
| CO, CO ₂ | Carbon oxide, Carbon dioxide |
| dB | decibels |
| DEA | Directorate of Environmental Affairs |
| EC | Environmental Coordinator |
| EIA | Environmental Impact Assessment |
| EMA | Environmental Management Act, No 7 of 1997 |
| EMP | Environmental Management Plan |
| FSRU | Floating Storing Regasification Unit |
| H ₂ S | Hydrogen Sulphide |
| IAP | Interested and Affected Party |
| IFC | International Finance Corporation |
| liquefaction | process of liquefying or making liquid |
| LNG | Liquid Natural Gas |
| LNGC | Liquid Natural Gas Carrier |
| CH ₄ | Methane |
| mg/l | Milligrams per litre |

| | |
|-----------------------|---|
| MME | Ministry of Mines and Energy |
| MSDS | Materials Safety Data Sheets |
| MW | Mega Watt |
| NACOMA | Namibia Coast Conservation and Management Project |
| NHC | National Heritage Council |
| NO_x | mono-nitrogen oxides, |
| OEM | Original Equipment Manufacturer. |
| OCGT | Open Cycle Gas Turbine |
| ODS | ozone depleting substances |
| SHE | Safety, Health and Environment |
| SME | Small and Medium Enterprise |
| SO₂ | Sulphur dioxide |
| STS | Ship to Ship Transfer. |
| Trestle jetty | Suspended facility on light columns. |

1 PRINCIPLES OF THE ENVIRONMENTAL MANAGEMENT PLAN

1.1 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 Management Act (2007) and its Regulations (2007), listing No 8(j) (aa) (bb) (cc). This EMP has also been drafted to comply with Equator Principles and IFC requirements in order to render the project bankable. The project is part of an energy provision project. This EMP provides management measures to address the effects on the socio-economic and biophysical environment that have been identified in the EIA.

1.2 PROJECT BACKGROUND

Xaris Energy Namibia (Pty) Ltd (the proponent) is intending to construct and manage an Open Cycle Gas Turbine (OCGT) Power Plant on 40 hectares of land in Walvis Bay, Namibia. The power plant initially will be sized to be able to yield 300MW of base load power to the national grid of Namibia.

This EIA assesses the marine components of the project that will supply natural gas to the Power Plant namely:

- Dredging work by widening the port entrance channel to the new Tanker Berth for the import and export of petroleum products in the port of Walvis Bay (Botha, Hooks, & Fauls, 2013).
- Dredging work and berth construction work at a new gas terminal for a Floating Storage Regasification Unit (FSRU) and a Liquid Natural Gas (LNG) carrier in a double banking (side-by-side) configuration during re-fuelling.
- Construction of a trestle gas pipeline from the FSRU to the land based port premises.

The operational activities that will take place in this marine environment are:

- Direct transfer of LNG from the LNG carrier to the FSRU every six weeks approximately.
- Storage of the LNG and regasification of the LNG to natural gas on board of the FSRU.
- Pumping of the natural gas from the FSRU via the trestle jetty and pipeline to the shore based port premises.

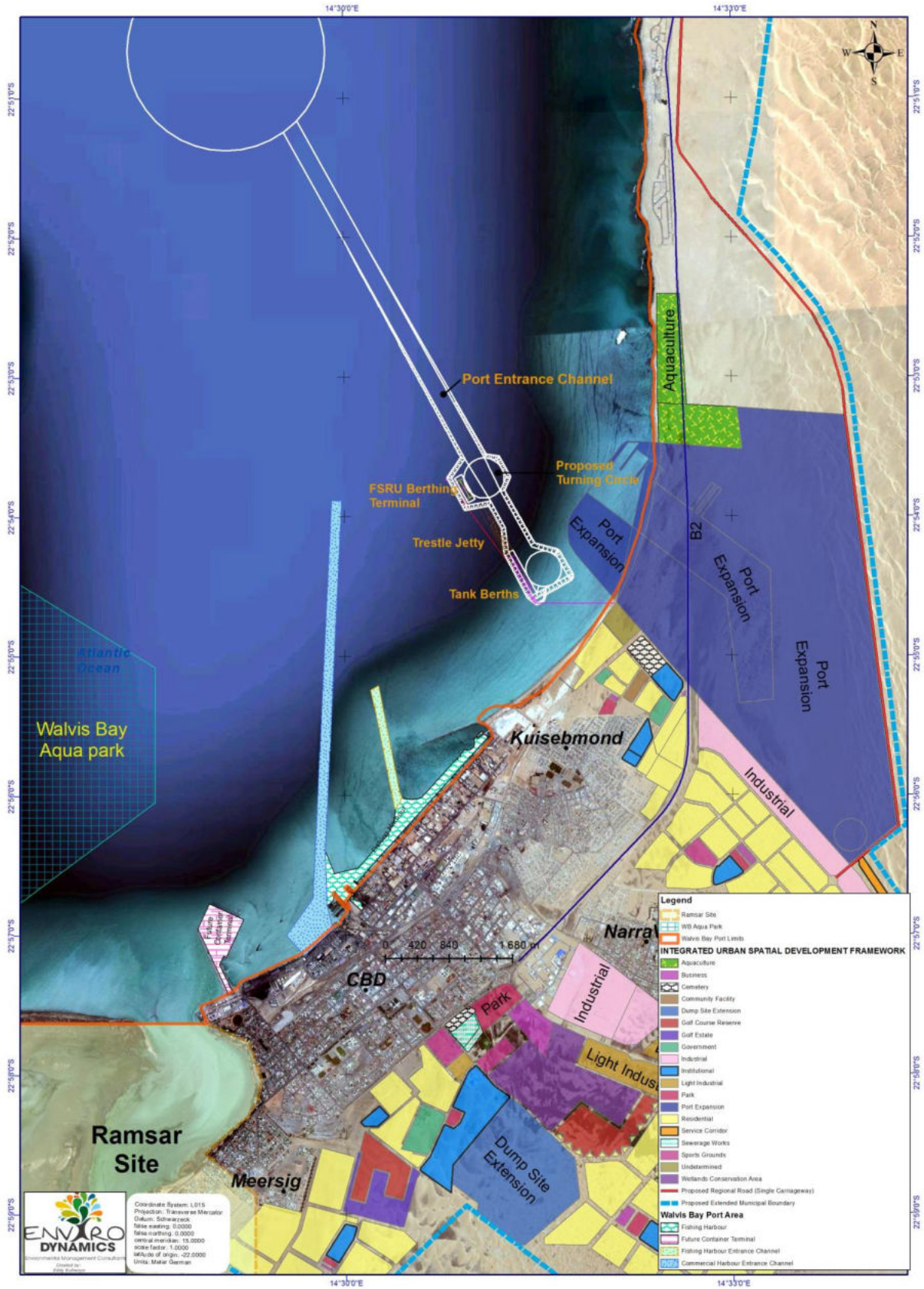


Figure 1: Marine components of the Xaris gas fired power plant and gas supply facility in Walvis Bay

1.3 ROLES AND RESPONSIBILITIES CONCERNING IMPLEMENTATION OF THE EMP

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 |
|--------------------------------------|---|------------|------------|
| Client | Accountable for all aspects of EMP compliance | Continuous | Government |
| Environmental Coordinator | Supervisory / Auditing EMP compliance | Monthly | Client |
| Contractor/ Operator | Accountable for implementation of EMP | Weekly | Client |
| Environmental Control Officer | Responsible for implementation and monitoring | Continuous | Contractor |

Proponent

The client will take full responsibility for compliance to the EMP and will report to the Directorate of Environmental Affairs (DEA) 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. The Client will also report to the DEA every three years in order to demonstrate compliance to this EMP and to renew the environmental clearance certificate.

Environmental Coordinator

The Environmental Coordinator (EC) (as appointed by Proponent) will inspect the site or operations 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 will be included in a quarterly report,

- Conduct inspections of the rehabilitation area and give guidance regarding rehabilitation measures where required.

The Contractor or Operator

The duties of the Contractor/Operator or his nominated authority are as follows:

- Familiarize themselves with the requirements of the EMP,
- Develop environmental policies and procedures to comply with the EMP as per IFC requirements,
- 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/Operations 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.

1.4 ENVIRONMENTAL MANAGEMENT REQUIREMENTS

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, operational, maintenance and decommissioning 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, from the beginning of the project to its end (operational phase), concerning the effective management of all areas. 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. The EMP is laid out as follows:

- Permit and Legal Requirements;
- Planning and Design Requirements;
- Environmental Management Requirements; and
- Environmental Mitigation Requirements

Table 2: Legislation Management Requirements

| FIELD | INSTRUMENT AND CONTENTS | MANAGEMENT REQUIREMENT |
|--|---|---|
| Finance | The International Finance Corporation (IFC) | LNG, Port and Shipping compliance plans and procedures |
| | Equator Principles | |
| Marine | The Benguela Current Commission (BCC) | Regulatory requirements for ocean water quality. |
| | UN Convention on the Law of the Sea, 1982 (UNCLOS) | Shipping and pollution |
| | The Ramsar Convention (RC) | Protected estuary/lagoon |
| Noise | South Africa - GNR.154 of January 1992; South Africa - GNR.155 of 10 January 1992; SANS (South African National Standards) 10103:2008; SANS 10328; SANS 10357, | Comply with SANS/IFC guidelines |
| Air | WHO, (2005): WHO Air quality guidelines IFC, (2007): Environmental Health and Safety Guidelines, | Comply with WHO/IFC guidelines |
| | Atmospheric Pollution Prevention Ordinance 11 Of 1976 | Identify and certify air pollution sources |
| Water | South African Water Resources Management Act: Water quality standards World Health Organisation (WHO): Water Quality Standards | Discharge of process water for engine cooling as well as effluents Elize Mbandeka Tel: 061-208 7141 |
| | Water Act No 54 of 1956 is still in force | Permits to abstract water and discharge waste water. |
| Marine Pollution | Territorial Sea and Exclusive Economic Zone of Namibia (No 3 of 1990, amended by Act 30 of 1991 | Use and control of Namibia's territorial sea. |
| | Dumping at Sea Control Act, N.73 of 1980 | Prohibit incineration and limits dumping at sea. |
| | The Marine Resources Act 2000 | Protect marine ecosystems. |
| | Marine Notice No. 2 of 2012 issued by the Ministry of Works and Transport | Require ministerial permission to transfer LNG at sea. |
| | Namibian Ports Authority Act 2 of 1994 | Control the port boundaries and activities. |
| | Prevention and Combating of Pollution of the Sea by Oil Act (No. 6 of 1981) | Report discharge/spills of LNG and other fuels. |
| Prevention and Combating of Pollution of | Provide for incidental spills. | |

| FIELD | INSTRUMENT AND CONTENTS | MANAGEMENT REQUIREMENT |
|--------------------------|--|---|
| | the Sea by Oil Amendment Act (No. 24 of 1991) | |
| | Pollution Control and Waste Management Bill: | Apply waste management systems. |
| Labour and Safety | Labour Act (1992) and Affirmative Action (Employment) Act 29 of 1998 | Adhere to all applicable provisions of the Labour Act and the Health and Safety regulations. Labour Law Advice: Tel: 061-309 957 |
| | Hazardous Substances Ordinance 14 of 1974: | |
| | Public Health Act 36 of 1919: | Prevent public water pollution and provide construction worker protection. |
| | National Heritage Act 27 of 2004 | All protected heritage resources (e.g. human remains etc.) 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 |

2 PLANNING AND DESIGN PHASE MITIGATION DETAILS

This phase contains instructions that should be considered during the planning and design phase. These management and design requirements are important to ensure that safe avoidance measures are introduced in the design of the facilities as well as processes.

The accountability lies with the project proponent for the implementation of the management and design measures. The design team and facility suppliers will be responsible for proving the incorporation of these design measures.

Table 3: Management and design requirements for the Planning and Design phase

| ASPECT | MANAGEMENT/DESIGN REQUIREMENT |
|-------------------------------|--|
| Dredging equipment and Piling | <p><i>(International Finance Corporation, 2007: EHS guidelines for Port, Harbours, and Terminals)</i> (International Finance Corporation, 2007)</p> <p>Design for a minimum practical horizontal and vertical footprint for the dredging activity and trestle foundations.</p> <p>Upfront agreement with Namport on which disposal site to use and analysing the site to determine best practice methods suitable to the site.</p> <p>Discuss dredging experience and past difficulties with Namport, dredging operators used previously, and other authorities.</p> <p>Use the Trailing Suction Hopper Dredger technology for the dredging operation design. Add relevant material spill/turbidity control measures including:</p> <ul style="list-style-type: none"> • Geotechnical information of the site to determine how the sediment will react when disturbed and disposed of and how to manage the reaction. Evaluate the risk of disturbing H₂S and CH₄. Evaluate the contaminant content of spoil to determine need for treatment before disposal. • Overflow design that filters suspended solids during dredging activity. Low turbidity valves cut the airflow in the overflow stream to stabilize the flow and assist in speeding the settling process of solids in the overflow to the ocean floor. • Use de-gassing equipment on the centrifugal pumps to eliminate gas build-up that reduces pump efficiency, causing unnecessary |

| ASPECT | MANAGEMENT/DESIGN REQUIREMENT |
|---|---|
| | <p>material loss at the suction head.</p> <ul style="list-style-type: none"> • Use overflow as process water via a “green pipe” to assist the suction head effectiveness and containing overflow spill at the suction head to be recycled. • Use equipment that can reduce the discharge to seafloor “head” to minimise exposure of spoil to the water column and so the discharge plume. <p>Add relevant Hydrogen Sulphide (H₂S) and Methane (CH₄) control measures including:</p> <ul style="list-style-type: none"> • Apply existing H₂S procedure of dredging activities in the port (Document Reference number BKI-516-1 0012-3E-H2S-0) to the dredger layout and systems design. • Continuous on-board monitoring (deck and confined spaces) capability from the bridge, • Isolate deck, engine room intake and accommodation intakes from the hopper, • Close the rear section of the hopper and circulating air forward to the bow. <p>Reverse circular drilling for piling is required due to its low noise levels.</p> |
| <p>FSRU and LNG carrier design. (International Finance Corporation, 2007)</p> | <p><i>(International Finance Corporation, 2007: EHS guidelines for Port, Harbours, and Terminals (International Finance Corporation, 2007); EHS guidelines for Shipping (International Finance Corporation, 2007); EHS guidelines for Liquefied Natural Gas (LNG) Facilities) (International Finance Corporation, 2007).</i></p> <p>Avoid use of antifouling paint containing tributyltin, copper oxides, and biocides. Epoxy based paints last longer than copper oxide paints.</p> <p>Waste treatment design measures include certified on-board ballast/bilge containment/treatment systems and sewage treatment systems. These should include reserve tanks of sufficient capacity, automatic alarm and close-off system to stop discharge exceeding standards.</p> <p>Apply secondary containment for high pressure fuel delivery systems.</p> <p>Apply fuel efficiency, air emissions, and noise control in the design of</p> |

| ASPECT | MANAGEMENT/DESIGN REQUIREMENT |
|--------|--|
| | <p>the FSRU.</p> <ul style="list-style-type: none"> • Comply with emissions regulations pertaining to NOx and SOx. • Consider if alternative land based electricity supply design is viable for operations. • Avoid fire and refrigeration systems containing chlorofluorocarbons (CFCs) and ozone depleting substances (ODS). <p>Both ship and process sources of noise should be minimised to below IFC and South African standards (SANS 10103, 10357) by:</p> <ul style="list-style-type: none"> • Selecting equipment with lower sound power levels. • Installing suitable mufflers on engine exhausts and compressor components. • Installing acoustic enclosures. • The intake air ducts and exhaust ducts should be attenuated. <p>Develop a ship based Emergency Shutdown and Detection system (ESD) for the transfer and storage process as part of the FSRU design.</p> <p>Design an on-board gas release detection system that can pinpoint the source.</p> <p>Venting/flaring should only be an emergency measure.</p> <p>Collection and use of Boil Off Gas should be part of the ship design.</p> <p>Develop a ship based fire response system that is not water based or halon based (do not use water or halon in fire extinguisher systems).</p> <p>LNG anti roll-over measures should be part of the ship design.</p> <p>LNG spill prevention and containment measures must be part of the ship design such as:</p> <ul style="list-style-type: none"> • Breakaway hose connections. • Containment curb around the LNG transfer bay area to contain sufficient spill to stop and isolate flow in the system. • Dead end sumps with pumps to contain spilled material on ship. <p>Use cool colours (based on blue) for the FSRU if the applicable safety regulation allow it, to reduce visual impact.</p> <p>Odorization of the gas will facilitate detection of gas leakage.</p> |

| ASPECT | MANAGEMENT/DESIGN REQUIREMENT |
|---|---|
| | The use of polyethylene pipes, which is not subject to corrosion, should be considered as an alternative to ferrous metal pipeline materials. |
| EMP Implementation | <p>Develop an effective strategy to accurately carry out the mitigation actions relevant to the construction activities in this environment.</p> <p>Establish an applicable internal disciplinary/corrective action system for non-compliance or corrective action.</p> |
| Financial Provisions (general IFC Standards (International Finance Corporation, 2012) | <p>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.</p> <p>Ensure sufficient insurance provisions for potential consequential environmental losses.</p> |
| Recruitment | <p>If recruitment is applicable:</p> <p>Adhere to the legal provisions for the recruitment of labour (target percentages for gender balance, optimal use of local labour and SME's, etc.). Contracts will require an employment plan that set an objective to employ women as 15% of the labour force where this is feasible. If this target is not achieved written motivation must be provided explaining the conditions and giving alternative targets and future steps to improve the new target.</p> <p>The recruitment process must be formal and organised.</p> <p>Preference should be given to recruit those who live within the project area and are fit to work (records of applicants' origin and selection process).</p> |
| Stakeholder Communication | Communicate planned activities with affected parties through established community communication channels. |
| Health and Safety | <p>Adhere to all legal requirements pertaining to health and safety; and consider in designs.</p> <p>Compile a health and safety plan.</p> |

| ASPECT | MANAGEMENT/DESIGN REQUIREMENT |
|------------------------------|--|
| Responsibility and timeframe | <p>Client is accountable (assure realisation) and the design teams, External Service Provider (ESP) and suppliers are responsible (organise and implement).</p> <p>The timeframe include the design, period with a control system to prove designs suggestions are incorporated before manufacturing starts.</p> |

2.1 CONSTRUCTION AND OPERATIONS CONTRACT PREPARATION

This phase contains instructions that should be considered whenever construction or operation activities are contracted or sub-contracted to a company other than Xaris. 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, both social and ecological, is appropriately protected while construction activity takes place (

Table 4).

Table 4: Construction contract preparation management requirements

| ASPECT | MANAGEMENT REQUIREMENTS |
|---------------------|--|
| EMP implementation | Relevant sections of this EMP should be included in the tender documents for all development so that tenderers can make provision for its implementation. |
| Financial provision | <p>Financial provision for the compilation of all required IFC management plans should be included as a cost item within tenders concerning construction operations.</p> <p>Financial provision for the facilitation of a safety, health and environment 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.</p> <p>Financial provision for the drafting of a Communication Plan should be included as a cost item within construction tender documents.</p> <p>Financial provision for other items such as Health and Safety requirements, ablutions etc. and including any other items in this EMP.</p> |
| Recruitment | <p>If applicable:</p> <p>Provisions designed to maximise the use of local labour should be included within tenders concerning construction operations.</p> <p>A provision stating that all unskilled labour should be sourced</p> <ul style="list-style-type: none"> • from the area and • female employment is prioritised with formal targets (See Table 3 |

| ASPECT | MANAGEMENT REQUIREMENTS |
|------------------------------|---|
| | <p>conditions) .</p> <p>target should be included within tenders concerning constructions operations.</p> <p>Specific recruitment procedures ensuring local firms enjoy preference during tender adjudication should be included within tenders concerning construction operations where required skills and experience exist.</p> |
| Health and Safety | <p>Ensure construction activities are maintained within a construction footprint to be demarcated prior to construction activities.</p> <p>Implement health and safety plan.</p> |
| Responsibility and timeframe | <p>Client is accountable (assure realisation) and the construction, operations and maintenance contractors are responsible during the construction, operations and maintenance phases.</p> <p>The timeframe include the construction, commissioning and operational period with a control system to approve construction, operations and maintenance plans before commencement.</p> |

2.2 MANAGEMENT PLANS REQUIRED FOR THE PROJECT

The following management plans are required to manage the implementation of the EMP as per IFC standards, EHS Guidelines, MARPOL, and SANS.

Table 5 below shows the relevant plans.

The development of these plans and procedures must be integrated with the design process in order to align with each other.

Table 5: Management plans to align with IFC compliance.

| PLAN | SUB PLANS AND PROCEDURES |
|--------------------------|--|
| Dredging Management Plan | <p>Spill and discharge procedures.</p> <p>Hydrogen Sulphide (H₂S) and Methane (CH₄) safety procedures.</p> |

| PLAN | SUB PLANS AND PROCEDURES |
|---|---|
| Waste and Pollution Management Plan | Sediment toxins and chemical composition baseline. Liquids and solids waste procedures. Hazardous waste disposal procedure (MARPOL) . Hazardous waste spill and containment procedure. Ballast and sediment management procedures. Ballast exchange Log. |
| Emissions Monitoring and Control Plan | Monitoring and reporting procedure of emissions to keep within NO _x , SO ₂ , CO, CO ₂ within acceptable limits. |
| Noise Management Plan | Monitoring based of SANS. Noise complaints register. |
| LNG Transfer and Storage Plan | Safe transfer, storage, and regasification of LNG procedures |
| LNG Spill Prevention and Containment Plan | Spill risk identification and prevention procedures. Emergency spill containment procedures for each type of spill condition |
| Hazardous Materials Management Plan | Dangerous Goods Manifest. |
| Ship based Emergency Preparedness and Response Plan | Risk identification and risk management procedures. Response procedure for each type of risk. |
| Safety Management Plan | Hazards identification and management procedures. Safety procedures and Safety Incidents Register. Permit to Work system and log. Occupational health and safety monitoring plan. Life Safety Management Plan. |
| Fire Response Plan | Fire Risk Identification procedures. |
| Security Management Plan | Security risk identification and response procedures. |

| PLAN | SUB PLANS AND PROCEDURES |
|---------------------------------|---|
| | Response procedures within an fire risk environment |
| Marine mammals interaction Plan | Noise baseline to determine levels of interference with marine mammals. |
| Traffic Management Plan | Traffic communications plan. |

3 ENVIRONMENTAL MANAGEMENT PLAN

3.1 INTRODUCTION

The following table provides a large scale overview of all the major environmental management themes pertaining to both generic and site specific mitigation details. This table serves to act as quick reference, for the detailed mitigation details that follow below, for the implementation of the construction component of this EMP.

| Theme | Objective | Mitigation Detail | |
|--------------------------------------|---|-------------------|---------------|
| | | Generic | Site-specific |
| Waste management | Avoid and where not possible minimise all pollution associated with construction. | Section A | Section A |
| Borrow pits | Ensure topsoil protection and post-construction rehabilitation. | Section B | Section B |
| Health and safety | Safeguard health and safety of labourers and general public. | Section C | Section C |
| Noise, vibration and visual impact | Avoid and where not possible minimise noise and vibration associated with marine 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 | Section E |
| 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 | Section G |
| 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 | |
| 1. Waste management plan | <ol style="list-style-type: none"> 1. The Contractor should compile a Waste Management Plan which should address as a minimum the mitigation measures included in this section. 2. Apply the principle of reduce, re-use and re-cycle must be applied to waste generated. 3. All hazardous waste disposal should be certified and records kept. |
| 2. Hazardous waste | <ol style="list-style-type: none"> 1. All heavy construction vehicles and equipment on site should be provided with a drip tray and sealable transport container. <ul style="list-style-type: none"> – Drip trays are to be transported with vehicles wherever they go. – Drip trays should be cleaned daily and spillage handled, stored and disposed of as hazardous waste. 2. All heavy construction vehicles should be maintained regularly to prevent oil leakages. 3. Maintenance and washing of construction vehicles should be take place only at a designated workshop area. <ul style="list-style-type: none"> – The workshop floor should be lined with concrete. – The workshop should have an oil-water separator for collect run-off from washing. 4. 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. 5. All oils and hazardous waste on the marine works is to be contained separately for each type of hazardous waste in a sealable container. Do not mix types of hazardous waste materials in one container. Remove the waste from all vessels to a prepared waste control point on a daily basis. The waste control point must be to specification of the Nampont Hazardous Waste Plan. 6. All hazardous substances (e.g. fuel or chemicals) should be stored, according to safety regulations in a specific location on an impermeable surface which is bunded. |
| 3. Sewage and grey water | <ol style="list-style-type: none"> 1. Do not allow the sewage (black water) to be discharged directly onto open soil or any water body. 2. All sewage must be removed regularly and disposed of at a recognised (municipal) sewage treatment facility. 3. The water collected from wash basins and showers / ablution facilities of the construction/operations crew (grey water), should not be left standing for long periods of time as this promotes parasite and bacterial proliferation. Grey water should be recycled: |

| ASPECT | MITIGATION MEASURE |
|--------------------------------------|--|
| | <ul style="list-style-type: none"> - Used for dust suppression (on land); - Used to clean equipment. <p>4. If grey water will not be recycled it should be removed along with the black water on a regular basis.</p> |
| 4. General waste | <ol style="list-style-type: none"> 1. The construction/operations site should be kept tidy at all times. All domestic and general construction/operations waste produced on a daily basis should be cleaned and contained daily. 2. No waste may be buried or burned. 3. 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. 4. 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. 5. Construction labourers should be sensitised to dispose of waste in a responsible manner and not to litter. 6. No waste may remain on site after the completion of the project. |
| SPECIFIC MITIGATION MEASURES | |
| 5. General | <ol style="list-style-type: none"> 1. All waste should be contained immediately in closed waste containers. |
| 6. Ballast Water | <ol style="list-style-type: none"> 1. All vessels should replace ballast water at least once before entering Namibian Exclusive Economic Zone and once at least once after entering the Zone. 2. Keep a log of ballast exchange as part of a Liquid and Solid Waste Management Plan. 3. Ballast water should be replaced regularly with deep sea water during daytime that contains less potential organisms. |
| 7. Waste of marine activities | <ol style="list-style-type: none"> 1. Absolutely no hazardous waste spilling should be tolerated in the marine environment. Any spill should be remedied immediately and should be recorded in the Safety Incidents Register. 2. Determine contaminant levels in the seafloor to determine how cutting of piling process should be disposed of. 3. Bentonite slurry used in drilling for piling should be recovered and re-used or disposed of at an appropriate landfill, not in the ocean. |
| RESPONSIBILITY AND TIMEFRAME | |
| 4.6 | Contractor - Once Off |

| ASPECT | MITIGATION MEASURE |
|---|---|
| 1.1; | Proponent - Once off, updated quarterly. |
| 1.2; 1.3 2.1; 2.3 - 2.6 3.1 - 3.4 4.1 - 4.5 5.1 7.1; 7.3 | Contractor/Operator – Continuous/Daily |
| 2.2 6.1 - 6.3 7.2 | Contractor/Operator – Periodically as required. |

SECTION B: BORROW MATERIALS

A borrow-pit may be required for concrete stone and sand requirements associated with the berth and trestle foundation construction.

| ASPECT | MITIGATION MEASURE |
|-------------------------------------|---|
| GENERIC MITIGATION MEASURES | |
| 1. Soil | 1. The Contractor should adhere to prescribed measures emanating from the borrow-pit investigation and the design for excavations and disposal of spoil material. |
| SPECIFIC MITIGATION MEASURES | |
| 2. Borrow pits | 1. Use only existing commercial borrow-pits (which have EMP's) in the area for concrete stone and sand. |
| RESPONSIBILITY AND TIMEFRAME | |
| 1.1; 2.1 | Contractor - Periodically. |

SECTION C: HEALTH AND SAFETY

| ASPECT | MITIGATION MEASURE |
|---------------------------------------|---|
| GENERIC MITIGATION MEASURES | |
| 1. HIV/AIDS and TB training | <ol style="list-style-type: none"> 1. The Contractor should approach the Ministry of Health and Social Services to co-opt a health officer to facilitate HIV/AIDS and TB education programmes periodically on site during the construction phase. 2. Training should be conducted with all personnel at all levels of the project every six months. 3. Training should cover basic understanding, prevention, lifestyle measures as well as emergency risks and procedures. 4. Encourage the relocation of family units to the project rather than individuals being removed from the family unit. |
| 2. Safety Around Work Areas | <ol style="list-style-type: none"> 1. Provide additional warning signage in areas of movement and in "no personnel" areas where workers are not active. 2. Work areas must be set out and isolated from access on a daily basis. 3. All building materials and equipment are to be stored only within set out and demarcated work areas. 4. Only construction personnel will be allowed within these work areas. 5. 2 fire extinguishers should be available at each fuel storage area and cooking facilities. 6. Comply with all mitigation measures laid out in Section A (Waste Management mitigation details). |
| 3. Temporary ablutions | <ol style="list-style-type: none"> 1. Separate ablutions (toilet and shower) should be available for men and women and should clearly be indicated as such. 2. Portable toilets (i.e. easily transportable) should be available at construction site: <ul style="list-style-type: none"> – 1 toilet for every 25 females. – 1 toilet for every 50 males. – Sewage waste needs to be removed on a regular basis to an approved (municipal) sewage disposal site. Alternatively, pump it into sealable containers and store it until it can be removed. – Workers responsible for cleaning the toilets should be provided with latex gloves and masks. |
| 4. PPE and personal protection | <ol style="list-style-type: none"> 1. Appropriately rated and fitted Personal Protective Equipment should be provided for each position. 2. Dust/chemicals protection masks should be provided to workers if required when working in a dusty environment or where chemical fumes are present. 3. Potable water should be provided to workers. |

| ASPECT | MITIGATION MEASURE |
|-------------------------------------|---|
| | <ol style="list-style-type: none"> 4. No person should be allowed to smoke outside of designated smoking areas. 5. No workers should be allowed to drink alcohol during work hours. 6. No workers should be allowed on site if under the influence of alcohol. 7. Provide First Aid training as per legal requirement and IFC SHE guidelines, including MSDS guidelines for exposure to hazardous materials. |
| SPECIFIC MITIGATION MEASURES | |
| 5. Work planning | <ol style="list-style-type: none"> 1. All activities should be managed through a Permit to Work System, to control access to materials and apply safety procedures as well as work package coordination to avoid activity conflict. 2. Conduct regular safety drills and toolbox talks (health and safety reminders) |
| 6. Fire and explosion | <ol style="list-style-type: none"> 1. Conduct a fire risk assessment for all activities to determine typical fire/explosion situations and the requirements to be able to manage and suppress the conditions resulting from such situations within the minimum amount of time lapsed (5 minute success limit). 2. Fire precaution and control measures/equipment on any vessel used must adhere to SANS (adopted by MME) or better. Inspect periodically as per specialist installation requirements. The measures and equipment must be readily accessible. 3. All vessels must be fitted with engine room fire prevention measures : <ul style="list-style-type: none"> - Fire doors, fire pumps, emergency fuel-flow stopping devices. 4. Sufficient quantities of fire retardant (water or foam as appropriate) must be available to deal with the typical fire conditions expected on an activity. 5. Materials Safety Data Sheets (MSDS) for all products must be at the point of storage and use. Inspect materials regularly as per MSDS requirements and maintain, replace and dispose of immediately if required. Keep a log of inspection and actions taken. 6. Inspect equipment that may carry fire/explosion threat regularly as per manufacturer requirements and maintain or replace. Remove and dispose of all redundant materials and equipment immediately. Keep a log of inspection and actions taken. 7. Develop a fire and explosion prevention plan which should include as a minimum: <ul style="list-style-type: none"> - Prevention of potential ignition sources - Fire alarm system - Active Fire protection systems for all materials and products on site. - Fire response plan - Fire safety training |

| ASPECT | MITIGATION MEASURE |
|--------------------------|---|
| | <ul style="list-style-type: none"> - Allow for a trained firefighting team to be present on site or on board of vessels operating. - Keeping a fire incident register <p>8. No open fires may be made anywhere on site.</p> <p>9. Develop an Emergency Evacuation Protocol with emergency escape routes which are protected sufficiently.</p> <p>10. All personnel and visitors must pass an Emergency Procedures Induction (fire drill and Emergency Evacuation Protocol included) in order to be allowed on site or vessel</p> <ul style="list-style-type: none"> - before being allowed to enter the site/vessel and - receive refresher induction every month. <p>11. All permanent personnel on any vessel must carry valid sea farers' safety training certification.</p> |
| 7. Gas lines | <p>1. Gas pipelines and pipeline components, in addition to general installation and pipe joining techniques such as welding, should meet international standards for structural integrity and operational performance.</p> <p>2. Testing of pipelines and pipeline components for pressure specifications and presence of leaks should be undertaken prior to commissioning. The system should be gas tight when tested at a higher pressure than the normal maximum operation gas pressure</p> <p>3. Pipelines, valves, and other component infrastructure should be regularly maintained, and ventilation and gas detection / alarm equipment installed in station buildings or vaults.</p> <p>4. Removal of sources of ignition prior to gas venting for maintenance and repair activities. Purging of gas from pipeline or pipe components prior to welding or cutting activities. .</p> <p>5. Installation of gas lines and components using sufficient separation distance and appropriate pipe protection layering to minimize potential interference with other infrastructure. Separate plastic pipes from sources of heat.</p> |
| 8. Public | <p>1. Operators should establish an emergency preparedness and response plan (in line with IFC requirements) and communicate this plan to the public as necessary.</p> <p>2. Warning signs of construction and operation should be erected.</p> |
| 9. Marine Traffic | <p>1. Use Namport control warning and communication procedures on all vessels.</p> <p>2. Plan and manage all vessel traffic through the port control authority.</p> <p>3. Plan dredging for lower traffic periods.</p> |
| 10. Land Traffic | <p>1. Develop a weekly traffic plan to manage activities of the week ahead.</p> |

| ASPECT | MITIGATION MEASURE |
|--|---|
| | 2. Use the same routes as the contractor vehicles for the New Tanker Berth project as direct access from the B2 will not be allowed. 3. Keep a traffic complaints register with the remedial actions taken |
| 11. Security | 1. Integrate security measures with that of the New Tanker Bert as well as Namport Security Plan and procedures. 2. Liaison with the Namibian Police is essential. 3. Armed response and other security personnel should be trained how to function in a natural gas and flammable conditions environment. 4. Include access control, perimeter control, active presence, and monitoring. 5. Early warning systems on the trestle and berth should be in place. |
| 12. LNG spill management | 1. Develop a LNG Spill Management and Containment Plan. 2. Record all spill incidences and the response taken as well as lessons learnt. Provide a 6 monthly report. 3. Conduct annual reviews of the Plan in light of the records and lessons learnt. |
| RESPONSIBILITY AND TIMEFRAME | |
| 1.1-1.3; | Contractor - Once Off |
| 1.1-1.3; | Contractor/Operator - Quarterly. |
| 2.1-2.6; 3.1-3.2; 4.1-4.6; 5.1-5.2; 6.3-6.5; 6.8; 6.11; 7.4; 8.2; 9.1-9.3; 10.2-10.3; 11.4-11.5 | Contractor/Operator – Continuous/Daily |
| 1.4; 4.7; 6.1-6.2; 6.6-6.7; 6.9; 6.10; 7.1-7.3; 7.5; 8.1; 10.1; | Contractor/Operator – Periodically or as required. |

| ASPECT | MITIGATION MEASURE |
|-------------------------|--------------------|
| 11.1-11.3, 12.1-12.3 | |

SECTION D: NOISE, VIBRATION AND VISUAL IMPACTS

| ASPECT | MITIGATION MEASURE |
|---|---|
| GENERIC MITIGATION MEASURES | |
| 1. Noise | <ol style="list-style-type: none"> 1. 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 vessels is less than 1km from residential areas. 2. PPE should include personalised hearing protection systems for all personnel that is exposed to more than the maximum allowable IFC noise level of 85dB over 8 hours or peak of 140dB instantaneous. Any hearing protection system should reduce exposure to below 85dB. 3. Select low noise tools and equipment and maintain as per manufacturer specification. Sound barriers and access barriers should also be put in place to reduce or restrict access to areas of high noise exposure. 4. Limit prolonged exposure to excessive noise and provide quiet "noise relief" areas. |
| 2. Vibration | <ol style="list-style-type: none"> 1. Vibration exposure of personnel should be within the limits of appropriate vibration regulations. |
| SPECIFIC MITIGATION MEASURES | |
| 3. Noise | <ol style="list-style-type: none"> 1. Conduct noise sampling for the various activities in order to determine appropriate noise fields where hearing protection is required. 2. Maintain hearing test programme for personnel with regular follow-up. 3. Under water noise monitoring before and during dredging/piling/operations by a marine mammal specialist. 4. Use a procedure of short/lower noise and vibration start (soft start) periods for 30 minutes to warn marine mammals to move away from the site before full operations start. 5. A marine mammal observer should monitor movement of any marine mammals within 1km of the dredging/piling activity. If marine mammals are present or move into the 1km zone activity should be stopped until the mammals move away. 6. Apply bubble curtains if the noise persistently exceeds acceptable levels. |
| 4. Visual | <ol style="list-style-type: none"> 1. Visual elements should be removed or applied to a different use once the installation is decommissioned. |
| RESPONSIBILITY AND TIMEFRAME | |
| 1.1-1.4; 2.1; 3.3-3.5; | Contractor/Operator – Continuous/Daily |

| ASPECT | MITIGATION MEASURE |
|---------------|--|
| 3.1-3.2; 3.6; | Contractor/Operator – Periodically or as required. |
| 4.1 | Proponent/Contractor/Operator – Once off |

SECTION E: ENVIRONMENTAL TRAINING AND AWARENESS

| ASPECT | MITIGATION MEASURE |
|--|---|
| GENERIC MITIGATION MEASURES | |
| 1. Environmental Induction (Training) | 1. All construction workers are to undergo environmental induction (training) which should include as a minimum the following: <ul style="list-style-type: none"> - 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 | |
| 2. Emergency preparedness | 1. Training of gas utility workers in procedures for emergency preparedness and response involving appropriate public authorities, in addition to emergency shutdown and pressure reduction in the pipeline system. |
| RESPONSIBILITY AND TIMEFRAME | |
| 1.1; 2.1 | Contractor/Operator – Periodically or as required |

SECTION F: ENVIRONMENTAL CONSERVATION

| ASPECT | MITIGATION MEASURE |
|--|---|
| GENERIC MITIGATION MEASURES | |
| 1. Conservation ocean and groundwater | 1. Contaminated water (with hydrocarbons) should not be allowed to be disposed of on open soil or in the ocean. |
| 2. Materials camp and lay-down areas | 1. Suitable locations for the materials camp and lay-down areas should be identified with the assistance of the Engineers Representative and the following should be considered in selecting these sites: <ul style="list-style-type: none"> - The areas designated for the proposed services infrastructure 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). |
| SPECIFIC MITIGATION MEASURES | |
| 3. Suspension of dredged sediment | 1. Apply the results and recommendations of the geotechnical study to compile a dredging and dredging safety management plan. 2. Spill material must not exceed 10% of dredged volume. 3. Measure representative suspended solids in real time at: Main entrance channel for ships (Buoy 6); at the fairway; Near Bird Island; at the 3 rd (future) tanker berth (comparative to the Bulk Fuel Terminal study). 4. Measurements must be based on "Water and Sediment Guidelines for coastal Areas in the BCLME Region" (CSIR Natural Resources and the Environment, 2006). Dredging should be halted and adjusted to reduce cause if limits are reached. 5. Measure Total Suspended Solids levels in the top 3m of the water column at: <ul style="list-style-type: none"> - <20mg/l or 80th percentile of background levels (desired low risk level). - 20-80mg/l for 3+ days (lower threshold of adverse ecological effect) - 80-100mg/l for 6+ hours (probable adverse effect, consider adjustment) - 150mg/l (proven negative impact, therefore cease dredging operation until adjustments are in place and proven to work) 6. Take water samples at the dredge site before and after every 100,000m ³ removal for Trybutyltin, Cadmium (Cd), Mercury (Hg), Copper (Cu), Chromium (Cr), Lead (Pb), Zinc (Zn), Arsenic (As), Nickel (Ni), and other potential contaminants recommended by the geotechnical study. |
| 4. Sediment | 1. Sediment and water quality limits are based on the BCLME guidance values (CSIR Natural Resources and the Environment, 2006) or other Namibian guideline |

| ASPECT | MITIGATION MEASURE |
|--|---|
| disposal | <p>values gazetted before or during the activity.</p> <p>2. Take sediment samples at the dredge site before and after every 100,000m³ removal for Trybutyltin, Cadmium (Cd), Mercury (Hg), Copper (Cu), Chromium (Cr), Lead (Pb), Zinc (Zn), Arsenic (As), Nickel (Ni), and other potential contaminants recommended by the geotechnical study. If any dredge sample shows high levels of contamination (100+ times the guideline) consult with the Port authority to determine the position and method of disposal.</p> <p>3. Sediment that is within the limits will be disposed at the designated disposal site. Disposal should apply the design to minimise water column contamination and spreading of sediment beyond the disposal site boundary.</p> |
| 5. Air and Water Quality | <p>1. A procedure for hydrostatic testing of pipelines should be developed and implemented.</p> <p>2. A gas leak detection and repair program should be developed and implemented.</p> |
| 6. Bird movement | <p>1. Lighting should face down and be covered in order not to disperse.</p> <p>2. Monitor and record bird collisions with marine structures by daily survey of ship and trestle jetty for fatalities.</p> |
| 7. Bottle nose dolphin habitat loss | <p>1. Monitor and record sightings of marine mammals (species, pod size, duration in area, locality).</p> <p>2. Work with Walvis Bay municipality, NACOMA, Nampont and Ministry of Mines and Energy to create an offset by establishing a protected area at:</p> <ul style="list-style-type: none"> - The shore area north of Bird Island. - Feeding waters near Pelican Point. |
| 8. Ship/marine mammal interaction | <p>1. Typical marine mammal species encountered are Heaveside dolphin, Bottlenose dolphin, Humpback whales and Wright whales.</p> <p>2. Reduce speed to between 5 knots to 8 knots to make avoidance by mammals possible and have a marine mammal watch on duty when operating within the bay area or within 5 km from Pelican Point. Avoid Pelican Point with at least 2 km clearance.</p> <p>3. Do not approach or cross path with marine mammals if safe conduct allows for it.</p> |
| RESPONSIBILITY AND TIMEFRAME | |
| 1.1; 3.2-3.5; 6.2; 7.1; | Contractor/Operator – Continuous/Daily |

| ASPECT | MITIGATION MEASURE |
|---|--|
| 3.6; 4.1-4.3; 5.1-5.2 7.2; 8.1-8.3 | Contractor/Operator – Periodically or as required. |
| 2.1; 3.1; 6.1 | Proponent/Contractor/Operator – Once off |

SECTION G: EMPLOYMENT/RECRUITMENT

| ASPECT | MITIGATION MEASURE |
|-------------------------------------|--|
| GENERIC MITIGATION MEASURES | |
| 1. Legislation | 1. 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. |
| 2. Recruitment | 1. The Contractor should compile a formal recruitment process including the following provisions as a minimum: <ul style="list-style-type: none"> - The local authority (town council, local headman etc.) should assist with the recruitment process. - Recruitment should be conducted at the site offices in a formal manner only. - Set a target of employing females at the workforce. - 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 | |
| 3. Skills transfer | 1. Deliberate skills transfer and career development of Namibians should be implemented in scarce skills areas. |
| RESPONSIBILITY AND TIMEFRAME | |
| 1.1; | Contractor/Operator – Continuous/Daily |
| 2.1 3.1 | Contractor/Operator – Periodically or as required. |

SECTION H: STAKEHOLDER COMMUNICATION

| ASPECT | MITIGATION MEASURE |
|---|--|
| GENERIC MITIGATION MEASURES | |
| 1. Disclosure and Communication plan | <p>Xaris should draft a Disclosure and Communication Plan, which should outline as a minimum the following:</p> <ol style="list-style-type: none"> 1. 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; 2. How these stakeholders will be consulted on an ongoing basis; 3. 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. |
| 2. General communication matters | <ol style="list-style-type: none"> 1. The Proponent should make use of a Community Liaison Officer to liaise between the Contractor, stakeholders, and Xaris. The appointed Contractor shall appoint a person from the construction team to take responsibility for the implementation for all provisions of this EMP. 2. The Contractor shall report on the status of the implementation of all provisions of the EMP at site meetings. 3. The Contractor should implement the environmental awareness training as stipulated in Section E. 4. 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 Disclosure and Communication Plan should be agreed upon and given to the Contractor/Operator before construction commences. 5. The Disclosure and Communication Plan, once agreed upon by Xaris, shall be binding. 6. All communication with the stakeholders should take place through the Community Liaison Officer. 7. A copy of the EMP must be available at the site office and should be accessible to all stakeholders as required. 8. Key representatives from the above mentioned list should be invited to attend quarterly site meetings to raise any concerns and issues regarding project progress. 9. The Contractor should liaise with Xaris regarding all issues related to community consultation and negotiation before construction commences. 10. A procedure should be put in place to ensure that concerns raised have been followed-up and addressed. |

| ASPECT | MITIGATION MEASURE |
|--------------------------------------|---|
| | 11. All people on the stakeholders list should be informed about the availability of the communication plan in writing by the Proponent prior to the commencement of construction activities. |
| SPECIFIC MITIGATION MEASURES | |
| | <ul style="list-style-type: none"> • No specific mitigation measures have been identified. |
| RESPONSIBILITY AND TIMEFRAME | |
| 1.1-1.3; 2.2-2.3; 2.6; 2.8; 2.10; | Proponent/Contractor/Operator – Periodically or as required. |
| 2.4-2.5; 2.7; | Proponent/Contractor/Operator – Continuous/daily |
| 2.1; 2.9; 2.11 | Proponent/Contractor/Operator – Once off |

SECTION I: SOCIO-ECONOMIC AND MISCELLANEOUS

| ASPECT | MITIGATION MEASURE |
|-------------------------------------|---|
| GENERIC MITIGATION MEASURES | |
| <p>1. Archaeology</p> | <p>1. 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:</p> <ul style="list-style-type: none"> – If operating machinery or equipment stop work; – Demarcate the site with danger tape; – Determine GPS position if possible; – Report findings to foreman; – Report findings, site location and actions taken to superintendent; – Cease any works in immediate vicinity; – Visit site and determine whether work can proceed without damage to findings; – Determine and demarcate exclusion boundary; – Site location and details to be added to the project's Geographic Information System (GIS) for field confirmation by archaeologist; – Inspect site and confirm addition to project GIS; – Advise the National Heritage Council (NHC) and request written permission to remove findings from work area; and – Recovery, packaging and labelling of findings for transfer to National Museum. <p>2. Should human remains be found, the following actions will be required:</p> <ul style="list-style-type: none"> – Apply the chance find procedure as described above; – Schedule a field inspection with an archaeologist to confirm that remains are human; – Advise and liaise with the NHC and Police; and – Remains will be recovered and removed either to the National Museum or the National Forensic Laboratory. |
| SPECIFIC MITIGATION MEASURES | |
| | <ul style="list-style-type: none"> • No Specific Mitigation measures have been identified. |
| RESPONSIBILITY AND TIMEFRAME | |
| <p>1.1-1.2</p> | <p>Contractor – Periodically or as required.</p> |

4 IMPLEMENTATION REQUIREMENTS PER PHASE

The operational phase runs complex processes involving:

- Ship-to-ship LNG transfer.
- Ship based LNG storage.
- Ship based regasification of LNG to natural gas.
- Direct pumping of natural gas to shore based gas fired power station.

Therefore the management system must consider:

- Construction activities.
- Operations and process activities.
- Maintenance activities.
- Closure activities.

Section 3 includes all the requirements for all activities in each of these phases.

Instead of repeating the applicable requirements again, we arrange in **Table 6** below those requirements from **Section 3** that are applicable to each phase.

A separate Environmental and Social Management System (ESMS) should be developed for each of the life cycle phases of the project. The ESMS should cover all relevant activities by means of detailed plans and procedures.

Table 6: Requirement list per phase

| EMP SECTION | CONSTRUCTION | OPERATIONS | MAINTENANCE | CLOSURE |
|-----------------------------|--------------|---------------------|-------------|----------|
| A: Waste management | 1 | 1 | 1 | 1 |
| | 2 | 2.5; 2.6 only | 2 | 2 |
| | 3 | 3 | 3 | 3 |
| | 4 | 4 | 4 | 4 |
| | 5 | 5 | 5 | 5 |
| | 6 | 6 | 6 | 6 |
| | 7 | 7.1 only | 7.1 only | 7.1 only |
| B: Borrow materials | 1 | NA | 1 | 1 |
| | 2 | | 2 | 2 |
| C: Health and safety | 1 | 1 | 1 | 1 |
| | 2 | 2 NA | 2 | 2 |
| | 3 | 3 NA | 3 | 3 |
| | 4 | 4.1; 4.3; 4.4; 4.5; | 4 | 4 |

| EMP SECTION | CONSTRUCTION | OPERATIONS | MAINTENANCE | CLOSURE |
|--|--|--|--|---|
| | 5 6 7 8 9 10 11 12 NA | 4.6; 4.7 only 5 6 7.4 only 8 9.1; 9.2 only 10 NA 11 12 | 5 6 7 8 9 10 11 12 NA | 5 6 7.5 only 8 9 10 11 NA 12 NA |
| D: Noise, vibration and visual impacts | 1 2 3 4 NA | 1.2; 1.3; 1.4 only 2 3.1; 3.2; 3.3; only 4 NA | 1 2 3 4 NA | 2 3 4 |
| E: Environmental training and awareness | 1 2 NA | 1 2 | 1 2 | 1 2 NA |
| F: Environmental conservation | 1 2 3 4 5 NA 6 7.1 only 8 | 1 2 NA 3 NA 4 5 6 7 8 | 1 2 3 only if dredging 4 only if dredging 5 NA 6 7.1 only 8 | 1 2 3 NA 4 NA 5 NA 6 NA 7.1 only 8 |
| G: Employment / Recruitment | All | All | All | All |
| H: Stakeholder Communication | All | All | All | All |
| I: Socio-economic and miscellaneous | 1 | 1 NA | 1 | 1 |

5 CONCLUSIONS AND RECOMMENDATIONS

The marine components and operations process display a variety of complex activities that can easily cause significant damage to the environment if not managed well.

The most effective prevention strategy is to include specific requirements in

- the design and manufacturing of dredger (**Table 3**),
- the design and manufacturing of the LNG carrier (**Table 3**) and
- the design and manufacturing of the FSRU (**Table 3**).

Secondary to the design is effective and easy to apply and control systems to prevent the causing of pollution and damage to the environment. Various management and prevention plans and procedures are proposed based on IFC, SANS and MARPOL requirements for example (see **Table 5 and Section 3**). These plans cover all activities for the full lifecycle of the project.

Finally plans must be in place to control and resolve incidences where the project activities do affect the environment despite the precautions taken. These are managed through control plans, response plans and emergency plans that apply the IFC and other standards requirements (**Table 5 and Section 3**). It is essential that these plans are regularly tested, applied and reviewed to assure they are effective and personnel are competent in applying them.

It is recommended that the EMP for the Xaris Gas Fired Power Plant and Gas Supply Facility in Walvis Bay: Marine components receive environmental clearance subject to the development of the necessary management plans and procedures as set out in **Table 5** based on the minimum IFC standards and guidelines and Equator Principles.

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