Proposed Coega Gas-to-Power: Gas Infrastructure

Draft Environmental Management Programme

Report Prepared for

Coega Development Corporation

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Profile and Expertise of EAPs

SRK Consulting (South Africa) Pty Ltd (SRK) has been appointed by Coega Development Corporation (CDC) to undertake the Environmental Impact Assessment (EIA) process required in terms of the National Environmental Management Act 107 of 1998 (NEMA).

SRK Consulting was established in 1974 and comprises over 1 400 professional staff worldwide, offering wide-ranging expertise in the natural resources and environmental sectors. SRK's Port Elizabeth environmental department has a proven track record of managing large, complex environmental and engineering projects in the Eastern Cape, Africa and internationally. SRK has rigorous quality assurance standards and is ISO 9001 certified.

As required by NEMA, the qualifications and experience of the key independent Environmental Assessment Practitioners (EAPs) undertaking the EIA are detailed below and Curriculum Vitae provided in Appendix A.

Project Reviewer: Christopher Dalgliesh, BBusSc (Hons); MPhil (EnvSci)
Registered EAP No. 2019/413
Chris Dalgliesh is a Director and head of SRK's Environmental Department in Cape Town. He has more than 33 years environmental consulting experience covering a broad range of projects, including EIA and ESIA (EMPR), environmental and social due diligence, socio-economic impact assessments, stakeholder engagement, strategic environment assessments and management plans, state of environment reporting, environmental management frameworks, site safety reports for the nuclear industry, natural resource management and waste management

Project Manager: Nicola Rump, MSc, EAPSA
Nicola Rump is a Principal Environmental Scientist in SRK's Port Elizabeth office and has been involved in environmental management for the past 12 years working on South African and international projects including EIAs and ISO 14001 auditing for a variety of activities. Her experience includes Basic Assessments, Environmental Impact Assessments, Environmental Management Plans, Environmental Auditing and Stakeholder Engagement. Nicola is the Environmental Assessment Practitioner for this Environmental Impact Assessment process.

Project Consultant: Abby van Nierop, BSc Hons
Abby van Nierop is an Environmental Scientist in the Port Elizabeth office. Abby has been involved in environmental management for the past 7 years. Her expertise includes assistance with Environmental Impact Assessments (EIAs), Basic Assessments, Environmental Management Programmes (EMPrs), Water Use Applications (WUAs), environmental compliance auditing compliance auditing and as a Public Participation Co-ordinator.

Statement of SRK Independence

Neither SRK nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK has no beneficial interest in the outcome of the assessment which is capable of affecting its independence.

Disclaimer

The opinions expressed in this report have been based on the information supplied to SRK by CDC. SRK has exercised all due care in reviewing the supplied information, but conclusions from the review are reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

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Acronyms and Abbreviations

CCGT	Combined Cycle Gas Turbine
CDC	Coega Development Corporation
DEA	Department of Environmental Affairs (National) (now DEFF)
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism
DEFF	Department of Environment, Forestry and Fisheries (National) (formerly DEA)
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
GHG	Greenhouse Gas Emissions
GN	Government Notice
LNG	Liquid Natural Gas
MW	Megawatt
NMBM	Nelson Mandela Bay Municipality
RMIPPPP	Risk Mitigation Independent Power Producer Procurement Programme
SAHRA	South African National Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SCC	Species of Conservation Concern
SEZ	Special Economic Zone
WML	Waste Management Licence
WUA	Water Use Authorisation

Glossary

Auto – refrigeration	The process in which LNG is kept at its boiling point, so that any added heat is countered by energy lost from boil off.
Base Load Power Plant	A power plant that provides a continuous supply of electricity and is only turned off during maintenance.
Baseline	Information gathered at the beginning of a study which describes the environment prior to development of a project and against which predicted changes (impacts) are measured.
Berth	Designated location in port/harbour for the mooring of vessels
Biodiversity	The diversity, or variety, of plants, animals and other living things in a particular area or region. It encompasses habitat diversity, species diversity and genetic diversity
Breakwater	Structures constructed on coasts as part of coastal defence or to protect an anchorage from the effects of both weather and longshore drift
Construction Phase	The stage of project development comprising site preparation as well as all construction activities associated with the development.
Cumulative Impacts	Direct and indirect impacts that act together with current or future potential impacts of other activities or proposed activities in the area/region that affect the same resources and/or receptors.
Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.
Environmental Authorisation	Permission granted by the competent authority for the applicant to undertake listed activities in terms of the NEMA EIA Regulations, 2014.
Environmental Impact Assessment	A process of evaluating the environmental and socio-economic consequences of a proposed course of action or project.
Environmental Impact Assessment Report	The report produced to relay the information gathered and assessments undertaken during the Environmental Impact Assessment.
Environmental Management Programme	A description of the means (the environmental specification) to achieve environmental objectives and targets during all stages of a specific proposed activity.
Fauna	The collective animals of a given region.
Floating Storage Regasification Unit	Floating vessel that receives liquefied natural gas and converts this to its gaseous form on board.
Flora	The collective plants of a particular region, habitat or geological period.
Fossil	Rare objects that are preserved due to unusual circumstances.
Heritage Resources	Refers to something, e.g. a building, an area, a ritual, etc. that forms part of a community's cultural legacy or tradition and is passed down from preceding generations.
Hydrology	(The study of) surface water flow.
Impact	A change to the existing environment, either adverse or beneficial, that is directly or indirectly due to the development of the project and its associated activities.
Integrated Environmental Management	The practice of incorporating environmental management into all stages of a project's life cycle, namely planning, design, implementation, management and review.
Jetty	A structure that projects from the land out into the water
Liquefaction	The process by which natural gas is converted into liquid natural gas
Liquid Natural Gas	Natural gas that has been converted to liquid form.

Mitigation measures	Design or management measures that are intended to avoid and / or minimise or enhance an impact, depending on the desired effect. These measures are ideally incorporated into a design at an early stage.
Natural Gas	A hydrocarbon gas that is usually obtained from underground sources, often in association with petroleum and coal deposits. Natural gas generally contains a high percentage of methane and inert gases.
Operational Phase	The stage of the works following the Construction Phase, during which the development will function or be used as anticipated in the Environmental Authorisation.
Particulate matter	Broad term used for fine particles found in the ambient atmosphere, including soil dust, dirt, soot, smoke, pollen, ashes, aerosols and liquid droplets.
Port	A location on a coast or shore containing one or more harbours where ships can dock and transfer people or cargo to or from land
Quay	A structure on the shore of a harbour where ships may dock to load and unload cargo. Includes one or more berths and may include piers, warehouses or other facilities necessary for handling the ships.
Regasification	The process by which LNG is heated, converting it into its gaseous state.
Sustainable development	Sustainable development is generally defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. NEMA defines sustainable development as the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.
Terminal	The set of facilities at a port where loading and unloading of cargo/container takes place. Terminals are named on the basis of the type of cargo that can be handled by them. Some of the most common types of terminals are container terminal, bulk cargo terminal, LNG terminal
Ullage	The empty space in large tanks used to store liquids.
Waterbody	A body of water forming a physiographical feature, for example the sea.
Watercourse	A natural freshwater feature, including pans.

1 Introduction

1.1 Background

The Coega Development Corporation (CDC) proposes to develop a gas to power project, including three power plants and associated infrastructure, within the Coega Special Economic Zone (SEZ) (see Figure 1-1 and Figure 1-2) and have appointed SRK Consulting (South Africa) (Pty) Ltd (SRK) to conduct an Environmental Impact Assessment (EIA) in terms of the National Environmental Management Act (NEMA).

The overall project would broadly involve the following components:

- A Liquefied Natural Gas (LNG) terminal, consisting of a berth with off-loading arms within the Port of Ngqura, cryogenic pipelines, storage and handling facilities and re-gasification modules;
- Three Gas to Power plants, each with up to 1000 MW generation capacity (specific generation technologies may vary);
- Gas pipelines for the transmission, distribution and reticulation of natural gas within the Coega SEZ and Port of Ngqura; and
- Electricity transmission lines to evacuate electricity to the previously approved 400 kV lines in the SEZ, or via new 132 kV power lines to Dedisa substation.

The overall/ultimate proposed project will comprise of three power plants with power generation capacities of up to 1000 MW each. A total power generation capacity of up to 3000 MW will therefore be available once the full extent of the project has been developed (which may be spread over a number of phases in a modular fashion), the timing of which is unknown at this stage and is dependent on the CDC securing successful clients for the development of each component.

This Draft Environmental Management Programme (EMPr) deals with the gas infrastructure components of the project, facilitating the supply of gas to the power plants, and gas and LNG to third party off-takers.

NEMA requires that an Environmental Management Programme (EMPr) be submitted along with the EIA Report to demonstrate how environmental management and mitigation measures will be implemented. The mitigation measures, which were identified during the Scoping and Environmental Impact Reporting process, apply to the following phases of the development process:

- The Design Phase: These measures relate to the detailed layout, planning and design of the gas infrastructure and will largely be implemented by the planning and development team prior to the commencement of any physical on site activities. These mitigation measures are presented in Section 2.
- The Construction Phase: These mitigation measures are applicable during site preparation and construction of the gas infrastructure and must be implemented by the relevant contractors and sub-contractors. These mitigation measures are presented in Section 3.
- The Operational Phase: These mitigation measures are applicable during the long-term operation of the gas infrastructure. These mitigation measures are presented in Section 4.
- The Decommissioning Phase: It should be noted that the Gas infrastructure would be decommissioned at the end of the contract period for provision of power. Decommissioning will also occur in stages and would trigger the need for separate Environmental Authorisations and a separate EMPr and are not explicitly addressed in this EMPr.

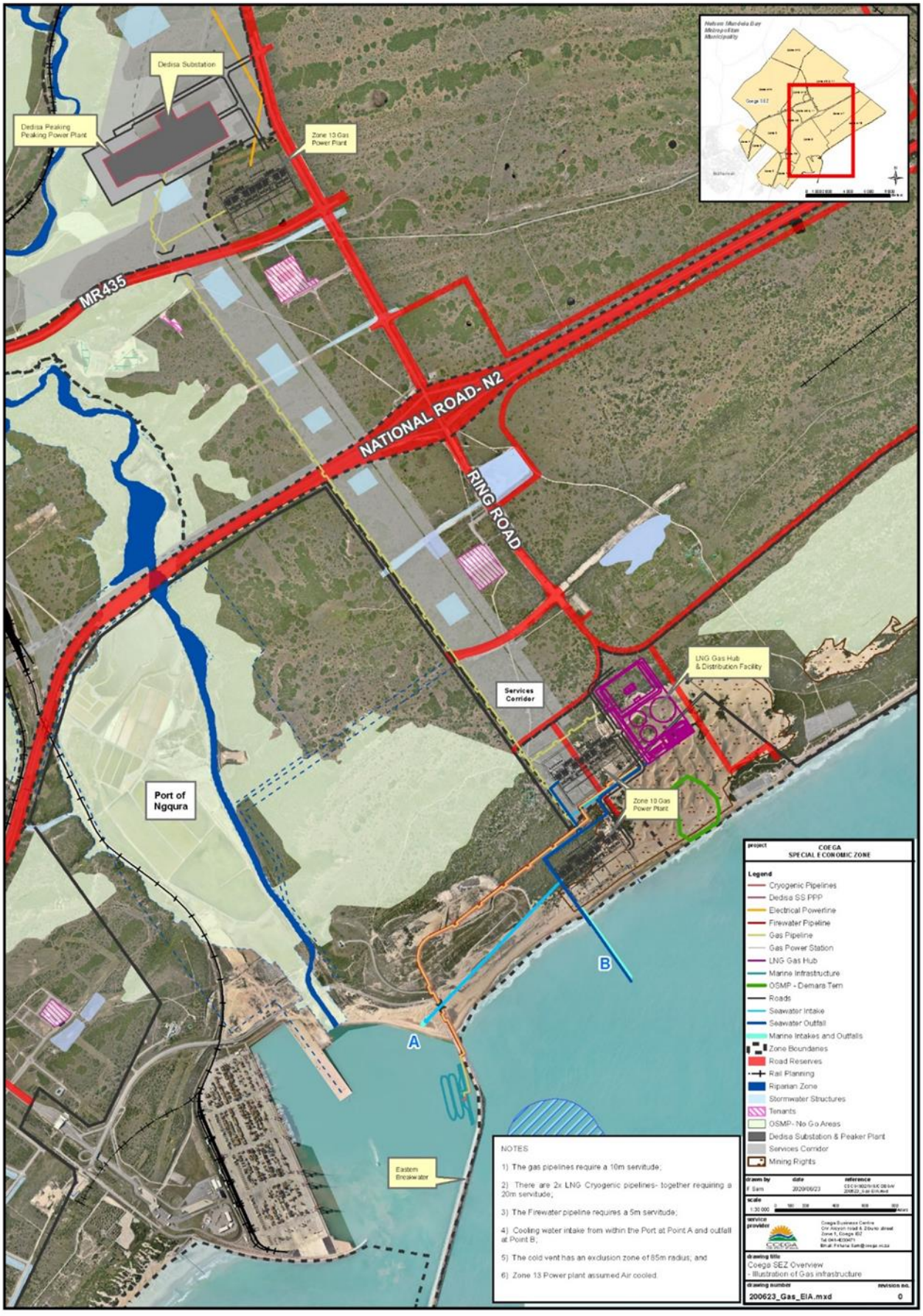

Figure 1-1: Map of the Coega SEZ showing the CDC gas to power project

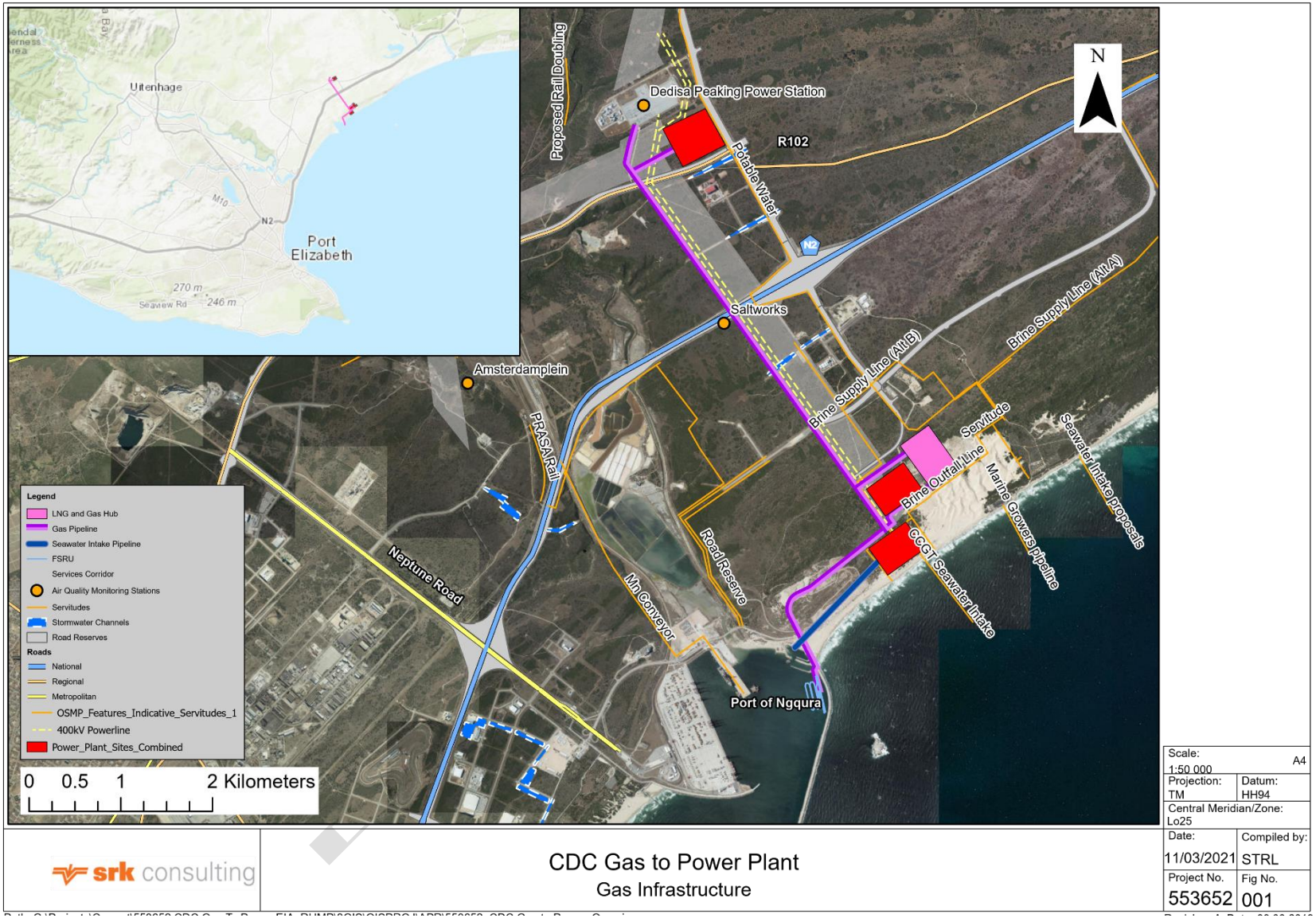

Figure 1-2: Site locality map for Gas Infrastructure

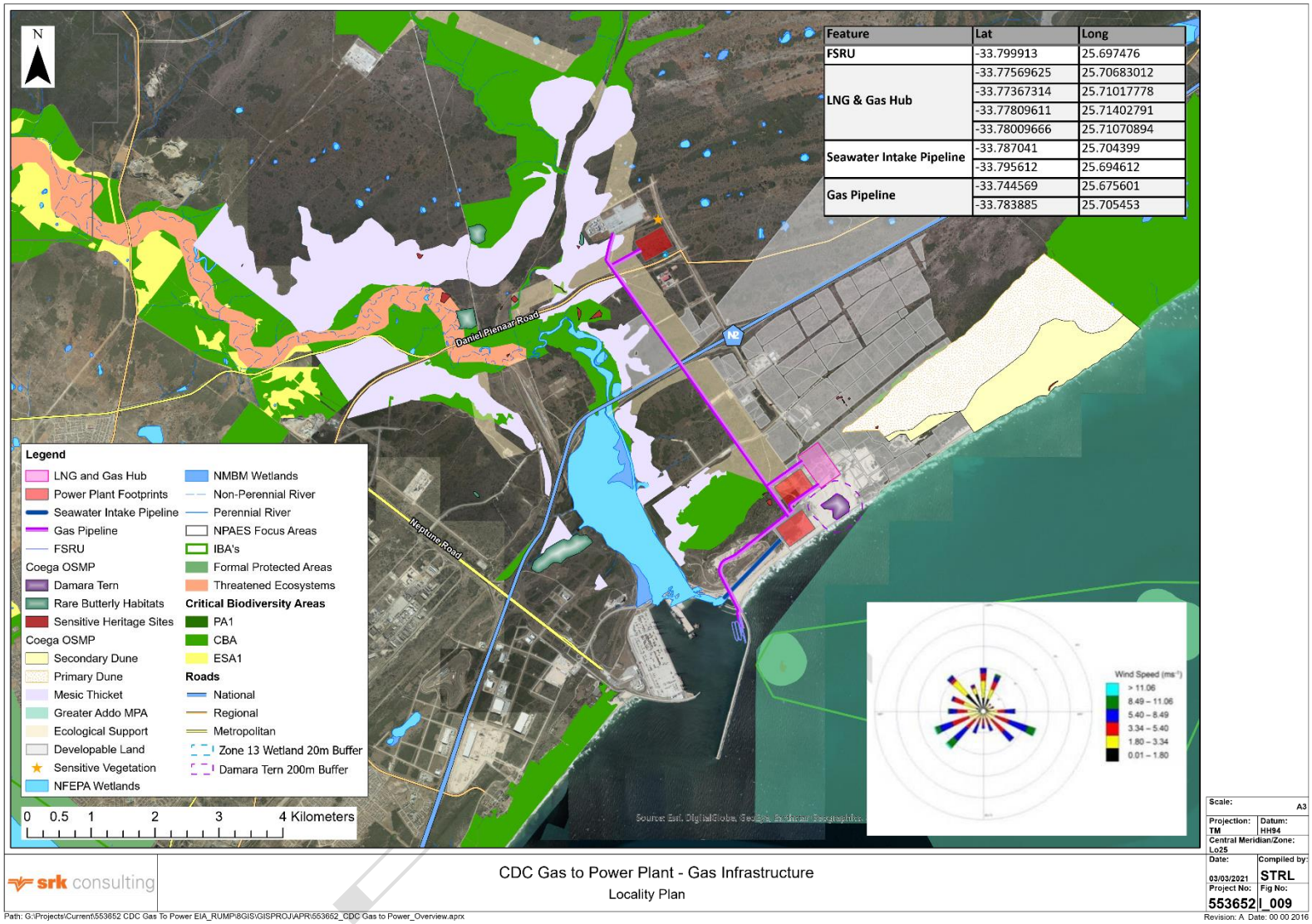

Figure 1-3: Terrestrial environmental sensitivities including identified buffer areas

1.2 Contents of the EMPr

Appendix 4 of the 2014 EIA Regulations, as amended in 2017 (Government Notice (GN) 326 of 07 April 2017) prescribes the required content in an EMPr. These requirements, and the sections of this EMPr in which they are addressed, are summarised in Table 1-1.

Table 1-1: Contents of the EMPr as per Appendix 4 of the 2014 EIA regulations (as amended in 2017)

GN326, Appendix 4	Item	Section Reference
1.(1)(a)(i)	Details of the EAP who prepared the EMPr	Page ii
1.(1)(a)(ii)	the expertise of that EAP to prepare an EMPr, including a curriculum vitae	Page ii
1.(1)(b)	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 1.3
1.(1)(c)	a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers	Figure 1-3
1.(1)(d)	A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including—	-
1.(1)(d)(i)	• planning and design	Section 3 & Table 3-1
1.(1)(d)(ii)	• pre-construction activities	Section 3 & Table 3-1
1.(1)(d)(iii)	• construction activities	Section 4 & Table 4-2
1.(1)(d)(iv)	• rehabilitation of the environment after construction and where applicable post closure; and	Section 4 & Table 4-2
1.(1)(d)(v)	• where relevant, operation activities	Section 5 & Table 5-1
1.(1)(e)	- (removed in the 2017 amendment)	-
1.(1)(f)	a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to —	
1.(1)(f)(i)	• avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	Table 3-1, Table 4-2, Table 5-1
1.(1)(f)(i)	• comply with any prescribed environmental management standards or practices	Table 3-1, Table 4-2, Table 5-1
1.(1)(f)(i)	• comply with any applicable provisions of the Act regarding closure, where applicable; and	Not applicable
1.(1)(f)(i)	• comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;	Not applicable
1.(1)(g)	the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 4.2

GN326, Appendix 4	Item	Section Reference
1.(1)(h)	the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 4.2.2
1.(1)(i)	an indication of the persons who will be responsible for the implementation of the impact management actions;	Sections 3.1, 4.1, and 5.1
1.(1)(j)	the time periods within which the impact management actions contemplated in paragraph (f) must be implemented	Table 3-1, Table 4-2, Table 5-1
1.(1)(k)	the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Table 3-1, Table 4-2, Table 5-1
1.(1)(l)	a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations	Section 4.2.2
1.(1)(m)	an environmental awareness plan describing the manner in which	-
1.(1)(m)(i)	• the applicant intends to inform his or her employees of any environmental risk which may result from their work	Table 4-2
1.(1)(m)(ii)	• risks must be dealt with in order to avoid pollution or the degradation of the environment	Table 4-2
1.(1)(n)	any specific information that may be required by the competent authority	Not applicable
2.	Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply	Not applicable

1.3 Project Description

This chapter describes the key characteristics of the proposed gas infrastructure within the Coega SEZ. The project design information in this chapter reflects the information available at the time of the compilation of the EIA Report. It is expected that the project description will evolve and be refined during detailed design.

At the outset, it is important to note that this description is deliberately non-specific in terms of the proprietary technologies that would be required for the overall site development. As the specific technology providers have not yet been selected, the approach in this report is to describe each of the components of the development using typical/standard Gas to Power plant design information.

A generic process flow diagram showing the two phases of gas infrastructure establishment (initially, with off-shore storage and regasification of LNG in a Floating Storage and Regasification Unit (FSRU) (phase 1) followed by development of an onshore storage and regasification facility at the LNG & gas hub (phase 2), is provided in Figure 1-4.

1.3.1 LNG Terminal

An LNG terminal will need to be constructed at the Port of Ngqura to accommodate the LNG transport/storage vessels and offloading operations. The proposed site for the LNG terminal is located within and at the base of the eastern breakwater, seaward of the Admin Craft Basin (ACB) in the port.

LNG terminals are predominantly constructed as piled structures. This standard design was used as a baseline for the development of the proposed terminal. Piled jetty structure design has been identified as the most (technically) feasible consisting of (Figure 1-5):

- An access trestle with road and provision for pipelines and services: approximately 283 m long by 5 m wide deck on piled access trestle;
- A platform with provision for distribution of natural gas and future conversion to distribution of cryogenic LNG; and
- Mooring and berthing dolphins, to protect the berth infrastructure from impact.

A separate platform area will be required when converting the FSRU terminal to a Liquified Natural Gas Carrier (LNGC) terminal, as the manifold positions on FSRU and LNGC vessels differ. A platform area of 20 m by 30 m was allocated for the distribution of gas and was based on the space requirements for the plant and equipment.

A large amount of plant and equipment will be needed for the distribution of cryogenic LNG and will require a substantial area of platform space. A separate platform of 40 m by 30 m, constructed for the distribution of gas, was allocated for typical plant and equipment required on the LNG platform.

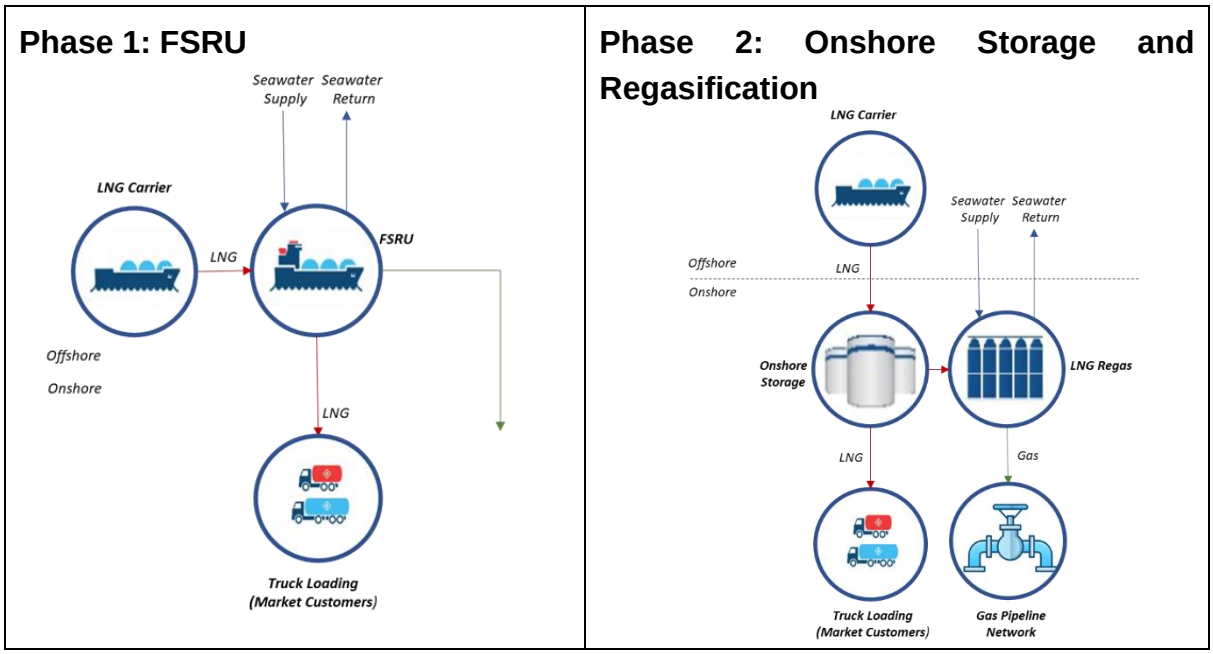

Figure 1-4: Example Process Flow Diagram of onshore and Regasification

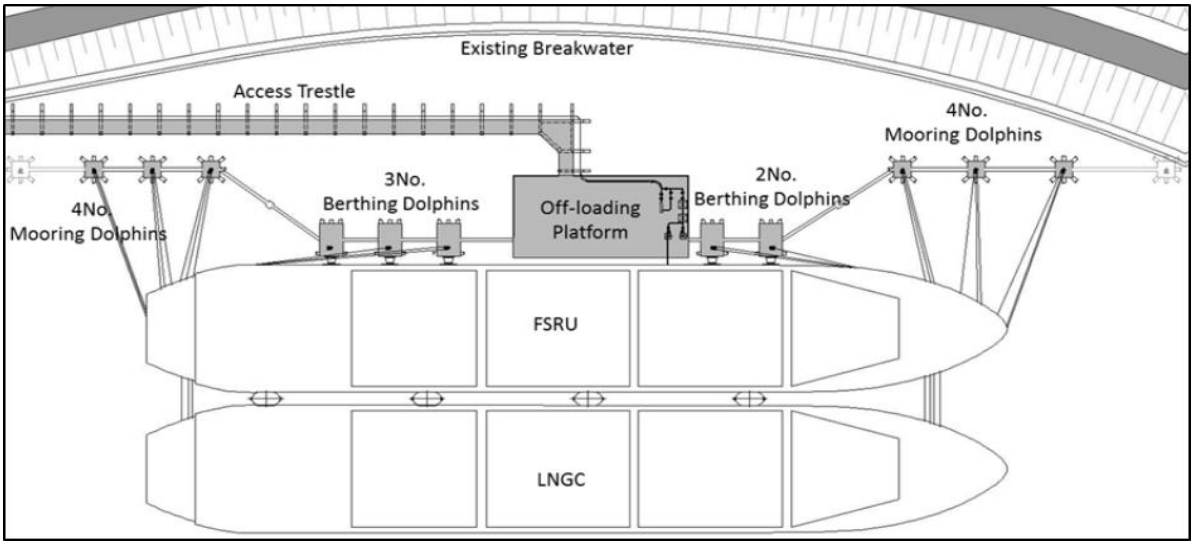

Figure 1-5: Layout 1 –Piled jetty structure

The technical feasibility study found that Firewater Pump Packages would be required at the Jetty, mounted in dedicated Firewater Pump Rooms designed to be fully self-sufficient in terms of power, control and cooling. The pumps will draw seawater from the harbour.

Dredging is expected to involve loading of dredged material directly into a series of sailing hopper barges, which transport the material to the disposal area. Dedicated disposal locations within the site will need to be confirmed, with an attempt to locate a dump site as close as possible to the dredging works. Environmental monitoring of turbidity and water quality would be required at dredging areas and dump sites. It is anticipated that dredging activities will take approximately 22 weeks to complete. Preliminary calculations of anticipated dredge volumes as presented in Table 1-2 indicate that there is sufficient capacity for the anticipated volume of dredge spoil from terminal excavations to be spoiled at the spoil location.

Table 1-2: Calculated dredged volumes for the two LNG terminal layouts considered

Soil type	Layout 1 – Eastern Breakwater dredging volume (m^3)	Layout 2 – Dig-out option dredging volume (m^3)
Fill material and marine deposits	48,500	67,000
Gravel Lag Deposits (Cobbles and Gravels)	16,200	67,000
Soft Rock (Mudstone: 0 to 12.5 MPa)	-	903,000
Medium to Hard Rock (Mudstone: 12.5 to 30 MPa)	3,300	370,000
Hard Rock (Siltstone: 30 to 50 MPa)	-	74,000
TOTAL	**68,000**	**1,480,000**

1.3.2 LNG Carrier (LNGC)

LNG will be delivered to the Port of Ngqura via LNGC vessels. The LNGC would berth alongside the moored FSRU and transfer the LNG across to the FSRU storage tanks. It is expected that LNG will initially be offloaded via a short cryogenic pipeline from the LNGC to the FSRU. However, once land-based storage is constructed, and the FSRU departs, LNG will then be pumped from the LNGC to onshore storage tanks via cryogenic LNG unloading arms and a cryogenic pipeline. The unloading process takes approximately 12 to 24 hours.

Boil off Gas is expected from the storage and transportation of LNG and measures to contain, capture, re-use and recover BOG are incorporated in the design of the LNGC and cryogenic pipelines. During the unloading of an LNGC, BOG reports back to the LNG tanker's cargo system by a separate vapour return line(s) to ensure that the pressure in both the FSRU or land-based storage tanks and the LNGC storage tanks is maintained within their design operating parameters.

1.3.3 Floating Storage and Regasification Unit (FSRU)

The main components of an FSRU include:

- LNG transfer system (offloading system),
- Storage tanks (in ship);
- Boil-Off Gas handling system,
- LNG pumping system,
- Vaporisation equipment, and
- Heat source (in this case seawater)

It is envisaged that up to two FSRU's, each with a storage capacity of 170,000 m^3 (i.e. a total storage capacity of 340,000 m^3) would be required for the project, although land-based storage is likely to be

implemented before the second FSRU becomes a requirement. The FSRU, and potentially the second FSRU, will be berthed permanently at the FSRU terminal.

The FSRU houses onboard LNG regasification facilities for the re-warming of the liquefied gas back to natural gas at ambient air temperature via vaporisers. Various re-warming options are available however the most likely option will be the extraction of relatively warm seawater and the subsequent discharge of the cooled seawater once it has heated the LNG. The estimated maximum quantity of seawater needed for heating LNG is at 20,840 m³/hour; discharged seawater would be 8ºC cooler than the intake water.

1.3.4 Gas Transmission pipelines

Two types of gas pipelines are required to transmit both LNG and natural gas from the LNG terminal to the three power plants and the boundary of the Dedisa peaking power plant (if required) and LNG and gas hub in Zone 10. All gas transmission pipelines will be installed underground and will require servitude widths of 20 m for the double cryogenic pipeline (for LNG) and 10 m for the gas pipeline (for natural gas).

The pipelines will be approximately 1 km long and will run from the FSRU, supported by a trestle structure running on the inside of the eastern breakwater until it reaches the landward end of the breakwater near the ACB, and subsequently further onshore to a turning / intersection point where they will be routed north and run along the coast to the Zone 10 power plants and LNG and gas hub (Appendix B).

During the period when the FSRU is in operation (Phase 1 of the LNG terminal), a pipeline will transfer natural gas from the Port to the power plants in Zones 10 and 13. A single natural gas pipeline approximately 6 km long will then run in the services corridor from there to the Zone 13 power plant and boundary of the Dedisa power station site.

LNG cryogenic pipelines will be installed to distribute LNG to third party offtakers (via the truck distribution centre located in the LNG and gas hub in zone 10). The pipeline will convey the LNG from the FSRU via the trestle and along the coastline, following the alignment of the gas pipeline, to the proposed LNG & gas hub, and will include a return pipeline (i.e. a double cryogenic pipeline, with a combined servitude of 20 m is proposed).

Phase 2 of the proposed LNG terminal development will entail onshore storage and regasification. This will include cryogenic pipelines to feed LNG from the LNG carrier to the land-based storage and regasification terminal located at the LNG and gas hub in Zone 10. The cryogenic pipelines will be routed underground on the landward side of the main breakwater as there is insufficient space between the ACB and breakwater to accommodate the above-ground cryogenic pipelines. Following this they will be routed parallel to the coast in a north easterly direction towards the LNG and gas hub and power stations.

1.3.5 LNG and Gas Hub

The LNG and gas hub will be located adjacent to the Zone 10 North power plant and will include facilities for land-based LNG storage and regasification, as well as the truck distribution centre (for third party supply of LNG and gas). The hub will occupy a footprint of up to 23.1 ha, and will be fenced, with an access controlled entrance point. Facilities within the storage and regasification area include admin offices, a utility station and control room, maintenance and repairs workshop and store, a cold vent system, metering package and pig launcher. The truck distribution centre will include a weighbridge, control cabin and loading facilities. The hub will be connected to fire water pipelines (running from the LNG terminal in the port), gas and LNG transmission pipelines.

1.3.6 LNG storage

It is proposed that during Phase 2 of the gas infrastructure development, the FSRU will no longer be the most feasible option and land-based storage and regasification will become economically more feasible. The cryogenic pipelines (already constructed in Phase 1) will feed LNG directly from the LNG terminal to a new land-based storage and regasification terminal, at the LNG and gas hub. The Boil Off gas (BOG) is captured and recondensed to be sent to the vaporiser with LNG or compressed and sent via the return cryogenic pipeline back to the storage and regasification unit.

It is estimated that up to a maximum of two FSRUs of 170 000 m³ LNG storage capacity each would be required for Phase 1 and up to two tanks of 160,000 m³ each for onshore regasification during Phase 2 (i.e. total LNG storage of 320,000 m³ to 340,000 m³) will be required. No storage of natural gas is proposed.

The storage facility will require a venting system as protection against the risk of overpressure due to "roll-over" in the LNG tank. LNG "rollover" refers to the rapid release of LNG vapours from a storage tank, resulting from stratification.

1.3.7 LNG Regasification

The main component in the regasification process is the vaporiser, i.e. heat exchangers used to return the LNG to its regular vapour phase. Due to the proximity of the sea it is expected that the technically preferred vaporisers would be Open Rack Vaporisers (ORV). ORVs take seawater and stream it over the vertical tubes of the vaporisers in order to warm up the LNG. This is the most common type and generally is the preferred choice where warm seawater is available. The estimated maximum quantity of seawater needed for heating LNG is 20,840 m³/hour for a typical seawater with a change in temperature 8º C across the vaporiser. Infrastructure for the intake and discharge of seawater for heating purposes is excluded from the scope of this EMPr.

1.3.8 Cold vent system

The regasification and storage facility (both onshore and offshore) will have its own independent overpressure protection and venting systems and fire and gas and depressurisation regimes. The design of the project is expected to be in accordance with a philosophy of minimum venting in order to protect the environment without compromising safety. During normal operation, there will be no flow of vapour from the facilities into the vent system.

Relief and vent streams from the FSRU are expected to be handled by the FSRU. Operational and minor upsets in the LNG Truck Loading Facility are also assumed to return to the FSRU (or onshore regasification unit once this is operational) through the cryogenic recirculation pipeline.

The vent system will need to be sized to handle vapour resulting from depressurisation of the gas pipeline between the jetty and the Emergency Shut Down Valve at the gas distribution facility, and any other coincident relief scenarios.

It is anticipated that there will be a requirement to depressurise the above ground section of the gas pipeline between the FSRU and the underground section of pipeline. It is not anticipated that it will be necessary to blowdown the underground section of gas pipeline.

An emergency Cold Vent system will be required to provide safe release of gas and depressurisation of the gas containing facilities up to the Emergency Shut Down Valve at the Gas Distribution Facility, in the event of an emergency upset or start-up/run-down conditions. The Cold Vent System is expected to terminate in a pipe vent supported by a structural steel stack of a height and location designed to ensure suitable dispersion of the gas. The Cold Vent System is expected to be provided with a Snuffing Package for manual use in the event of ignition.

1.3.9 Gas Distribution

The gas exported from the regasification unit will be transported to a gas distribution centre at the LNG and gas hub. The facility will have its own access point with a gate and will include facilities for gas chromatography as well as pig handling and receiving.

Facilities for online operational pigging are included at each end to allow for pipeline inspection and integrity management. The receiving facilities at the distribution centre include a gas filter to allow any impurities in the pipeline after construction to be removed prior to export to clients. Long term use of the gas filter may not be required, depending on the pipeline and upstream facility cleanliness.

In addition to the above-mentioned items, the gas distribution facilities typically include:

- Emergency shutdown valves to automatically isolate the pipeline on the activation of a shutdown event;
- Valves on each customer stream to allow for the isolation of the particular stream for performance of maintenance on any of the equipment;
- Control room for local operation of the system;
- A cold vent to allow for de-pressurisation of any part of the facility as required in an emergency or during routine maintenance;
- Gas conditioning, which typically includes a gas mixing vessel and LPG and / or Nitrogen supply; and
- Firefighting facilities for emergency response in the event of fire.

1.3.10 Truck loading facility

A Truck Loading Facility will be provided within the LNG and gas hub for third party offtake. This will be complete with recirculation systems for BOG and LNG. The Truck Loading Facility will typically comprise a weighbridge and associated loading arms. Initially it is assumed that parallel loading of two road tankers should be provided for. The estimated offtake of LNG is approximately of 787 tpd, providing offtake by 40 x 20 ton LNG trucks per day.

1.3.11 Waste generation and management

During construction, waste types typically associated with large infrastructure will be generated. During operation, the following waste streams are expected:

- Used generator and turbine lubricant oil, which will be collected on site and removed in drums by a specialist contractor for appropriate disposal;
- Small volumes of oily sludge recovered from on-site surface water treatment;
- Spent gas turbine fabric air filter and lube oil filter cartridges;
- Dried powder / sludge and spent resins from on-site effluent treatment / demineralisation;
- Solid domestic waste (office consumables etc.);
- Scrap metals, plastic and packaging, which will be recycled where possible;
- Waste solvents and grease from cleaning of workshop equipment; and
- Spent laboratory chemicals from water testing and treatment.

2 Environmental Objectives

This section specifies the impact management objectives and outcomes used to determine the extent of management action(s) required to mitigate the impacts identified during the impact assessment process. A summary of the potential impacts of the proposed development identified and assessed in the EIA Report is presented in Table 2-1. Additional details on the nature of these impacts are provided in the Draft EIA Report (SRK Report No: 553652/ Infrastructure /3, March 2021).

2.1 Visual Impacts

Altered sense of place and visual intrusion may be caused by earthworks and the operational LNG and Gas Hub. The FSRU(s) and mooring infrastructure will be in keeping with the existing port infrastructure and the other components of the gas infrastructure project (pipelines etc) will largely run within existing services corridors. These components are there not expected to result in significant visual impacts. The project is located in an industrial zone (Coega SEZ) in areas allocated to bulk services, energy and aquaculture development. While the LNG and Gas Hub site is sheltered to an extent from sensitive receptors along the N2 and inland, opportunities for visual screening may be limited for receptors along the coast and for offshore viewers (such as visitors to the MPA). To manage impacts during construction, activities will need to be managed so that negative visual impacts (including those resulting from dust) are minimised

The management objectives for this impact are:

- Prevent short term visual impacts during construction, e.g. dust, litter, etc;
- Promote consistency the surrounding land uses, through compliance with the CDC's architectural guidelines.

2.2 Impacts relating to Waste Management

With the exception of effluent and air emissions, no large scale systematic waste by-products would be generated as part of the process. Wastes similar to other industrial or manufacturing concerns would naturally be generated and are expected to be moderate in quantity. Lack of adequate waste management during both construction and operation could result in spread of litter, illegal dumping, contamination soil, water resources and the marine environment, and increased prevalence of scavengers at the site.

Table 2-1: Summary of potential impacts and their significance following mitigation

Impact group	Impact Description	During Construction		During Operation	
		without mitigation	with mitigation	without mitigation	with mitigation
Visual	V1: Change in visual character and sense of place	Very low	Insignificant	Low	Low
Waste Management	WM1: Poor Waste Management resulting in pollution of surroundings	Medium	Insignificant	Low	Very low
Soil, Stormwater & Erosion	WE1: Pollution of Soil and Stormwater, and increase in Erosion	Very low	Insignificant	Medium	Low
Terrestrial Ecology	TE1: Loss and disturbance of vegetation	Low	Very low	Medium	Low
Terrestrial Ecology	TE2: Impact on Damara Terns due to Disturbance	Medium	Medium	High	High
Heritage Resources	HR1: Damage or destruction of concentrations of Heritage Resources	Low	Very low	-	-
Traffic	TI1: Increased traffic volumes affecting traffic flow	Very low	Very low	Very low	Very low
Traffic	TI2: Additional axle loading resulting in deterioration of road condition	Very low	Very low	-	-
Traffic	TI3: Traffic safety impact due to additional / high-speed traffic	Very low	Very low	Very low	Very low
Dust	CA1: Dust impacts	Low	Very low	-	-
Infrastructure	CA2: Damage to other infrastructure	Insignificant	Insignificant	-	-
Fire	CA3: Veld fires and fire management	Very low	Insignificant	-	-
Climate Change	CC1: Impact on climate change by way of GHG emissions resulting from the project			Very high	Very high
Climate Change	CC2: Climate change risk and vulnerability of the project to climate change			Low	Very low
Noise	N1: Noise affecting nearby receptors	Very low	Insignificant	Very low	Very low
Socio-economic	SE1: Direct and Indirect employment opportunities	Low (positive)	Low (positive)	Medium (positive)	Medium (positive)
Socio-economic	SE2: Growth of the local, regional and provincial economies	Low (positive)	Low (positive)	Medium (positive)	Medium (positive)
Socio-economic	SE3: Contribution to increased energy security	-	-	High	-
Air Quality	AQ1: Impact on ambient SO_2 , NO_2 and PM_{10} concentrations	-	-	Insignificant	Insignificant
Air Quality	AQ2: Impact on CO	-	-	Insignificant	Insignificant
Safety Risks	QR1: Loss of containment of LNG (Phase 1)			Medium	Medium
Safety Risks	QR2: Loss of containment of LNG (Phase 2)			Medium	Low
Safety Risks	QR3: Loss of containment of LNG due to pipeline failure (Phase 2)			Medium	Very Low

Impact group	Impact Description	During Construction		During Operation	
		without mitigation	with mitigation	without mitigation	with mitigation
Marine Ecology	ME1: Benthic communities through disturbance and loss of substratum	Very low	Very low	-	-
Marine Ecology	ME2: Impact of increased suspended sediment concentrations or turbidity	Very low	Very low		
Marine Ecology	ME3: Toxic effects of remobilised contaminants and nutrients	Insignificant	Insignificant	-	-
Marine Ecology	ME4: Disturbance, behavioural changes and avoidance due to underwater noise generated by dredging and general construction	Very low	Very low		
Marine Ecology	ME5: Disturbance, behavioural changes and avoidance due to underwater noise generated by from the LNGCs and FSRU	-	-	Very low	Very low
Marine Ecology	ME6: Disturbance, behavioural changes and avoidance due to underwater noise due to pile driving, underwater drilling and hydraulic rock breaking	Medium	Very low	-	-
Marine Ecology	ME7: Creation of artificial hard strata	Very low (positive)	Very low (positive)	-	-
Marine Ecology	ME8: Intake of large volumes of seawater from the port	-	-	Medium	Low
Marine Ecology	ME9: Introduction and spread of alien invasive species	Medium	Low	-	-
Marine Ecology	ME10: Discharge of high volumes of water with depressed or elevated temperatures	-	-	Very low	Very low
Marine Ecology	ME11: Discharge of co-pollutants (biocide, metals, and salinity)	-	-	Very low	Very low
Marine Ecology	ME12: Increase in ambient lighting	-	-	Very low	Very low
Marine Ecology	ME13: Waste Discharges to Sea	-	-	Low	Low
Marine Ecology	ME14: Accidental Spills of LNG	-	-	Insignificant	Insignificant
Marine Ecology	ME15: Accidental Spills of Hypochlorite	-	-	Insignificant	Insignificant
Marine Ecology	ME16: Faunal strikes with LNGCs and Dredgers	-	-	Insignificant	Insignificant
Marine Ecology	ME17: Release of diesel to sea during bunkering or due to vessel accident	-	-	High	Insignificant

Colour Coding

Negative status of impact					Positive status of impact				
High	Medium	Low	Very Low	Insignificant	Insignificant	Very Low	Low	Medium	High

During construction, the waste generated will largely be construction waste (rubble, cement waste, packaging, small amounts of hazardous materials), with small amounts of domestic waste from workers on-site. It is anticipated that on-site chemical toilets will be used for sanitation during construction, and it must be ensured that the contents thereof are properly disposed of. During operation, waste generated by the LNG and Gas Hub, FSRU and associated facilities could result in the impacts mentioned above if not adequately managed. Waste entering the stormwater system may also result in blockages and downstream contamination.

The management objectives for this impact are:

- Prevent waste pollution of surrounding habitats; and
- Legally compliant management of solid waste.

2.3 Impact on Soil, Stormwater and Erosion

Vegetation clearing and disturbance of soils during construction will leave the ground vulnerable to erosion by water and wind. This could lead to increased sediment load in stormwater runoff, potentially clogging the receiving stormwater infrastructure. Loss of topsoil and erosion will also limit the potential for vegetation growth in these areas, leading to further erosion. There is a risk of downstream erosion and sedimentation if undeveloped cleared areas are not properly rehabilitated during and after the construction phase**.**

An increase in the extent of hardened surfaces from the development will increase the impermeable surface area and lead to reduced ground absorption of stormwater and increased surface water runoff. This will result in an increase in the quantity and velocity of stormwater leaving the site and could result in soil erosion and downstream sedimentation impacts if there is improper storm water management design.

Runoff also has the potential to transport potential contaminants (generated from project point sources as well as roads) away from the site into downstream natural environments, including the sea and littoral active zone. Spills or leaks of liquids such as chemicals, hydrocarbons, paints, or water contaminated with paints, solvents, cement of other construction related materials may infiltrate into the soil and thereby enter groundwater resources, by means of ground or surface water runoff. Similarly, during operation, spills or leaks of materials and fuels stored on site may occur during storage or handling, potentially polluting surface and groundwater resources, or the marine environment.

No wetlands or other surface water features have been identified on or within 32 m of the proposed Gas Infrastructure.

The management objectives for this impact are:

- Prevent contamination of surface water, soil, and groundwater
- Prevent erosion, sedimentation of surface water, and loss of topsoil.

2.4 Impacts on Terrestrial Ecology

Loss and disturbance of vegetation will occur through the clearing of areas for the construction of the power plant units (including associated infrastructure) and the spread of invasive alien vegetation may be promoted through the disturbance to land. Faunal species could be lost and habitats fragmented through vegetation clearing for the development, displacing these animals to adjacent areas.

During operation, noise and other anthropogenic impacts of the development will also disturb and displace fauna in the surrounding habitat. Most species will be able to migrate to other areas of the SEZ further from the site, provided suitable habitat is available.

Clearing of vegetation, has previously been authorised through the "Rezoning of the remainder of the Coega SEZ" impact assessment process, and impacts associated with this are currently managed through the approved Coega Open Space Management Plan (OSMP).

The LNG and Gas Hub proposed for Zone 10 lies approximately 200-300 m of the Damara Tern breeding area.

The impact management objective for this impact is:

- Minimise disturbance to vegetation;
- Minimise impacts to Species of Special Concern;
- Minimise the spread of alien invasive plants;
- Prevent disturbance to the Damara Tern colony; and
- Prevent erosion by appropriate rehabilitation of disturbed areas.

2.5 Impacts on Heritage Resources

Damage or destruction to heritage resources on the site may occur due to earthworks and excavations during construction or during maintenance activities. As heritage studies have previously been compiled by specialists for the Coega SEZ and no sensitive areas/material was identified within the proposed development area. Zone 10, being close to the coast, was noted as a sensitive area in general from a heritage perspective, and for this reason additional mitigation measures were recommended by the specialist.

Excavation activities might uncover heritage resources and the impact management objective for this impact is to prevent destruction of possible archaeological and / or paleontological material should such resources be uncovered.

2.6 Impacts on Air Quality

The process of liquefaction involves extracting most of the impurities in raw natural gas. The remaining natural gas is primarily methane with only small amounts of other hydrocarbons and consequently is widely considered a clean fossil fuel. The quantity and nature of emissions to the atmosphere from LNG combustion depends on the quality of the fuel, fuel consumption, the combustion device, and the air pollution control devices. The combustion of LNG results in gaseous emissions of sulphur dioxide (SO_2), oxides of nitrogen ($NO + NO_2 = NO_X$), carbon monoxide (CO), and some particulate matter (PM). Carbon dioxide (CO_2) is the main Greenhouse Gases resulting from LNG combustion.

SO_2 is produced from the combustion of sulphur in the LNG. NO_X is produced from thermal fixation of atmospheric nitrogen in the combustion flame and from oxidation of nitrogen bound in the LNG. The quantity of NOx produced is directly proportional to the temperature of the flame. The non-combustible portion of the fuel remains as solid waste and emitted as particulates. Back-up fuels stored on-site can generate VOCs such as benzene, toluene, ethyl benzene and xylene from storage and transportation losses.

For the Gas Infrastructure, the main sources of point source emissions include the Heater Stack, the generators via a combined stack, and the four stacks on a typical LNG carrier. Emissions from LNG handling and storage during start-up are considered to be negligible.

Storage and loading of LNG or NG from the Land-based LNG Terminal and Infrastructure Project generates negligible emissions as the fuel is kept at extremely low temperatures. Any gas that may escape will be returned to the storage unit.

The Air Quality Assessment found that the main sources of fugitive emissions include:

- The LNG resupply vessels during their transit from the eastern breakwater to the berthing area and
- The LNG Truck Loading Facility and associated road infrastructure.

The National Ambient Air Quality Standard (NAAQS) consists of a 'limit' value and a permitted frequency of exceedance. The limit value is the fixed concentration level aimed at reducing the harmful effects of a pollutant. The permitted frequency of exceedance represents the acceptable number of exceedances of the limit value expressed as the 99th percentile. Compliance with the ambient standard implies that the frequency of exceedance of the limit value does not exceed the permitted tolerance. Being a health-based standard, ambient concentrations below the standard imply that air quality poses an acceptable risk to human health, while exposure to ambient concentrations above the standard implies that there is an unacceptable risk to human health.

Air quality management interventions to reduce emissions are deemed to be unnecessary considering the low impact of the project on air quality.

2.7 Safety Risks resulting from Catastrophic Events

Accidental leaks of LNG could occur and result in a vapour cloud. The vapour cloud is quickly vaporised, however if an ignition source is present this can cause a fire which burns back to the source. The storage and handling of LNG (and other hazardous substances) may be considered to be a Major Hazard Installation (MHI) in terms of the Occupational Health & Safety Act.

The main hazards that would occur with a loss of containment of hazardous components at the proposed project include exposure to:

- Thermal radiation from fires;
- Overpressure from explosions.

Hazardous materials stored on the site and taken into account in the QRA are as follows:

- LNG and Natural Gas (predominantly methane), at the FSRU(s) and onshore storage

Leaks or spills of natural gas or LNG from pipelines conveying it may result in fires and explosions, which may have fatal consequences.

Safety risks are managed in terms of the Occupational Health and Safety Act which would that engineering designs adequately address safety requirements according to industry standards. No specific management objectives therefore are included in this EMPr.

2.8 Impacts on the Marine Environment

The elimination of marine benthic communities in the structural footprint of the LNG berth is an unavoidable consequence of the proposed development, and no direct mitigation measures, other than the no-project alternative, are possible. In the case of the cooling water discharges from the LNGC and FSRU, structural adaptations can be implemented to the vessels outlets thereby avoiding impacts to the sediments below the vessels. The initial negative impacts are deemed of low intensity within the immediate vicinity of the LNG berth. Furthermore, the negative impacts persist over the short-term only recolonisation of unconsolidated sediments will be rapid and as the new structures and rock armouring will offer a new settling ground for hard bottom species and will be rapidly colonised.

Elevated suspended sediment concentrations and increased turbidity in the Port due to dredging and construction activities, and in the vicinity of the dredge disposal site during dredge spoil disposal is deemed of low intensity within the immediate vicinity of the dredging and construction sites, with impacts persisting over the short-term only. As dredging and construction activities relating to the offloading facilities will be confined to within the Port area, impacts on the adjacent Addo Elephant MPA and Algoa to Amathole EBSA are unlikely. Suspended sediment plumes generated during dumping of dredge spoil and installation of the gas and cryogenic pipelines would, however, overlap with the MPA and EBSA, but as impacts would be highly localised and ephemeral, the impact is assessed to be of very low significance both without and with mitigation. Similarly, regular movement of maritime traffic already occurs along the existing approach channel to, and within the Port of Ngqura. Although additional sediment resuspension by turbulence generated propeller wash from LNGCs can be considered a cumulative effect, the impact can be considered insignificant. Although elevated suspended sediment concentrations are an unavoidable consequence of dredging and construction activities, impacts can be kept to a minimum through responsible dredging and construction practices.

As the proposed LNG terminal is located within a port, the shipping noise component of the ambient noise environment is expected to be significant within and around the construction site. Given the significant local shipping traffic and relatively strong metocean conditions specific to the area, ambient noise levels are expected to be 90–120 dB re 1 µPa for the frequency range 10 Hz – 10 kHz. The underwater noise from the LNGC and FSU, the truck carrier vessel and general construction activities may induce localised behavioural changes or masking of biologically relevant sounds in some marine fauna, but there is no evidence of significant behavioural changes that may impact on the wider ecosystem.

Resuspension of sediments during dredging and dumping of dredge spoil, as well as construction of piles for the access trestle along the breakwater, may result in the release of contaminants, increased nutrient concentrations and potential alteration of dissolved oxygen levels in the water column. This may affect biological organisms in a variety of ways.

Dredging, dumping of dredge spoil, deposition of rocks onto the seabed and pile driving, drilling, etc. during construction of the port infrastructure, as well as pumping of heating and cooling water by the LNGC and FSRU, and regasification of LNG will generate noise and vibrations that may be transmitted underwater and impact on marine organisms.

Deposition of rock material onto the seabed and installation of piles during construction of the port infrastructure will result in creation of artificial hard surfaces for colonization by marine organisms, replacing some of the natural habitat lost due to construction and resulting in a positive impact.

The operation of the FSRU is estimated to require a seawater flow rate of 45 000 – 600 000 m³/day for the vaporisers, cooling water and onboard desalination, which will be taken in directly from the port. The LNGCs will also require water for engine cooling and to protect the vessel from damage during LNG transfer and regasification, and both vessels would have a ballast control system to maintain vessel stability during cargo transfer. Cumulatively the volumes of seawater circulated through the vessels could be substantial and could potentially result in entrainment or injury of marine organisms, especially larvae and eggs.

The operation of the ballast control system in the FSRU and LNGC, as well as bio-fouling organisms on the hulls of LNGCs from outside South African waters may result in introduction of species not naturally found in the area. These may be in the form of larvae, eggs, cysts, or adult organisms, using the vessel hull as substrate.

Changes in water temperature resulting from thermal water discharges from the LNGC and FSRU during operation can have a substantial impact on aquatic organisms and ecosystems, in terms of physiology oof biota, localised changes in behaviour, or influences on ecosystem functioning.

Disinfection of the pipe and plant system with hypochlorite to prevent fouling of the heat-exchange system of the FSRU, as well as operation of the on-board desalination plant on the LNGC and FSRU, may result in release of heated seawater to the port.

The strong operational lighting used to illuminate the LNGC and FSRU vessels and the truck carrier at night may disturb and disorientate pelagic seabirds feeding in the area or attract turtles, marine mammals and fish. Although some species may change their feeding habits, the impacts on marine species are generally expected to be minor as the LNG terminal will be located in a port where artificial lighting will be of comparatively high intensity. It is expected, therefore, that seabirds and marine mammals in the area would become accustomed to the presence of the vessels within a few days.

Dredging and construction activities, as well as operation of the LNGC and FSRU at the LNG terminal will result in a reduction of water quality from routine discharges to the sea from vessels.

Unplanned events, such as diesel spills, LNG spills, and faunal strikes with the LNGC and truck carrier, are also possible.

The management objectives for this impact are:

- Reduce disturbance to substratum that might arise from water discharges from the FSU;
- Minimise elevated suspected sediment during construction;
- Reduce marine (sub-surface) noise, especially during construction;
- Ensure that ballast water management plans are developed and implemented;
- Reduce the zone of influence of thermal discharges;
- Minimise the potential for discharge of co-pollutants (e.g. chlorine, aluminium, and copper);
- Minimise impact of night-time lighting
- Ensure that a waste management plan is developed and implemented;
- Operate vessels in a manner that minimises the potential for faunal strikes; and
- Ensure that emergency preparedness and response plans are developed and implemented for diesel spills and LNG spill.

2.9 Noise Impacts

Noise impacts could originate from construction equipment and vehicle noise and noise from the operation of the Gas infrastructure and auxiliary infrastructure. Impacts could be experienced by local residents outside the study area, tenants within the SEZ, and the Port of Ngqura. Various ecological receptors have also been identified, including the Damara Tern colony in Zone 10, and rare butterfly habitats. The noise from the power plant will include audible, low frequency and infra sound.

Noise sensitive areas (NSA's) were identified in the vicinity of the Gas infrastructure. The most sensitive areas from a noise perspective will be Jahleel Island and the Damara Tern Colony. Dues to the attenuation of noise by distance, the other sensitive areas identified are too far away from the noise source to be of concern.

The management objectives for this impact are:

- Minimise noise impacts; and

- Legal compliance with regard to noise generation.

2.10 Impacts on Traffic

The following potential traffic related impacts relating to the proposed Gas Infrastructure have been identified. Note that the impacts will occur both in the short-term (i.e. during the construction phase) and medium to long-term once the plant is completed (operational phase):

- Road Capacity - Additional vehicle trips generated by the proposed development (up to 323 and 34 additional trips during the AM and PM peak hours for the construction and operational scenarios respectively) will have minimal impact in terms of road capacity given the current low hourly volumes along the road links and at the affected intersections, and low trips generated by the proposed power plant.
- Road Pavement - The Coega IDZ Demand Modelling Report indicates that all Class 2 roads would likely need to accommodate 7.5 million E80s per lane over a 20-year period. Given that the Ring Road is a class 2 road it has likely been designed for these volumes. As such the number of E80s generated by the Power Plant traffic relative to the maximum expected loading over the 20-year period is minimal. Similarly, the cumulative impact of all other known power plants will not impact significantly on the road pavements as their design has taken such volumes into account.
- Traffic Safety - Safety issues may initially be a concern given low traffic volumes as traffic is likely to operate at high speeds in low traffic environments.

The management objectives for this impact are:

- Prevent damage to road infrastructure; and
- Minimise traffic safety risks.

2.11 Impacts on the socio-economic environment

The proposed Gas Infrastructure development may result in the direct creation of approximately 2000 temporary job opportunities (over a construction period of 3 years), of which 30% would be unskilled labour. Indirect job opportunities (industries that provide construction materials and services for the project) may also benefit as a result of the construction of the proposed development. It is estimated that during the operational phase, approximately 200 long-term skilled and unskilled personnel will be required which will in turn create employment opportunities for local labour.

During construction, income to the government is expected to be marginally increased by taxes (VAT) paid by CDC/ the developer on locally procured goods and services. Investment in locally procured goods and services will also have a very limited indirect and induced effect on economic performance.

Local investment (e.g. the purchase of construction material) leads to (direct) new business sales. The suppliers of these goods and services spend their additional income, further adding to the circulation of money. This secondary expenditure, or demand, results in indirect and induced new business sales, i.e. the multiplier effect. Total new business sales are determined by the addition of direct, indirect and induced sales in the economy.

The management objective for this impact is to maximise the positive impact on the local (NMBM) economy, including the use of local and unskilled labour.

2.12 General construction impacts

Dust generated by construction activities has the potential to impact on off-site access roads by creating a dust nuisance to other tenants in the SEZ and impairing visibility on the roads thereby affecting traffic safety and visual impacts. Excess dust can also draw undue attention to the site by

increasing the visibility of construction activities. The impact of dust is more of a nuisance nature and does not typically pose a health risk due to the its typically coarse size of the dust particles.

While the project layout is intended to fit into the existing or yet to be developed services infrastructure in the SEZ, there is a potential remains for damage to existing services infrastructure (both underground and above ground) during excavation and other construction related activities. This may result in temporary disruptions to these services, affecting other tenants in the SEZ.

Much of the Zone 10 and surrounding vegetation is largely made up of dune thicket invaded by woody aliens, which is susceptible to burning, and therefore the risk of bush fires spreading to the proposed Gas infrastructure must be considered. There is a risk however of fires originating from within the development due to construction activities or general anthropogenic impacts.

The management objective for this impact is to minimise dust, fire, and damage to existing infrastructure.

2.13 Climate change impacts

A high-level GHG inventory was developed for the proposed Gas distribution infrastructure, to quantify its impacts on climate change. This GHG inventory estimated the emissions associated with the operation and value chain (both upstream and downstream) of the proposed project. The GHG inventory was assessed in comparison to a calculated South African carbon budget, which, in turn, informed the impact assessment conducted in this CCIA.

The Scope 1 and Scope 2 emissions were summarised into the following categories: Tanker Berthing and Deberthing and LNG Regasification. With an assumed project life span of 30 years[1], this amounts to 26 million tCO_2e throughout the lifespan of the Gas Distribution Infrastructure project. These emissions are related to a total annual throughput of 16.9 million m3 of LNG per year. The Scope 1 and Scope 2 emissions equate to 0.56% of South Africa's carbon budget.

The upstream Scope 3 emissions (from natural gas extraction, transport, processing and liquefication) amount to a total of 8.0 million tCO_2e per annum. The most significant portion of Scope 3 emissions, and of the entire project, is the downstream Scope 3 emissions which are 19.6 million tCO_2e per annum, which are related to the combustion of the imported LNG for various processes, including, but not limited to, the combustion emissions arising from the three proposed CDC gas-to-power stations.

The total annual emissions (Scope 1, 2 and 3) are 28.5 million tCO_2e per annum and the total GHG Inventory across the lifetime of the Gas Distribution Infrastructure is 855 million tCO_2e.

An assessment of the climate change risk and vulnerability of the Gas Distribution Infrastructure, considering the core operations, value chain, and social and natural environments, was conducted to inform the resilience of the project to climate change. Several climate change impacts could affect the core operations of the power plant. These impacts mostly affect the structural integrity of the equipment and installations. The health and safety of employees as well as their performance could also be significantly impacted, mostly due to increasing average temperatures and reducing water security. The climate change impacts that are likely to have severe impacts are associated with the increased frequency and severity of severe weather events, such as severe storms and severe rainfall events.

The management objectives for this impact are to:

[1] Power Generation Technology Data for Integrated Resource Plan of South Africa. (2017) Department of Energy

- Reduce Scope 1 GHG emissions where possible; and
- Improve the resilience of the Gas infrastructure in the design of the facility.

3 Measures Applicable to the Detailed Design Phase

3.1 Roles and Responsibilities

The key role players during the design phase of the project are:

- The holder of the Environmental Authorisation (the CDC or any developer it cedes the EA to); and
- The engineering consultants responsible for the design of the power plant and any associated activities

3.1.1 The Proponent (the CDC or developer rights are ceded to)

The Proponent is responsible for ensuring that the measures in this EMPr are complied with and must:

- Ensure that the engineering consultant team is aware of and takes into consideration all relevant measures in the EMPr; and
- Confirm that all relevant environmental management measures in the EMPr have been incorporated into the project design on completion of the Design Phase.

3.1.2 Engineering Consultants:

The engineering consultants must:

- Take cognisance of all relevant measures in the EMPr and ensure integration thereof in the detailed design; and
- Reference the environmental management measures applicable to the construction (Section 4) and operational (Section 5) phases of the project in all documents that will be applicable to future phases of the Project (e.g. tender documents).

3.2 Environmental Management Measures

The environmental management and mitigation measures that must be implemented during the design phase, as well as responsibilities and timelines for the implementation of these measures and monitoring thereof, are laid out in Table 3-1 below.

Table 3-1: Environmental management and mitigation measures that must be implemented during the Design Phase

Design Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsibility**	**Timeframe / Frequency**	**Monitoring Methods1**	**Performance Indicators**
Authorisations	1	Ensure that all required licences and permits have been obtained before the start of construction. These include, but may not be limited to: • Water Use Authorisations; and • Permits for the disturbance or removal of protected plant species.	• The Proponent	• Before construction commences	• Keep record of all permits, licences, and authorisations	• Required licences/permits on file
	2	Ensure that all conditions stated in required licences and permits are integrated into the project design and management. These include, but may not be limited to: • Water Use Authorisations; and • Permits for the disturbance or removal of protected plant species.				
	3	Review the detailed design of each component of the full 1000 MW (including the initial 200 MW) facility to determine whether there are significant deviations from the authorised project description and obtain confirmation from DEFF regarding the need, or not, to apply for an amendment to the authorisation in cases such as, but not limited to, the following: Substantial changes to the layout, • Stack height and parameters; • Changes in on site storage of dangerous goods; • Changes in fuel type, or changes in the use of backup fuels; or • A change in the height of the stacks for exhaust gases		• During detailed design	• Technical review	• Confirmation from technical tams and/or DEFF
Preparation of Construction Phase	4	Include the EMPr in all tender documents to ensure that sufficient resources are allocated to environmental management by the Contractor.	• Consultant team	• Prior to call for tenders	• Check tender documents and contract	• Incorporated in tender documents

Design Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsibility**	**Timeframe / Frequency**	**Monitoring Methods1**	**Performance Indicators**
	5	Plan and make adequate financial provision for rehabilitation and restoration activities and clearly allocate timing and responsibility for environmental rehabilitation.	• The Proponent	• Before construction commences	• Review rehabilitation plan and financial provisions	• Rehabilitation plan and financial provisions
	6	Appoint a botanist to implement an initial search and rescue and collect key plant species for growing in a nursey and reintroduction to the area / use during rehabilitation.	• Consultant team	• Before construction commences	• Appointment letter	• Initial search and rescue undertaken and plants moved to nursery
	7	Obtain a permit from Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) SCC and protected species are removed from the construction footprint.	• The Proponent / botanist	• Before removal of SCC	• Application lodged	• Permit obtained
Visual Impacts	8	Design of buildings, lighting, and grounds according to the CDCs architectural guidelines	• The proponent	• In preparation for building plan approval	• Approved building plans	• Approved building plans
Pollution of Soil and Stormwater	9	Implementation of a site specific stormwater management plan, in accordance with the CDC's overarching stormwater management strategy for the SEZ, to ensure stormwater exiting the site meets the requirements in terms of quality and volume	• The Proponent	• Prior to construction	• Building plan approval	• Approved building plans
Pollution of Soil and Stormwater	10	Provide suitable traffic accommodation measures as part of construction contract to inform other road users of presence of construction related traffic	• The Proponent s)	• Before appointing a contractor	• Annual compliance audits	• Traffic accommodation measures included in contracts
Increased traffic	11	The design of storage & handling facilities is governed by well-established South African National Standards which are aimed at pollution prevention	• Design engineer	• In preparation for building plan approval	• Approved building plans	• Approved building plans
Stormwater management	12	The stormwater management plan for the site must be implemented to ensure that any impacts of stormwater from the site are mitigated as far as possible within the site (measures such as the use of permeable surfaces, re-use of runoff from built areas such as roofs as well as the use of measures such as swales) to minimise the stormwater	• Design engineer	• In preparation for building plan approval	• Approved building plans	• Approved building plans

Design Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsibility**	**Timeframe / Frequency**	**Monitoring Methods1**	**Performance Indicators**
		impacts on the watercourse				
Stormwater management	13	If necessary, pre-treatment areas such as oil, sediment and litter traps should be included in the stormwater management design.	• Design engineer	• In preparation for building plan approval	• Approved building plans	• Approved building plans
Air quality mitigation not included	14	Design to include installation of instrumentation, including detection and emergency shut down for chlorine and ammonia.	• Design engineer	• In preparation for building plan approval	• Approved building plans	• Approved building plans
Safety management	15	Design to include installation of instrumentation, including detection and emergency shut down for natural gas leaks in the gas pipelines	• Design engineer	• In preparation for building plan approval	• Approved building plans	• Approved building plans
Safety management	16	Design to include installation of instrumentation, including detection and emergency shut down for diesel leaks in above ground storage tanks.	• Design engineer	• In preparation for building plan approval	• Approved building plans	• Approved building plans
FSU Design	17	Design intakes to minimise entrainment or impingement by reducing the average intake velocity to about 0.1 to 0.15 m/s. This is comparable to background currents in the oceans and will allow mobile organisms to swim away from the intake under these flow conditions (UNEP 2008).	• FSU Operator	• Design phase	• Annual compliance audit	• Monitoring records
FSU Design	18	Consider water conservation opportunities for LNG facility cooling systems (e.g. air cooled heat exchangers in place of water cooled heat exchangers)	• FSU Operator	• Design phase	• Annual compliance audit	• Specifications
FSU Design	19	Design the discharge of cooling water to surface waters in a manner that will allow maximum mixing and dilution of the thermal plume to ensure that the temperature is within 3°C of ambient temperature at the edge of the mixing zone or within 100 m of the discharge point	• FSU Operator	• Design phase	• Annual compliance audit	• Specifications • Modelling / monitoring records
FSU Design	20	Fit deflector plates to discharges directed vertically downwards to modify the discharge to 45°	• FSU Operator	• Design phase	• Annual compliance audit	• Specifications
FSU Design	21	Consider water conservation opportunities for LNG facility cooling systems (e.g. air cooled heat exchangers in place of water cooled heat exchangers).	• FSU Operator	• Design phase	• Annual compliance audit	• Specifications

Design Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsibility**	**Timeframe / Frequency**	**Monitoring Methods1**	**Performance Indicators**
FSU Design	22	Design the FSU in a manner that enables neutralising of NaOCl with SMBS prior to discharge to ensure that the most conservative international guideline value (<<2 µg/L) for residual chlorine at the point of discharge is met.	• FSU Operator	• Design phase	• Annual compliance audit	• Specifications
FSU Design	23	The hypochlorite generation unit must be suitably bunded to prevent and spills from the plant entering the marine environment	• FSU Operator	• Design phase	• Annual compliance audit	• Specifications
FSU Design	24	Design the FSU in a manner that enables blending brine from the onboard desalination plant with cooling water prior to release	• FSU Operator	• Design phase	• Annual compliance audit	• Specifications
FSU Design	25	Prepare an emergency response plan covering recommended measures to prevent and respond to LNG spills.	• FSU Operator	• Design phase	• Annual compliance audit	• Presence of plan

4 Measures Applicable to the Construction Phase

4.1 Roles and Responsibilities

The key role players during the construction phase of the project are anticipated as follows:

- The Proponent, i.e. The holder of the Environmental Authorisation (the CDC or any developer it cedes the EA to);
- Resident Engineer (RE), who will oversee the activities of the contractors on site;
- Contractors responsible for the construction of the project;
- Any sub-contractors hired by the contractor; and
- Environmental Control Officer (ECO).

The anticipated construction phase organogram is presented in Figure 4-1 below and shows the proposed lines of communication during this phase. All instructions relating to the EMPr will be given to the contractor via the RE. In an emergency situation, the ECO may give an instruction directly to the Contractor/ sub-contractors. Both the Contractor and ECO will report issues of concern to the RE, who in turn will report on progress to the proponent. The Proponent will retain responsibility for ensuring that the Contractor fully implements the provisions of the EMPr.

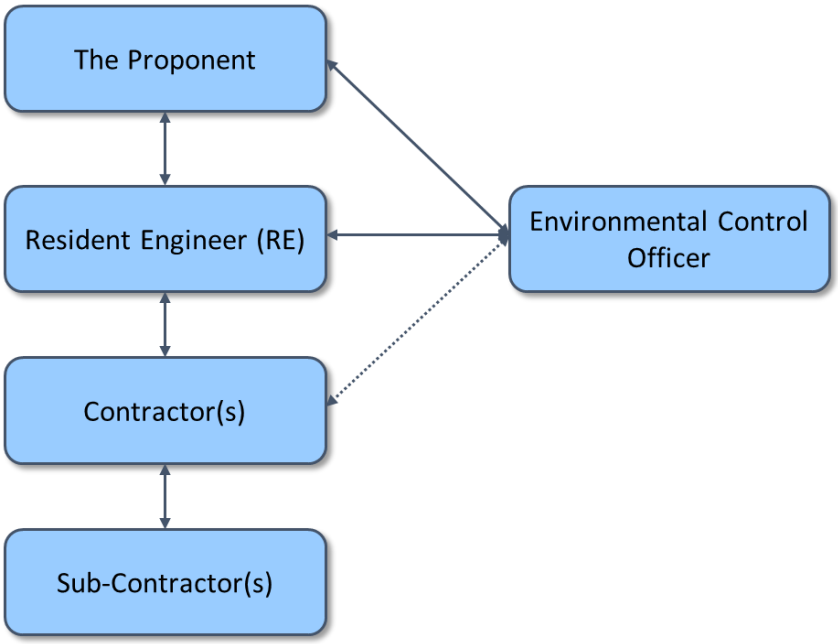

Figure 4-1: Construction phase reporting structure

Key roles and responsibilities during the construction phase with respect to the implementation of the EMPr are outlined below.

4.1.1 The Proponent (the CDC or developer rights are ceded to)

The Proponent has the overall responsibility for management of the project. In terms of environmental management, the proponent must:

- Appoint suitably experienced Engineers who will be responsible for the overall management of activities on site during the Construction Phase;
- Appoint an independent and suitably qualified ECO to monitor compliance with the EMPr for the duration of the Construction Phase;

- Ensure that the Engineers are aware of the requirements of the EMPr, implement the EMPr and monitor the Contractor's activities on site;
- Ensure that the Contractor is aware of and contractually bound to the provisions of this EMPr by including the relevant environmental management requirements in the tender and contract documents, as appropriate;
- Ensure that the Contractor remedies environmental problems timeously and to the satisfaction of the ECO and authorities (when necessary); and
- Notify the authorities should problems not be remedied timeously.

4.1.2 The Resident Engineer

The Proponent will appoint suitably qualified Engineering company who will in turn designate a suitable Resident Engineer (RE) who will be responsible for overseeing activities of the Contractor during the Construction Phase. The RE must:

- Ensure that the Contractor is duly informed of the EMPr and associated responsibilities and implications of this EMPr prior to commencement of construction;
- Monitor the Contractor's activities (together with the ECO) with regard to the requirements outlined in the EMPr;
- Relay all instructions from the ECO to the Contractor and ensure that these are fully understood and implemented;
- Report any environmental emergencies/concerns to the ECO immediately;
- Act as a point of contact for local residents and community members; and
- Ensure that non-compliance is remedied timeously and to the satisfaction of the Proponent, ECO, and where applicable, the relevant authorities.

4.1.3 The Contractor

The Contractor will be required to appoint or designate a Contractor's Environmental Representative (CR) who will assume responsibility for the Contractor's environmental management requirements on site and be the point of contact between the Contractor and the ECO. The CR must:

- Ensure that all activities on site are undertaken in accordance with the EMPr;
- Monitor the Contractor's activities with regard to the requirements outlined in the EMPr;
- Ensure that all employees and sub-contractors comply with the EMPr;
- Immediately notify the ECO of any non-compliance with the EMPr, or any other issues of environmental concern; and
- Ensure that non-compliance is remedied timeously and to the satisfaction of the ECO.

The Contractor has a duty to demonstrate respect and care for the environment. The Contractor will be responsible for the cost of rehabilitation of any environmental damage that may result from non-compliance with the EMPr, environmental regulations, and relevant legislation.

4.1.4 Sub-contractors:

All Sub-contractors will be required to:

- Ensure that all employees are duly informed of the EMPr and associated responsibilities and implications of this EMPr prior to commencement of construction;
- Ensure that all activities on site are undertaken in accordance with the EMPr;
- Monitor employees' activities with regard to the requirements outlined in the EMPr;
- Immediately notify the ECO of any non-compliance with the EMPr, or any other issues of environmental concern; and
- Ensure that non-compliance is remedied timeously and to the satisfaction of the ECO.

The Sub-contractor has a duty to demonstrate respect and care for the environment. The Sub-contractor will be responsible for the cost of rehabilitation of any environmental damage that may result from non-compliance with the EMPr, environmental regulations and relevant legislation, resulting from their presence on site.

4.1.5 The Environmental Control Officer (ECO)

The ECO must be a suitably qualified/experienced environmental professional, appointed by the proponent, for the duration of the Construction Phase of the Project. The ECO must:

- Request Method Statements from the Contractor prior to the start of relevant construction activities, where required, and approve these (as appropriate) without causing undue delay;
- Monitor, review and verify compliance with the EMPr by the main Contractor, as well as any sub-contractors and specialist contractors;
- Undertake site inspections at least once a month to determine compliance with the EMPr;
- Identify areas of non-compliance and recommend corrective actions (measures) to rectify them in consultation with the Proponent, the RE, and the Contractor, as required;
- Compile a checklist highlighting areas of non-compliance following each ECO inspection;
- Ensure follow-up and resolution of all non-compliances;
- Provide feedback for continual improvement in environmental performance;
- Respond to changes in project implementation or unanticipated site activities which are not addressed in the EMPr, and which could potentially have environmental impacts, and advise the Proponent, the RE, and Contractor as required; and
- Undertake a site closure inspection, which may result in recommendations for additional clean-up and rehabilitation measures.

4.2 Compliance and Monitoring

4.2.1 Method Statements

A Method Statement is a document setting out specific details regarding the plant, materials, labour, and the method the Contractor proposes using to carry out certain activities, usually activities that may have a detrimental effect on the environment. It is submitted by the Contractor to the ECO.

The purpose of a Method Statement is for the Contractor to provide additional details regarding the proposed methodology for certain activities, and for the ECO to confirm that these meet the requirements of the EMPr and acceptable environmental practice. This allows the EMPr to be less prescriptive and affords the Contractor a certain amount of flexibility or to respond to stipulations in the EMPr. It also provides a reference point to detect deviations from the agreed approach to an activity.

Each Method Statement will address environmental management aspects relevant to the activity and will typically provide detailed descriptions of items including, but not necessarily limited to:

- Nature, timing and location of activities;
- Procedural requirements and steps;
- Management responsibilities;
- Material and equipment requirements;
- Transportation of equipment to and from site;
- Method for moving equipment/material while on site;
- How and where material will be stored;
- Emergency response approaches, particularly related to spill containment and clean-up; and
- Response to compliance/non-conformance with the requirements of the EMPr.

The following list provides examples of Method Statements that may be requested from the Contractor:

- Environmental awareness course preparation;
- Material and equipment storage and delivery;
- Fuel storage, dispensing and fuel spills;
- Waste management;
- Management of contaminated water;
- Erosion and stormwater control; and
- Cement batching.

The Method Statements will be submitted by the Contractor to the ECO not less than 14 days prior to the intended date of commencement of an activity. The ECO shall approve / reject the Method Statement within two days of receipt of the method statement. An activity for which a Method Statement has been requested shall not commence until the ECO has approved such method and, once approved, the Contractor shall abide by the relevant Method Statement. A suitable Method Statement format can be agreed between the ECO and Contractor.

4.2.2 Environmental Records and Reports

Environmental records and reports required during the Construction Phase are listed in Table 4-1.

Table 4-1: Reports required during Construction

Report	Frequency	From	To
Environmental Checklist	Weekly	CR	ECO
Environmental Compliance Report	Monthly	ECO	Proponent and RE
Site Closure Audit	End of Contract	ECO	Proponent and RE

Environmental Checklist

The CR will undertake weekly site inspections to check on the implementation of the EMPr by the Contractor and complete a brief report/checklist after the inspection. The completed checklists shall be submitted to the ECO at the end of each inspection. This checklist should be discussed between the CR and the ECO during the initial site inspection, and agreement reached on the preferred format and content.

Environmental Compliance Report

The ECO will prepare monthly Environmental Compliance Reports, detailing any environmental issues, non-compliances, and actions to be implemented. These reports will be based on the ECO's observations and the weekly Environmental Checklists. Environmental Compliance Reports will be submitted to the Proponent and a full record will be kept by the ECO, for submission to DEFF on request.

When more frequent site visits are undertaken by the ECO, the frequency of reports will increase accordingly to allow for timeous reporting of environmental issues and actions required.

Photographic Records

If the ECO identifies any areas of concern, the ECO will request photographic records, which must be submitted by the Contractor for record purposes. Photographic records will typically be recorded in the monthly compliance reports.

Construction Site Closure Audit

The ECO will undertake a final site closure audit on completion of the Construction Phase. The purpose of this is to confirm compliance with all site closure requirements identified by the ECO, and that the site has been left in an environmentally suitable condition. If outstanding environmental requirements are observed during this inspection, a further inspection must be carried out to confirm compliance. The Site closure Audit report will be submitted to the Proponent for record purposes, and to DEFF if requested.

4.2.3 Corrective Action

Corrective action is a critical component of the plan-do-check-act cycle and it is through corrective action that continuous improvement can be achieved. Where repeated non-compliance is recorded, procedures may need to be altered accordingly to avoid further corrective actions.

If environmental compliance monitoring by the CR and ECO indicates non-compliance with the EMPr or approved Method Statements, the RE will formally notify the Contractor through a Corrective Action Request. The Corrective Action Request documents:

- The nature of the non-conformance/environmental damage;
- The actions or outcomes required to correct the situation; and
- The date by which each corrective or preventive action must be completed.

Upon receipt of the Corrective Action Request, the Contractor will be required to produce a Corrective Action Plan (or similar plan), which will detail how the required actions will be implemented. The Corrective Action Plan must be submitted to the ECO for approval prior to implementation. Once it has been approved, the corrective action must be carried out within the time limits stipulated in the Corrective Action Request. Additional monitoring by the CR and ECO will then be required to confirm the success or failure of the corrective action.

4.3 Environmental Management Measures

The environmental management and mitigation measures that must be implemented during the construction phase, as well as responsibilities and timelines for the implementation of these measures and monitoring thereof, are laid out in Table 4-2 below.

Table 4-2: Environmental management and mitigation measures that must be implemented during the Construction Phase

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Initial appointments and preparations	1	Appoint an independent ECO to oversee construction activities.	• Proponent	• Before construction commences • Once the final construction footprint has been pegged	• Review appointment documentation	• Appointment documents
	2	Appoint a suitably qualified botanist / specialist to mark SCC and protected species within the construction footprint and to oversee the removal, rescue and relocation of the SCC.				
	3	Obtain a permit from DEDEAT for SCC and protected species that are to be removed from the construction footprint.	• Proponent / botanist	• Before removal of SCC	• Application lodged	• Permit obtained
	4	Implement a search and rescue along the entire footprint immediately prior to construction to move any fauna that are directly threatened by the construction activities and unlikely to move out by themselves. No wildlife may be removed from the site or surrounding areas unless approved by the ECO in consultation with the appropriate permits obtainable from relevant competent authorities	• Herpetologist	• Before construction starts	• Visual inspection • Record of relocations	• Records of relocations
Clearing	5	Conduct a site walkthrough by a suitably experienced faunal specialist prior to clearing of the site for search and rescue of faunal species of special concern that may occur in the vicinity	• Proponent/ specialist	• Before clearing	• ECO Audit	• Monitoring records
Clearing	6	Conduct the botanical search & rescue of SSC in accordance with the permit obtained from DEDEAT.	• Proponent/ specialist	• Before clearing	• ECO Audit	• Monitoring records
Clearing	7	Clearing must take place in a phased manner (i.e. the entire area to be developed should not be cleared all at once)	• Contractor(s)	• Start of construction	• Visual inspection by CR and ECO	• Monitor extent of clearing

[2] Unless otherwise indicated, monitoring will be undertaken by the ECO, supported by the authorities where the requirement is specifically stipulated in a licence or permit.

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Clearing	8	Limit the footprint area of the construction activity to what is absolutely essential.	• Contractor(s)	• Throughout construction	• Visual inspection • Appointment of vegetation specialist • Search and Rescue Report	• Area cleared relative to development footprint • Area disturbed outside of construction site boundary • Number of incidents of animals found in trenches
Clearing	9	Ensure that no vegetation is removed or disturbed outside the delineated construction site boundary.	• Contractor(s)	• Throughout construction	• Visual inspection • Appointment of vegetation specialist • Search and Rescue Report	• Area cleared relative to development footprint • Area disturbed outside of construction site boundary • Number of incidents of animals found in trenches
Clearing and earthmoving	10	Construction within or immediately adjacent to the watercourse should preferably take place during the drier months of the year.	• Contractor(s)	• Throughout construction	• Visual inspection during ECO audits	• Visible impacts on nearby wetland
Clearing and earthworks	11	Areas to be cleared of vegetation or topsoil shall be cleared only when required, and shall be rehabilitated immediately on completion of the construction activity in that area	• Contractor	• Start of construction	• Visual inspection	• Size of disturbed areas
Clearing and stockpiles	12	When necessary, appropriate dust control measures (such as wetting of soil and covering of stockpiles) shall be implemented	• Contractor(s)	• Throughout construction	• ECO audits	• No visible dust plumes, especially during string winds

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Complaints register / grievance mechanism	13	Maintain and disclose a complaint register. The register must record: • Complainant name and contact details; • Date complaint was lodged; • Person who recorded the complaint; • Nature of the complaint; • Actions taken to investigate the complaint and outcome of the investigation; • Action taken to remedy the situation; and • Date on which feedback was provided to complainant.	• Contractor(s)	• Duration of construction activities	• Monthly ECO Audits	• Register on site • Complaints followed up and closed out
Concrete / cement work	14	Where possible, ready-mix cement must be used.	• Contractor(s)	• Throughout construction	• ECO audits	• Visual inspection
Concrete / cement work	15	No mixing of cement within 50 m of the wetland, or any other watercourse and mixing must be conducted on an impermeable surface and all cement contaminated wastewater must be collected for evaporation and disposal	• Contractor(s)	• Throughout construction	• ECO audits	• Visual inspection

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Concrete / cement work	16	Use Ready-Mix concrete rather than batching where possible.	• Contractor(s)	• Throughout construction	• Visual inspection and approval by CR and ECO.	• Number of incidents of batching outside works footprint; • Contamination of water and soil; and • Visible litter / waste on site.
Concrete / cement work	17	Ensure that no cement truck delivery chutes are cleaned on site. Cleaning operations are to take place off site at a location where wastewater can be disposed of in the correct manner. If this is not possible a suitable washing facility is to be developed on site in consultation with the ECO.	• Contractor(s)	• Throughout construction	• Visual inspection and approval by CR and ECO.	• Inspection of incident records

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Concrete / cement work	18	Batch cement in a bunded area within the boundaries of the development footprint only (where unavoidable).	• Contractor(s)	• Throughout construction	• Visual inspection and approval by CR and ECO.	• Number of incidents of batching outside works footprint; • Contamination of water and soil; and • Visible litter / waste on site.
Concrete / cement work	19	Ensure that cement is mixed on mortar boards and not directly on the ground (where possible).	• Contractor(s)	• Throughout construction	• Visual inspection and approval by CR and ECO.	• Inspection of incident records
Concrete / cement work	20	Place cement bags in bins and dispose of bags as waste to a licensed waste disposal facility.	• Contractor(s)	• Throughout construction	• Visual inspection and approval by CR and ECO.	• Number of incidents of batching outside works footprint; • Contamination of water and soil; and • Visible litter / waste on site.
Construction layout	21	Access roads should be kept to a minimum and their length and width should be minimised to reduce the surface area from which dust can be generated	• Contractor	• Start of construction	• Visual inspection	• Visibility of dust coming off construction site • Number of registered complaints
Construction traffic	22	When transporting fine materials, dust tarps should be installed on vehicles	• Contractor	• Duration of construction	• Visual inspection	• Visibility of dust coming off vehicles • Number of registered complaints
Construction traffic	23	Limit speeds on access and internal roads to 40kmph	• Contractor	• Duration of construction	• Visual inspection	• Visibility of dust coming off construction site

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Demarcate working area	24	Construction should be limited to the development footprint and the wetland should be demarcated as a no-go area with a buffer of 20 m between the delineated wetland and the development footprint being maintained.	• Contractor(s)	• Throughout construction	• Visual inspection during ECO audits	• Visible impacts on nearby wetland
Demarcation of working area	25	Demarcate construction site boundaries upon establishment. Control security and access to the site. Fence off site boundaries to the satisfaction of the ECO and ensure that plant, labour, and materials remain within site boundaries.	• Contractor(s)	• Start of construction	•	•
Demarcation of working area	26	No-Go/ open space areas (including the sensitive vegetation patch north of the site) must be clearly demarcated/ clearly marked (i.e. with danger tape) before any construction activities commence on site and appropriate measures implemented to ensure compliance	• Contractor(s)	• Start of construction	• Visual inspection by CR and ECO	• No disturbance to no-go areas
Dust management	27	Avoid clearing of vegetation until absolutely necessary (i.e. just before earthworks).	• Contractor(s)	• Throughout construction	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Size of disturbed areas
Dust management	28	Regularly evaluate the effectiveness of all dust management measures. Amend how or which measures are used if necessary.	• Contractor(s)	• Throughout construction	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Visibility of dust coming off construction site • Number of registered complaints
Dust management	29	Stabilise exposed surfaces as soon as is practically possible.	• Contractor(s)	• Throughout construction	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Visibility of dust coming off construction site • Number of days that dust plumes are visible • Number of registered complaints

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Dust management	30	Avoid excavation and handling and transport of materials which may generate dust under high wind conditions or when a visible dust plume is present.	• Contractor(s)	• Throughout construction	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Visibility of dust coming off construction site • Number of days that dust plumes are visible
Dust management	31	If required, place wind barriers at right angles to prevailing wind currents as close to the work areas as possible. Vertical barriers should be at least 2 m high and screening material must have a porosity of 50% or less. For larger surfaces place barriers at intervals of approximately 10 times the barrier height, if feasible	• Contractor(s)	• Throughout construction	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Visibility of dust coming off construction site • Number of days that dust plumes are visible • Number of registered complaints
Dust management	32	Minimise dust generated off stockpiles: • Locate piles in sheltered areas where possible; • Minimise the slope of the stockpile; • Limit stockpile sizes; and • Cover stockpiles when not in active use for some time and / or use an environmentally friendly chemical spray to bind soil.	• Contractor(s)	• Throughout construction	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Visibility of dust coming off construction site • Dust mitigation measures in place • Number of days that dust plumes are visible • Number of registered complaints
Dust management	33	Cover trucks transporting loose material to or from site with tarpaulins, plastic, or canvas.	• Contractor(s)	• Throughout construction	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Dust mitigation measures in place • Number of registered complaints

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Dust management	34	Ensure that any material spilled from trucks on public roads during transport to or from the site is cleaned up.	• Contractor(s)	• Throughout construction	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Number of registered complaints
Dust management	35	Limit construction vehicle speeds to 40 km/hr on gravel roads.	• Contractor(s)	• Throughout construction	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Visibility of dust coming off construction site • Number of registered complaints
Dust management	36	Limit the number of vehicles allowed on-site and restrict the movement of these vehicles over unsurfaced or unvegetated areas once they are on site to reduce dust problems.	• Contractor(s)	• Throughout construction	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Visibility of dust coming off construction site • Number of days that dust plumes are visible • Number of registered complaints
Employment	37	Recruit local labour as far as feasible to increase the benefits to the local households	• Contractor(s)	• Throughout construction	• Annual compliance audits	• Employment records (to include whether local or non-local)
Employment	38	Employ labour intensive methods in construction where feasible	• Contractor	• Throughout construction	• Annual compliance audits	• Employment numbers
Employment	39	Sub-contract to local construction companies where possible	• Contractor	• Throughout construction	• Annual compliance audits	• Employment records (to include whether local or non-local)

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Employment	40	Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering and other services to the construction crews	• Contractor	• Throughout construction	• Annual compliance audits	• Employment records (to include whether local or non-local)
Employment	41	Set targets for the use of local labour based on the availability of existing skills and people that are willing to undergo training	• Proponent • Contractor(s)	• Throughout construction	• Keep record of how targets were determined • Keep record of staff by origin • Keep record of training provided	• Percentage of local staff • Percentage of BEE staff
Employment	42	Maximise opportunities for the training of unskilled and skilled workers from local communities and use local Sub-Contractors where possible.	• Proponent • Contractor(s)	• Throughout construction	• Keep record of how targets were determined • Keep record of staff by origin • Keep record of training provided	• Percentage of local staff • Percentage of BEE staff
Employment	43	Meet empowerment targets relevant to the construction sector.	• Proponent • Contractor(s)	• Throughout construction	• Keep record of how targets were determined • Keep record of staff by origin • Keep record of training provided	• Percentage of local staff • Percentage of BEE staff

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Employment	44	Consider implementing labour-intensive rather than capital-intensive work methods where feasible.	• Proponent • Contractor(s)	• Throughout construction	• Keep record of how targets were determined • Keep record of staff by origin • Keep record of training provided	• Percentage of local staff • Percentage of BEE staff
Employment	45	Consider purchasing resources from local sources where possible.	• Proponent • Contractor(s)	• Throughout construction	• Keep record of how targets were determined • Keep record of staff by origin • Keep record of training provided	• Percentage of local staff • Percentage of BEE staff
Environmental awareness training	46	Provide environmental awareness training to all personnel on site at the start of their employment. Training should include discussion of: • Potential impact of construction waste and activities on the environment; • Suitable disposal of construction waste and litter; • Key measures in the EMPr relevant to worker's activities; • How incidents and suggestions for improvement can be reported. Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names	• Contractor(s)	• Before workers start working on-site • Before new activities are undertaken	• Check training attendance register • Observe whether activities are executed in line with EMPr requirements	• Proportion of workers that completed environmental training • Compliance of workers with EMPr
Existing infrastructure	47	Existing infrastructure and services within or close to the construction footprint are to be located (via GPR if necessary) and demarcated prior to construction activities commencing	• Contractor(s)	• Start of construction	• ECO Audits	• Inspection of site drawings

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Existing infrastructure	48	Relevant authority agencies and/or Department of the service supplied are to be notified should existing infrastructure be damaged by construction related activities	• Contractor(s)	• Throughout construction	• ECO Audits	• Inspection of incident records
Existing infrastructure	49	Other users are to be notified of any planned disruptions to services ahead of time	• Contractor(s)	• Throughout construction	• ECO Audits	• Inspection of incident records
Fire management	50	Ensure that no fires are permitted on or adjacent to site.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Number of fire incidents
Fire management	51	Smoking is not to be permitted on site except in designated areas	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Visual evidence
Fire management	52	Ensure that sufficient fire-fighting equipment is available on site.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits.	• Certified extinguishers in appropriate locations.
Fire management	53	Any fire incidents or accidents must be recorded, and a record thereof must be kept on site	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Number of fire incidents
Fire management	54	Equip all fuel stores and waste storage areas with fire extinguishers.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Certified extinguishers in appropriate locations.
Fire management	55	Ensure that all personnel on site are aware of the location of firefighting equipment on the site and how the equipment is operated.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits.	• Training records
Fire management	56	Suitably maintain firefighting equipment.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Certified extinguishers in appropriate locations.
Hazardous materials	57	Design and construct hazardous material storage facilities, including fuel storage, with suitable impermeable materials and a minimum bund containment capacity equal to 110% of the largest container.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Compliance with specification

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Hazardous materials	58	Locate hazardous material storage facilities, especially fuel storage, as far as practically possible from the nearby wetland	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Compliance with specification
Hazardous materials	59	Ensure that contaminants are not placed directly on the ground.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Compliance with specification
Hazardous materials	60	Develop (or adapt and implement) procedures for the safe transport, handling and storage of potential pollutants.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Number of spills of hazardous materials, including waste materials; • Evidence of contamination and leaks.
Hazardous materials	61	Avoid unnecessary use and transport of hazardous substances.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Number of spills of hazardous materials, including waste materials; • Evidence of contamination and leaks.
Hazardous materials	62	Keep Material Safety Data Sheets for all hazardous materials on site and ensure that they are available for reference by staff responsible for handling and storage of materials.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Availability of MSDSs
Hazardous substance handling	63	The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be administered to prevent leaks and spills. Drip trays must be used during pouring of liquids and secondary containment must be in place during storage	• Contractor(s)	• Throughout construction	• Visual inspection during ECO audits	• Use of drip trays • Secondary containment for stored hazardous materials
Hazardous substance handling	64	Spillages should be cleaned up immediately and any contaminated soil from the construction site must be removed and disposed of at a permitted waste disposal facility	• Contractor(s)	• Throughout construction	• ECO audits	• Incident records • Waste disposal records

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Heritage resources	65	An archaeologist must be present on site during vegetation clearing of selected strips of vegetation (to be identified by the archaeologist). Clearing must be by small machinery, or the least invasive method of clearing.	• Contractor(s) • Archaeologist	• Prior to vegetation clearing and earthworks commencing	• Visual inspection	• Audit Reports • Site inspection reports
Heritage resources	66	Monitoring by an archaeologist must take place during all earthmoving activities, including, but not limited, to trenching and piling.	• Contractor(s) • Archaeologist	• Throughout construction	• Visual inspection	• Audit Reports • Site inspection reports
Heritage resources	67	If any concentrations of heritage material / fossils are exposed during construction, all work in that area must cease and it be reported immediately to the Albany museum so that the required investigations can be undertaken. This could entail Phase 2 mitigation (to be determined by the Albany Museum).	• Contractor(s) • Archaeologist	• Throughout construction	• Visual inspection	• Sampling or destruction permits
Heritage resources	68	After vegetation clearing a report must be sent to SAHRA for review and guidance on the way forward.	• Contractor(s) • Archaeologist	• Throughout construction	• Annual compliance audit	• Report to Albany Museum
Heritage resources	69	Any excavations in the Salnova formation must be examined and sampled by a professional palaeontologist WHILE fresh bedrock is still exposed. The presence of a palaeontologist is required on site soon after exposure.	• Contractor(s) • Palaeontologist	• In the event that artefacts are found.	• Annual compliance audit	• Report to Albany Museum
Increased traffic	70	Traffic accommodation measures to be provided in terms of Chapter 13 of the South African Road Traffic Signs Manual	• Contractor(s)	• Throughout construction	• H&S Audits	• Audit Reports
Increased traffic	71	Measures to be provided subject to approval by the Engineer	• Contractor(s)	• Throughout construction	• H&S Audits	• Audit Reports
Increased traffic	72	Ensure construction traffic is confined to site area	• Contractor(s)	• Throughout construction	• H&S Audits	• Audit Reports

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Increased Traffic	73	Minimise need for continuous construction traffic on Ring Road by confining construction traffic to the site	• The Proponent	• Throughout construction	• Keep record of vehicles entering the site and time they enter • Keep record of incidences and complaints	• Number of incidents / complaints
Increased Traffic	74	Ensure that vehicle loads are within legislated limits, i.e. maximum Gross vehicle mass of 56 000kg	• The Proponent	• Throughout construction	• Visually inspect vehicles for any obvious faults or overloading	• Inspection records
Increased Traffic	75	Source relevant permits from the Eastern Cape Department of Transport should abnormal loads be required for transport of components	• The Proponent	• Throughout construction	• Annual compliance audit	• Permits
Layout	76	The construction site camp should be located further than 50 m from the wetland, or any other watercourse and preferably further away if possible	• Contractor(s)	• Throughout construction	• Visual inspection during ECO audits	• Visible impacts on nearby wetland
Layout	77	No storage of machinery within 50 m of the wetland, or any other watercourse and only emergency maintenance may be performed on site	• Contractor(s)	• Throughout construction	• Visual inspection during ECO audits	• Use of drip trays • Secondary containment for stored hazardous materials
Layout	78	No stockpiles of excavated or spoil material or topsoil to be within 50 m of the wetland, or any other watercourse.	• Contractor(s)	• Throughout construction	• ECO audits	• Visual inspection
Layout	79	Submit a method statement for site camp location and establishment for approval by the ECO at least two weeks prior to establishment of the camp.	• Contractor(s)	• At least 2 weeks prior to establishment of site camp	• Visual inspections • Method statement	• Approved method statement

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Layout	80	Establish a suitably fenced site camp at the start of the contract, which will allow for site offices, vehicle, equipment, material and waste storage areas to be consolidated as much as possible. Locate the site camp at a position approved by the ECO. Provide water and / or ablution facilities at the site camp for personnel.	• Contractor(s)	• Start of construction	•	• Site boundaries demarcated • Signage in place
Noise management	81	All construction operations should only occur during daylight hours if possible. Limit noisy construction activities to normal working hours as per the requirements of the noise control regulations.	• All contractors operating machinery	• Throughout construction	• Random noise measurements	• Results of random noise measurements • Absence of noise complaints
Noise management	82	Maintain all generators, vehicles, and other equipment in good working order to minimise exhaust fumes and excess noise.	• All contractors operating machinery	• Throughout construction	• Random noise measurements	• Results of random noise measurements • Absence of noise complaints
Noise management	83	No construction piling should occur at night where possible. Piling should only occur during the day to take advantage of unstable atmospheric conditions (which lessen the effects of project related noise).	• Contractor(s)	• Throughout construction	• ECO audits	• Absence of noise complaints
Noise management	84	Construction staff should receive “noise sensitivity” training such as switching off vehicles when not in use, location of Noise sensitive areas, etc.	• Contractor(s)	• Start of construction • Throughout construction	• ECO audits	• Training records
Noise management	85	An ambient noise survey should be conducted at the noise sensitive receptors during the construction phase	• Proponent	• Start of construction • Throughout construction	• Noise survey	• Survey report

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Protection of animals	86	Do not harm, catch or kill animals by any means, including poisoning, trapping, shooting or setting of snares.	• Contractor(s)	• Throughout construction	• Visual inspection • Appointment of vegetation specialist • Search and Rescue Report	• Area cleared relative to development footprint • Area disturbed outside of construction site boundary • Number of incidents of animals found in trenches
Protection of animals	87	Safely remove and relocate any fauna that may be physically harmed by construction activities.	• Contractor(s)	• Throughout construction	• Visual inspection • Appointment of vegetation specialist • Search and Rescue Report	• Area cleared relative to development footprint • Area disturbed outside of construction site boundary • Number of incidents of animals found in trenches
Protection of animals	88	Backfill trenches as soon as possible. Inspect open trenches daily for animals which may have fallen or become trapped	• Contractor(s)	• Throughout construction	• Visual inspection • Appointment of vegetation specialist • Search and Rescue Report	• Area cleared relative to development footprint • Area disturbed outside of construction site boundary • Number of incidents of animals found in trenches

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Record keeping	89	Maintain a register of complaints, e.g. for monitoring levels of nuisance experienced by neighbours. Respond to complaints by increasing the frequency and/or intensity management measures, e.g. dust suppression	• Contractor(s)	• Throughout construction	• ECO audits	• Register
Safety and security	90	Ensure that emergency procedures (in relation to fire, spills, contamination of the ground, accidents to employees, use of hazardous substances, etc.) are established prior to commencing construction.	• Contractor(s)	• Throughout construction	• Approval by CR and ECO.	• Compliance with specification.
Safety and security	91	Make all emergency procedures available, including responsible personnel, contact details of emergency services, etc. to all the relevant personnel. Clearly demarcate emergency procedures at the relevant locations around the site.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Compliance with specification.
Safety and security	92	Secure the site camp, particularly to restrict access unauthorised to fuels and any other hazardous substances.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Controlled access
Safety and security	93	Store all construction material and equipment in locked containers within the site camp. Employ 24 hour security for the Site Camp.	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Controlled access
Safety and security	94	Provide suitable emergency and safety signage on site, and demarcate any areas which may pose a safety risk (including hazardous substances, deep excavations etc.).	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Signage .
Safety and security	95	Advise the ECO of any emergencies on site, together with a record of action taken	• Contractor(s)	• Throughout construction	• Monthly ECO Audits	• Incidents register
Site Camp management	96	Provide appropriate sanitation facilities for the duration of the proposed construction activities and remove all waste to an appropriate facility.	• Contractor(s)	• Throughout construction	•	•
Site Camp management	97	Do not leave any food out in the open to avoid attracting animals.	• Contractor(s)	• Throughout construction	•	•
Stockpiles	98	Dust control measures such as wetting and covering of stockpiles to be implemented when necessary	• Contractor(s)	• Throughout construction	• Visual inspection by ECO	• Absence of dust generation

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Stormwater / run-off management	99	Ensure suitable control of run-off during the construction phase to prevent erosion of topsoil on stockpiles and adjacent land and undeveloped portions of the site	• Contractor(s)	• Throughout Construction	• Visual inspection of downstream areas and topsoil stockpiles	• No erosion
Stormwater / run-off management	100	Prevent discharge of any pollutants, such as cements, concrete, lime, chemicals, and other contaminated wastewater and fuels into any water sources and the stormwater system.	• Contractor(s)	• When cleaning existing plant and removing old equipment	• Monitor activity against method statement	• Implementation of preventative actions • Visibility of water pollution
Stormwater / run-off management	101	Collect stormwater from bunded areas in a suitable container and remove from the site for appropriate disposal.	• Contractor(s)	• Throughout construction	• Visual inspection	• Incidents of stormwater contamination
Stormwater / run-off management	102	Direct runoff or pump water from construction sites away from freshwater features, so that it is first captured in detention ponds for settlement. Ensure that flows are dissipated to prevent scour and initially collected in a tank or similar containment that allows coarse sediment to settle.	• Contractor(s)	• Throughout construction	• Visual inspection	• Visible leaks/water wastage • Visible surface erosion
Stormwater / run-off management	103	Incorporate adequate erosion and stormwater management measures during construction to prevent erosion and the associated sedimentation of freshwater features. Management measures may include berms, silt fences, hessian curtains and stormwater diversion away from areas susceptible to erosion. Avoid additional disturbance during the implementation of these measures.	• Contractor(s)	• Throughout construction	• Visual inspection	• Visible leaks/water wastage • Visible surface erosion
Stormwater / run-off management	104	An erosion control plan must be compiled by a suitably experienced specialist, outlining specific recommendations for stabilisation of dunes that are cleared or disturbed during construction. This must be compiled in consultation with a revegetation plan by a suitably experienced specialist in coastal vegetation.	• Contractor(s)	• Throughout construction	• Visual inspection	• Visible leaks/water wastage • Visible surface erosion

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Stormwater management	105	The stormwater management plan for the site should ensure that any impacts of stormwater from the site are mitigated as far as possible within the site (measures such as the use of permeable surfaces, re-use of runoff from built areas such as roofs as well as the use of measures such as swales) to minimise the stormwater impacts on the watercourse	• Contractor(s)	• Throughout construction	• Visual inspection during ECO audits	• Visible impacts on nearby wetland
Stormwater management	106	If necessary, pre-treatment areas such as oil, sediment and litter traps should be included in the stormwater management design	• Contractor(s)	• Throughout construction	• Visual inspection during ECO audits	• Visible impacts on nearby wetland
Topsoil storage	107	Designate and demarcate areas to be used for topsoil stockpiling.	• Contractor(s)	• Before construction commences	• Visual inspection •	• Incidence of erosion; and • Incidences of incorrect storage of topsoil.
Topsoil storage	108	Stockpile topsoil prior to the commencement of construction activities (stockpile no higher than 2 m) and conserve topsoil for landscaping and rehabilitation	• Contractor(s)	• Before construction commences	• Visual inspection •	• Incidence of erosion; and • Incidences of incorrect storage of topsoil.
Topsoil storage	109	Locate topsoil stockpiles in an area protected from the wind and agreed with the ECO.	• Contractor(s)	• Before construction commences	• Visual inspection •	• Incidence of erosion; and • Incidences of incorrect storage of topsoil.
Transportation and refuelling	110	Undertake regular maintenance of vehicles and machinery to identify and repair minor leaks and prevent equipment failures.	• Contractor(s)	• Throughout construction	• Visual inspection	• Maintenance records
Transportation and refuelling	111	Undertake any on-site refuelling and maintenance of vehicles/machinery in designated areas and at least 50 m from the nearby wetland. Line these areas with an impermeable surface and install oil traps.	• Contractor(s)	• Throughout construction	• Monthly ECO audits	• Visual inspection
Transportation and refuelling	112	Use appropriately sized drip trays for all refuelling and/or repairs done on machinery – ensure these are strategically placed to capture any spillage of fuel, oil, etc.	• Contractor(s)	• Throughout construction	• Monthly ECO audits	• Visual inspection

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Vegetation clearing	113	Disturbance to the natural vegetation to be kept to the minimum	• Contractor(s)	• At the commencement of construction	• Visual inspection by ECO	• Absence of dust generation • Intact natural vegetation adjacent, and in close proximity, to the development footprint.
Waste Management	114	Implement effective waste management	• Contractor(s)	• Throughout construction	• Visual inspection by ECO	• Absence of litter in and around the site
Waste Management	115	Waste management plan to address classification of waste streams, segregation at source, control of waste on site before disposal, removal of wastes from site, and record keeping	• Contractor(s) • ECO	• Prior to construction commencing	• Approval of the waste management plan(s) by the ECO	• Approved waste management plan(s)
Waste Management	116	Identify and separate materials that can be reused or recycled to minimise waste, e.g. metals, packaging and plastics, and provide separate marked bins/ skips for these items. These wastes must then be sent for recycling and records kept of recycling;	• Contractor(s)	• Throughout construction	• Visual inspection	• ECO audit reports • Waste disposal records
Waste Management	117	No disposal of wastes, other than at registered landfill sites	• Contractor(s)	• Throughout construction	• Visual inspection	• ECO audit reports • Waste disposal records
Waste Management	118	No waste may be burned	• Contractor(s)	• Throughout construction	• Visual inspection	• ECO audit reports
Waste Management	119	Sufficient portable on-site weather & vermin proof bins with lids need to be provided and appropriately placed and emptied regularly (contents to be disposed of at a licensed landfill site, and proof of disposal retained for auditing purposes)	• Contractor(s)	• Throughout construction	• Visual inspection	• ECO audit reports • Waste disposal records
Waste Management	120	Ensure that construction materials (e.g. bags of cement) are suitably stored and protected to avoid wastage	• Contractor(s)	• Throughout construction	• Visual inspection	• ECO audit reports •

Construction Phase Measures						
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Waste Management	121	Excess excavated material that cannot be used for backfill should not be allowed to accumulate on site and should be disposed of at a formal landfill site or suitable spoil site identified in consultation with the ECO.	• Contractor(s)	• Throughout construction	• Visual inspection	• ECO audit reports • Waste disposal records
Waste Management	122	Vehicles and/ or plant and personnel shall only be permitted within the demarcated construction areas, or on existing roads and/ or access tracks between demarcated areas.	• Contractor(s)	• Throughout construction	• Visual inspection	• No evidence of driving outside demarcated areas (ECO audit reports)
Waste Management	123	No clearing of vegetation, abstraction, storage, disposal or mixing of any substance (e.g. water, cement, petroleum etc.) may take place outside the demarcated construction area without prior approval of the ECO	• Contractor(s)	• Throughout construction	• Visual inspection	• No evidence of disturbance demarcated areas (ECO audit reports)
Waste Management	124	Limit all activities to within the construction footprint area, which must be demarcated prior to commencement of clearing;	• Contractor(s)	• Throughout construction	• Visual inspection	• No evidence of disturbance demarcated areas (ECO audit reports)
Waste Management	125	No hunting, poaching or otherwise harming of wildlife on and around the site	• Contractor(s)	• Throughout construction	• ECO audits	• Reported incidents, complaints, or other evidence
Waste Management	126	Environmental awareness programme to include protection of all fauna on site.	• Contractor(s)	• Throughout construction	• ECO audits	• Training records
Waste Management	127	Appropriate scavenger-proof solid waste management facilities with lids must be provided on-site during construction and must be regularly emptied	• Contractor(s)	• Throughout construction	• Visual inspection during ECO audits	• Absence of windblown litter
Waste management	128	Aim to minimise waste through reducing and re-using (packaging) material.	• Contractor(s)	• Throughout construction	• Visual inspection of waste collection and disposal areas • Visual inspection of construction areas (litter) • Check waste disposal slips	• Availability of rubbish bins and skips for different recyclable wastes

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Waste management	129	Collect recyclables separately and deliver these to suitable facilities or arrange for collection.	• Contractor(s)	• Throughout construction	• Visual inspection of waste collection and disposal areas	• Presence of litter • Availability of rubbish bins and skips
Waste management	130	Collect all waste in bins and/or skips at the construction site.	• Contractor(s)	• Throughout construction	• Visual inspection of waste collection and disposal areas	• Presence of litter • Availability of rubbish bins and skips
Waste management	131	Do not stockpile construction material or waste within 30 m of the nearby wetland or where it is likely to wash or blow into the wetland.	• Contractor(s)	• Throughout construction	• Visual inspection of waste collection and disposal areas	• Correct location of stockpiles
Waste management	132	Prevent littering by construction staff at work sites by providing bins or waste bags in sufficient locations.	• Contractor(s)	• Throughout construction	• Visual inspection of construction areas (litter)	• Absence of litter
Waste management	133	Dispose of waste appropriately and obtain certificates.	• Contractor(s)	• Throughout construction	• Check waste disposal slips	• Waste disposal certificates
Waste management	134	Do not allow any burning or burying of waste on site.	• Contractor(s)	• Throughout construction	• Visual inspection of waste collection and disposal areas	• Availability of rubbish bins and skips • Waste storage capacity •
Water Management	135	No polluted water from washing of mechanical plant or equipment to be discharged to the ground. This must be collected in a tank for evaporation and disposal	• Contractor(s)	• Throughout construction	• ECO audits	• Incident records • Waste disposal records
Site rehabilitation	136	Ensure that slopes are immediately stabilised to prevent erosion, using geofabric or other appropriate erosion stabilisation techniques.	• Contractor(s)	• Throughout construction	• Post Construction ECO audit	• Construction sites fully rehabilitated within two years

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Site rehabilitation	137	Remove all construction equipment, vehicles, equipment, waste and surplus materials, including site offices, temporary fencing and other facilities, from the site.	• Contractor(s)	• Throughout construction	• Post Construction ECO audit	• Construction sites fully rehabilitated within two years
Site rehabilitation	138	Clean up and remove any spills and contaminated soil in the appropriate manner.	• Contractor(s)	• Throughout construction	• Post Construction ECO audit	• Construction sites fully rehabilitated within two years
Site rehabilitation	139	Ensure that no discarded materials are buried on site or on any other land not designated for this purpose.	• Contractor(s)	• Throughout construction	• Monthly ECO audits	• Construction sites fully rehabilitated within two years
Site rehabilitation	140	Ensure that affected areas are rehabilitated following construction.	• Contractor(s)	• Throughout construction	• Post Construction ECO audit	• Construction sites fully rehabilitated within two years
Site rehabilitation	141	Rehabilitate areas adjacent to the site (if disturbance is unavoidable) to at least the same condition as was present prior to construction.	• Contractor(s)	• Throughout construction	• Post Construction ECO audit	• Construction sites fully rehabilitated within two years
Site rehabilitation	142	Use harvested topsoil for rehabilitation and landscaping following construction.	• Contractor(s)	• Throughout construction	• Post Construction ECO audit	• Construction sites fully rehabilitated within two years
Site rehabilitation	143	Rehabilitate project areas with locally indigenous species, including those removed from the site prior to construction.	• Contractor(s)	• Throughout construction	• Post Construction ECO audit	• Construction sites fully rehabilitated within two years
Site rehabilitation	144	Rehabilitate any disturbed areas as soon as construction in the area is complete.	• Contractor(s)	• Throughout construction	• Monthly ECO audits	• Construction sites fully rehabilitated within two years
Site rehabilitation	145	An alien invasive vegetation monitoring and control programme must be implemented throughout the construction and defects notification period, to clear alien invasive vegetation from all areas affected by construction activities and prevent its regrowth	• Contractor(s)	• Throughout construction	• Monthly ECO audits	• Construction sites fully rehabilitated within two years

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Site rehabilitation	146	Appoint a specialist contractor to remove alien and weed species in areas disturbed as a result of construction activities to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998).	• The Proponent	• After Construction	• Annual compliance audits	• Ongoing absence of alien vegetation
Site rehabilitation	147	Dispose of alien vegetation at the municipal waste dump (and do not dump this waste on or off site).	• The Contractor(s)	• Throughout construction	• Post Construction ECO audit	• Waste disposal slips
Monitoring	148	Appoint a qualified person to monitor rehabilitation success.	• The Proponent	• Once rehabilitation has been completed in the first section	• Contract documentation	• Appointment
Monitoring	149	Monitor rehabilitation success every three months in the first year, and every six months thereafter until acceptable species densities and cover are achieved. Monitor by means of 3 m x 3 m fixed plots in which species presence and cover is assessed, as well as fixed point photography.	• Contractor(s)	• Once rehabilitation has been completed in the first section	• Updates after each monitoring	• Regular monitoring • Rehabilitation success
Damara Terns	150	CDC to establish a Damara Tern Management Program within the CDC OSMP mechanisms, which incorporates: • specialist monitoring of the Damara tern population to determine the extent of their habitat, by an expert with previous experience monitoring this species, • An annual report on the status of the SEZ Damara tern population, and approval of the annual report / management plan by the EMC. • Continued monitoring of the Damara Tern population must be implemented	• CDC	• Prior to Construction	• Annual compliance Audit	• Presence of plan
Damara Terns	151	Maintain a No-Go buffer area to ensure no access or activities within 200 m of Damara Tern habitat as indicated on the environmental sensitivity map (Figure 1-3).	• Contractor	• Throughout construction	• ECO Audits	• Visual inspection

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
Damara Terns	152	No-Go buffer areas around the tern breeding area must be demarcated and pedestrian and other access must be prevented both during operation, particularly during the Damara Tern breeding season (early October to late February)	• Contractor	• Throughout construction	• ECO Audits	• Visual inspection
Damara Tern	153	Environmental awareness / toolbox talks to include awareness of the Damara tern population	• Contractor	• Throughout construction	• ECO Audits	• Training records
Damara Tern	154	Measures must be taken to minimise noise from machinery etc.	• Contractor	• Throughout construction	• ECO Audits	• Monitoring records
Damara Tern	155	Drivers of vehicles authorised to drive on the beach must be made aware of the presence of Damara Terns during the breeding season (October to March) and must keep below the high-water mark	• Contractor	• Throughout construction	• ECO Audits	• Training records
Damara Tern	156	Management actions such as litter picking must be carefully planned to minimise disturbance to breeding pairs.	• Contractor	• Throughout construction	• ECO Audits	• Visual inspection
LNG Terminal	157	All dredging activities and associated environmental monitoring must be conducted in accordance with the conditions stipulated under the port expansion authorisation.	• Contractor(s)	• Plan prior to dredging	• ECO Audits	• Monitoring records
LNG Terminal	158	Consider the use of silt curtains to manage suspended sediment plumes generated during construction of the LNG Terminal.	• Proponent • Contractor(s)	• Throughout construction	• ECO Audits	• Monitoring records
LNG Terminal	159	Restrict construction noise and vibration-generating activities to the absolute minimum required	• Contractor(s)	• Throughout construction	• ECO Audits	• Monitoring records
LNG Terminal	160	Have good house-keeping practices in place during construction	• Contractor(s)	• Throughout construction	• ECO Audits	• Visual inspection
LNG Terminal	161	Ensure that all pile driving is undertaken in accordance with international protocols (e.g. JNCC 2010; DPTI 2012)	• Contractor(s)	• Throughout construction	• ECO Audits	• Monitoring records • Visual inspection
LNG Terminal	162	Consider the use of a bubble curtain. As the noise from pile driving is transmitted through the sediment into the water, bubble screens do not eliminate all behavioural responses to the piling noise but reported noise reductions range from 3 to 20 dB	• Contractor(s)	• Throughout construction	• ECO Audits	• Construction records

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[2]**	**Performance Indicators**
LNG Terminal	163	Demonstrate that the BATNEEC (Best Available Technique Not Entailing Excessive Cost) approach has been applied to proposed pile driving operations	• Contractor(s)	• Throughout construction	• ECO Audits	• Construction records / method statements
LNG Terminal	164	Avoid pile driving in the early morning and evening when penguins and gannets are leaving for offshore feeding areas, or returning to their nesting sites	• Contractor(s)	• Throughout construction	• ECO Audits	• Construction records
LNG Terminal	165	Consider the use of Acoustic Deterrent Devices in conjunction with visual and/or acoustic monitoring to exclude animals from the piling area	• Contractor(s)	• Throughout construction	• ECO Audits	• Construction records / method statements
LNG Terminal	166	To improve the confidence rating in the assessment of significance, consider engaging an acoustic consultant to undertake a site specific underwater noise assessment before the start of construction of the dolphin berths. At a minimum this should address: • Determine the existing ambient noise environment based on measurements. • Establish the likely hearing sensitivity and bandwidth for the considered sensitive marine mammal species and determine noise exposure criteria for behavioural and physiological impacts. • Determine the expected source levels for the piling/construction activity, and predict received levels versus distance from the piling activity using a suitable noise propagation modelling method • Estimate the size of the zone of audibility, responsiveness, and hearing injury based on the above information, and determine suitable sizes for the safety zones	• Contractor(s)	• Prior to construction commencing • Throughout construction	• ECO Audits	• Construction records / method statements

5 Measures Applicable to the Operational Phase

5.1 Roles and Responsibilities

The key role players during the operation phase of the project are:

- The Proponent, i.e. The holder of the Environmental Authorisation (the CDC or any developer it cedes the EA to).

5.1.1 The Proponent

The Proponent has overall responsibility for the operation of the power plant. In terms of environmental management, the proponent must:

- Ensure that all personnel (employees and employees of contractors) are aware of, and contractually bound to, the provisions of this EMPr by including the relevant environmental management requirements into key performance areas and/or contracts.
- Notify the authorities should problems not be remedied timeously

5.1.2 Personnel, including employees and contractors

Personnel employed by the Proponent, either directly or contractors must:

- Comply with the applicable environmental commitments, procedures, restrictions, and guidance specified in the EMPr;
- Co-operate fully in implementing applicable environmental procedures;
- Ensure that copies of the EMPr are available at its offices and on site;
- Ensure that all its personnel on site, (including any sub-contractors and their staff) are familiar with and understand the requirements of the EMPr, that are relevant to their activities; and
- Ensure that any problems and non-conformances are remedied in a timely manner, to the satisfaction of the Proponent.

Personnel employed directly by the Proponent, Contractors, and their sub-contractors, have a duty to demonstrate respect and care for the environment and may be held liable in their individual capacity for not complying with commitments, procedures, restrictions, and guidance specified in the EMPr.

5.2 Environmental Management Measures

The environmental management and mitigation measures that must be implemented during the operational phase, as well as responsibilities and timelines for the implementation of these measures, and monitoring thereof, are laid out in Table 5-1.

Table 5-1: Environmental management and mitigation measures that must be implemented during the Operational Phase

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[1]**	**Performance Indicators**
Visual	1	Effective waste management	• The Proponent	• Throughout the operational life	• Visual inspection by CDC ECO	• Absence of litter, and/or accumulated waste
	2	Maintain gas infrastructure and services				• Visually well maintained structures and grounds
Climate Change	3	The procurement policy for LNG must specify or encourage less emission-intensive extraction methods of natural gas, to minimise the upstream extraction emissions and potential fugitive emissions associated with the use of LNG. It is suggested that an emission factor of 0.0253 tCO_2e/GJ is applied to LNG being procured	• The Proponent	• Throughout the operational life	• Annual compliance audit	• Carbon footprint calculations
Climate Change	4	Source LNG from nearby suppliers such as northern Mozambique, to reduce upstream transport emissions	• The Proponent	• Throughout the operational life	• Annual compliance audit	• Carbon footprint calculations
Climate Change	5	Source LNG from responsible suppliers, reducing emissions associated with extraction and upstream processing of the LNG	• The Proponent	• Throughout the operational life	• Annual compliance audit	• Carbon footprint calculations
Climate Change	6	Use good quality equipment to reduce the amount of natural gas that escapes as fugitive emissions and reducing the need for flaring	• The Proponent	• Throughout the operational life	• Annual compliance audit	• Carbon footprint calculations
Waste Management	7	Separate materials that can be reused or recycled to minimise waste e.g. metals, packaging and plastics, and provide separate marked bins/ skips for these items. These wastes must then be sent for recycling and records kept of recycling	• The Proponent	• Throughout the operational life	• Visual inspection by CDC ECO	• Absence of litter, • Waste disposal records
	8	No dumping within the surrounding area shall be permitted, and no waste may be buried or burned on site	• The Proponent	• Throughout the operational life	• Visual inspection by CDC ECO	• Absence of accumulated waste

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[1]**	**Performance Indicators**
						• Waste disposal records
	9	Sufficient portable on-site weather & vermin proof bins with lids need to be provided and appropriately placed and emptied regularly (contents to be disposed of at a licensed landfill site, and proof of disposal retained for auditing purposes);	• The Proponent	• Throughout the operational life	• Visual inspection by CDC ECO	• Absence of litter, • Waste disposal records
	10	Cleared alien vegetation should be disposed of so that it does not re-establish on site	• The Proponent	• Throughout the operational life	• Visual inspection by CDC ECO	• Absence of alien vegetation, • Waste disposal records
	11	Regular (weekly) waste collection service to be provided	• The Proponent	• Throughout the operational life	• Visual inspection by CDC ECO	• Waste disposal records (weekly)
	12	All staff shall be trained on correct waste management	• The Proponent	• Throughout the operational life	• Internal auditing	• Training records (weekly)
Pollution of Soil and Stormwater	13	Implementation of a site specific stormwater management plan, in accordance with the CDC's overarching stormwater management strategy for the SEZ, to ensure stormwater exiting the site meets the requirements in terms of quality and volume	• The Proponent	• Prior to construction and throughout the operational life	• Building plan approval	• Approved building plans • Compliance audits
	14	Harvesting of rainwater and stormwater where possible for use on site	• The Proponent	• Throughout the operational life	• Annual compliance auditing	• Water harvesting records and infrastructure
	15	Separation of clean and dirty stormwater on site and treatment of dirty stormwater prior to discharge	• The Proponent	• Throughout the operational life	• Annual compliance auditing	• Water monitoring records and infrastructure
	16	Ensure all storage and handling of hazardous liquids takes place over an impermeable surface to capture any leaks or spills for disposal or further treatment	• The Proponent	• Throughout the operational life	• Annual compliance auditing	• Visual inspection of infrastructure
	17	Include bunding to at least 110% of storage capacity around all fuel and chemical storage vessels where appropriate to do so, to capture any spills / leaks	• The Proponent	• Throughout the operational life	• Annual compliance auditing	• Building plans

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[1]**	**Performance Indicators**
Edge effects of operation	18	Monitor the surrounding area for signs of dumping of waste, harvesting of indigenous vegetation, destruction of natural forest, and invasion of additional informal residences, and take action to prevent these activities	• The Proponent	• Throughout the operational life	• Annual compliance audit	• No encroachment or unplanned loss of natural vegetation
Increased Traffic	19	Ensure that vehicle loads are within legislated limits, i.e. Gross vehicle mass of 56 000kg	• The Proponent	• Throughout the operational life	• Visual inspection for obvious signs of overloading	• Inspection records
	20	Ensure that vehicles are registered to transport hazardous goods and comply with SANS 1518 or other prescribed specifications	• The Proponent	• Throughout the operational life	• Annual compliance audit	• Compliance audits report
Noise management	21	An ambient noise survey should be conducted at the noise sensitive receptors to ensure that the impact is within the legal limit	• Proponent	• Throughout the operational life	• Noise survey	• Survey report
	22	An avifauna specialist should be consulted to determine the effects that an increase in noise levels will have on the Damara Tern Colony	• Proponent	• During operation	• Annual compliance audit	• Specialist report
LNG Truck carrier & LNGC	23	Undertake an entrainment study to more accurately determine the potential impacts of impingement and entrainment on communities within the Port of Ngqura.	• Vessel operators	• During operation	• Compliance audit	• Availability of study results.
FSU	24	Optimise operating modes in the open-loop system as far as possible to reduce impacts, or use closed-loop systems whenever practicable	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Maintenance records
FSU	25	Use multi-port discharges and adjust discharge rate to facilitate enhanced mixing with the receiving water body	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Maintenance records
FSU	26	Ports should discharge horizontally or within -45° of horizontal to maximise dilution and avoid erosion of the sediments where the jet hits the seabed.	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Maintenance records
FSU	27	Discharge cooling water to surface waters in a manner that will allow maximum mixing and dilution of the thermal plume to ensure that the temperature is within 3°C of ambient temperature at the edge of the mixing zone or within 100 m of the discharge point	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Monitoring records

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[1]**	**Performance Indicators**
FSU	28	Implement the principle of mechanical cleaning of the entire system as part of regular annual maintenance of the FSU in preference to the use of a biocide	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Maintenance records
FSU	29	Reduce lighting in non-essential areas	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Visual inspection
FSU	30	Use of guards to direct lights to areas requiring lighting	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Visual inspection
FSU	31	Avoid direct light in water, except during safety inspection	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Visual inspection
FSU	32	Low light mounting where possible	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Visual inspection
FSU	33	Use of long wavelength lights that are less intense for nocturnal animals	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Visual inspection
FSU	34	Compile a lighting plan that identifies specific measures that could be implemented to minimise or avoid impacts associated with operational night time lighting on avian species, fish species, and marine mammals	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Visual inspection
FSU	35	Implement a waste management system that addresses all wastes generated at the various sites, shore-based and marine. This should include: • Separation of wastes at source; • Recycling and re-use of wastes where possible; • Treatment of wastes at source (maceration of food wastes, compaction, incineration, treatment of sewage and oily water separation).	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Visual inspection
FSU	36	Implement leak detection and repair programmes for valves, flanges, fittings, seals, etc.	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Maintenance records
FSU	37	Use a low-toxicity biodegradable detergent for the cleaning of all deck spillages.	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Maintenance records

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[1]**	**Performance Indicators**
FSU	38	Maintain an emergency response plan covering recommended measures to prevent and respond to LNG spills.	• FSU operator	• Throughout the operational life	• Annual compliance audit	• Presence of plan
LNG Truck carrier & LNGC	39	Ensure that vessel speed is kept below 10 knots when underway in Algoa Bay.	• LNG Truck carrier & LNGC operators	• Throughout the operational life	• Annual compliance audit	• Visual inspection
LNG Truck carrier & LNGC	40	The vessel operators should keep a constant watch for slow-swimming large pelagic fish, marine mammals, and turtles in the path of the vessel.	• LNG Truck carrier & LNGC operators	• Throughout the operational life	• Annual compliance audit	• Visual inspection
FSU, LNG Truck carrier & LNGC	41	Ensure that all project-associated vessels have an oil spill contingency plan in place.	• Vessel operators	• Throughout the operational life	• Annual compliance audit	• Visual inspection
FSU, LNG Truck carrier & LNGC	42	As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill.	• Vessel operators	• Throughout the operational life	• Annual compliance audit	• Incident reports
FSU, LNG Truck carrier & LNGC	43	Ensure adequate resources are provided to collect and transport oiled birds to a cleaning station.	• Vessel operators	• Throughout the operational life	• Annual compliance audit	• Visual inspection • Incident reports
FSU, LNG Truck carrier & LNGC	44	Refuelling is to take place only under controlled conditions within the port.	• Vessel operators	• Throughout the operational life	• Annual compliance audit	• Visual inspection
LNG Supply	45	The LNGCs must have a Ballast Water Management Plan in place	• LNGC Operator	• Throughout the operational life	• Annual compliance audit	• Presence of plan
LNG Supply	46	Ballast water exchange must be done at least 200 nautical miles from the nearest land in waters of at least 200 m deep; the absolute minimum being 50 nautical miles from the nearest land	• LNGC Operator	• Throughout the operational life	• Annual compliance audit	• Operational records
LNG Supply	47	Ensure that routine cleaning of ballast tanks to remove sediments is carried out, where practicable, in mid-ocean or under controlled arrangements in port or dry dock, in accordance with the provisions of the ship's Ballast Water Management Plan	• LNGC Operator	• Throughout the operational life	• Annual compliance audit	• Maintenance records
LNG Supply	48	Use filtration procedures during loading of ballast in order to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms.	• LNGC Operator	• Throughout the operational life	• Annual compliance audit	• Maintenance records

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[1]**	**Performance Indicators**
LNG Supply	49	Ensure that hulls are regularly cleaned in controlled environments at ports certified to undertake such operations	• LNGC Operator	• Throughout the operational life	• Annual compliance audit	• Maintenance records
Employment	50	Recruit local labour as far as feasible to increase the benefits to the local households	• Proponent	• Throughout the operational life	• Annual compliance audit	• Employment records
	51	Sub-contract to local maintenance companies where possible	• Proponent	• Throughout the operational life	• Annual compliance audit	• Employment records
	52	Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering and other services to the maintenance crews	• Proponent	• Throughout the operational life	• Annual compliance audit	• Employment records
Traffic Management	53	Suitable warning traffic signage be provided to ensure safe operation along Ring Road	• NMBM	• Throughout the operational life	• Visual inspection	• Visual inspection
	54	Ongoing enforcement along access roads	• NMBM	• Throughout the operational life	• Visual inspection	• Traffic statistics

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Appendices

Appendix A: CV's of Key Professionals

Appendix B: Layout drawings