Gorgon Gas Development and Jansz Feed Gas Pipeline

Onshore Feed Gas Pipeline Installation Environmental Management Plan: Summary

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Terminology, Definitions and Abbreviations

Terms, definitions and abbreviations used in this document are listed below. These align with the terms, definitions and abbreviations defined in Schedule 2 of the Western Australian Gorgon Gas Development and Jansz Feed Gas Pipeline Ministerial Implementation Statements No. 800 and No. 769 respectively (Statement No. 800 and 769) and the Commonwealth Gorgon Gas Development and Jansz Feed Gas Pipeline Ministerial Approvals (EPBC Reference: 2003/1294, 2008/4178 and 2005/2184).

ABU	Australasia Business Unit
AS/NZS	Australian Standard/New Zealand Standard
At Risk	Being at risk of Material Environmental Harm or Serious Environmental Harm and/or, for the purposes of the EPBC Act relevant listed threatened species, threatened ecological communities and listed migratory species, at risk of Material Environmental Harm or Serious Environmental Harm.
Avifauna	Birds of a particular region.
Biocide	Any substance that can destroy living organisms.
Bund	An area of containment, such as a dam, wall, or other artificial embankment.
Construction	Construction includes any Proposal-related (or action-related) construction and commissioning activities within the Terrestrial and Marine Disturbance Footprints, excluding investigatory works such as, but not limited to, geotechnical, geophysical, biological and cultural heritage surveys, baseline monitoring surveys and technology trials.
Construction Contractor	Independent company appointed by Chevron Australia to undertake the work, The execution of the construction work, undertaken by the Construction Contractor, is managed by the EPCM Contractor on behalf of Chevron Australia.
Cth	Commonwealth of Australia
DER	Western Australian Department of Environmental Regulation
DMP	Western Australian Department of Mines and Petroleum (formerly Western Australian Department of Industry and Resources [DoIR])
DotE	Commonwealth Department of the Environment
DPaW	Western Australian Department of Parks and Wildlife
DRF	Declared Rare Flora has the meaning given by the *Wildlife Conservation Act 1950* (WA).

EIS/ERMP	Environmental Impact Statement/Environmental Review and Management Programme (for the Proposed Gorgon Development dated September 2005) as amended or supplemented from time to time.
EMP	Environmental Management Plan
Environmental Harm	Has the meaning given by Part 3A of the *Environmental Protection Act 1986* (WA).
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPCM	Engineering, Procurement and Construction Management
Feed Gas Pipeline	Pipeline from the wells to the Gas Treatment Plant.
Gorgon Gas Development	The Gorgon Gas Development as approved under in Statement No. 800 and EPBC Reference: 2003/1294 and 2008/4178 as amended or replaced from time to time.
Gorgon Gas Development Footprint	Consists of the cleared areas and uncleared areas approved to be cleared on Barrow Island used for the construction and operation of the Gorgon Gas Development and Jansz Feed Gas Pipeline.
Greenhouse Gases	Components of the atmosphere that contribute to the greenhouse effect. These include carbon dioxide (CO_2), methane (CH_4) sulfur hexafluoride (SF_6) and nitrous oxide (N_2O).
Hazardous Materials	Any substance (liquid or solid) that has the potential to cause harm to the environment or living organisms. Examples include concentrated reverse osmosis (RO) brine, cement dust, paint, fuels and solvents.
HDD	Horizontal Directional Drilling
Herpetofauna	Amphibians and reptiles
Hot Work	Any activity in a restricted/designated area, which either uses or could generate a fire through a naked flame, heat or sparks.
Hydrocarbons	A large class of organic compounds composed of hydrogen and carbon. Crude oil, natural gas, and natural gas condensate are all mixtures of various hydrocarbons.
Hydrotest	Method whereby liquid is pressurised within pipes and vessels to detect leaks.
Introduced Flora	Flora species that have been introduced to Barrow Island, including plants classified as Environmental Weeds by the Department of Parks and Wildlife (DPaW) under the Environmental Weed Strategy for Western Australia.
Introduced Species	A non-indigenous species in the Barrow Island terrestrial or marine environment.

Invertebrate Fauna	Animals that do not have a backbone (vertebrae). Examples include, but are not limited to, spiders, scorpions, land snails, millipedes and some subterranean fauna.
Jansz Feed Gas Pipeline	The Jansz Feed Gas Pipeline as approved in Statement No. 769 and EPBC Reference: 2005/2184 as amended or replaced from time to time.
JHA	Job Hazard Analysis
Karst	An area of irregular limestone in which erosion has produced fissures, sinkholes, underground streams, and caverns.
km	Kilometre
KP	Kilometre point
L	Litre
LNG	Liquefied Natural Gas
LTMTMP	Long-term Marine Turtle Management Plan
m	Metre
m/s	Metres per second
m^3	Cubic metre
Marine Turtles	Refers to Flatback, Green, Loggerhead and Hawksbill Turtles.
Material Environmental Harm	Environmental Harm that is neither trivial nor negligible.
MEG	Monoethylene Glycol
mg/L	Milligrams per litre
Migratory Species	Species listed as migratory under section 209 of the EPBC Act (Cth).
mm	Millimetre
MTPA	Million Tonnes Per Annum
NDT	Non-destructive Testing
NIS	Non-indigenous Species
ODS	Ozone Depleting Substance
OHS	Occupational Health and Safety
Personnel	Employees, contractors or third parties conducting works on Barrow Island

pH	Measure of acidity or basicity of a solution
Pig	Pipeline inspection gauge; a tool that is sent down a pipeline and propelled by the pressure of the product in the pipeline.
Potable water	Drinking water
ppm	Parts per million
Practicable	For the purposes of this Plan and for Statement No. 800 and 769 means reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge.
QMS	Quarantine Management System
Rehabilitation	The ongoing management and monitoring of the site after reinstatement works are completed and handover of the site has been accepted by Chevron Australia.
Reinstatement	Clean up and reconstruction of a site or area to mimic pre-existing landform. Reinstatement also includes ground preparation (ripping, scarifying etc.) prior to the spread of topsoil and vegetative material.
ROW	Right of Way - the strip of land or area along the pipeline alignment that encompasses the pipelines, trenches, access tracks, stockpiles and associated features and in which the pipeline construction activities will be completed.
Serious Environmental Harm	Environmental harm that is: a) irreversible, of a high impact or on a wide scale; or b) significant or in an area of high conservation value or special significance and is neither trivial nor negligible.
Significant Impact	An impact on a Matter of National Environmental Significance or their habitat, relevant to EPBC Act Reference: 2003/1294, Reference: 2005/2185 and 2008/4178 that is important, notable or of consequence having regard to its context or intensity.
Splice Pit	Concrete structure where the terminating offshore umbilical is joined to the separated onshore cables and tubes.
spp.	Species (plural)
Stringing	The process whereby multiple sections of pipe are joined together to form the pipeline
Stygofauna	Groundwater-dwelling aquatic fauna.
TDF	Terrestrial Disturbance Footprint; The area to be disturbed by construction or operations activities associated with the Terrestrial Facilities
TEC	Threatened Ecological Community

Threatened Species	Species listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent under section 178 of the EPBC Act (Cth).
Topsoil	The top layer of soil that stores seed and acts as the growth medium in which vegetation can establish itself.
Umbilicals	Connections between topside equipment and subsea equipment.
Vegetation Association	Comprises unique flora assemblages, or unique vegetation communities, that help to identify the association.
WA	Western Australia
Waste Water	Sewage and other contaminated liquid waste streams. Examples include, but are not limited to, washdown water, oily water, greywater and chemically contaminated water.
Water Winning	Harvesting water to carry out works. Often this consists of a pump spread located under water (i.e. ocean or lake) returning water to the work site.
Windrow	A long, narrow row of vegetation, debris, and some soil created during site preparation and clearing operations.

1.0 Introduction

This document summarises the Environment Plan for the Gorgon Gas Development and Jansz Feed Gas Pipeline Onshore Feed Gas Pipeline Installation, which was accepted by the Western Australian Department of Mines and Petroleum on 27 November 2012.

Chevron Australia proposes to develop the gas reserves of the Greater Gorgon Area. Subsea gathering systems and subsea pipelines will be installed to deliver feed gas from the Gorgon and Jansz–Io gas fields to the west coast of Barrow Island. From there, the feed gas pipeline system traverses across Barrow Island to a 15 million tonnes per annum (MTPA) Gas Treatment Plant located on the east coast. The Gas Treatment Plant will produce liquefied natural gas (LNG), condensate, and domestic gas. Gas for domestic use will be exported by a pipeline from the east coast of Barrow Island to the domestic gas collection and distribution network on the Western Australian mainland.

1.1 Operator

The Operator for the project is Chevron Australia Pty Ltd, on behalf of the Gorgon Joint Venturers, which comprise:

- Chevron Australia Pty Ltd
- Chevron (TAPL) Pty Ltd
- Shell Development (Australia) Pty Ltd
- Mobil Australia Resources Company Pty Ltd
- Osaka Gas Gorgon Pty Ltd
- Tokyo Gas Gorgon Pty Ltd
- Chubu Electric Power Gorgon Pty Ltd.

1.2 Location

The Gorgon gas field is located approximately 130 km and the Jansz–Io field approximately 200 km off the north-west coast of Western Australia (Figure 1-1). Barrow Island is located off the Pilbara coast 85 km north-north-east of the town of Onslow and 140 km west of Karratha.

The onshore feed gas pipeline, cables and tubes (Figure 1-1) extends from the HDD (Horizontal Directional Drilled) shore crossing on the west coast of Barrow Island at North White's Beach, traversing the island a distance of approximately 12.5 km through to the inlet area of the LNG Plant on the east coast. The co-ordinates for the Onshore Feed Gas Pipeline are provided in Table 1-1.

Table 1-1 Coordinates for the Onshore Feed Gas Pipeline

Pipeline		Easting	Northing
Gorgon	HDD (KP 0)	335 054.910 mE	7 711 237.539 mN
	Inlet Area of LNG Plant - Pig Trap Closure (KP12.3)	337 954.773 mE	7 700 445.625 mN
Jansz	HDD (KP 0)	335 068.249 mE	7 711 265.523 mN
	Inlet Area of LNG Plant - Pig Trap Closure (KP 12.5)	337 987.773 mE	7 700 445.601 mN

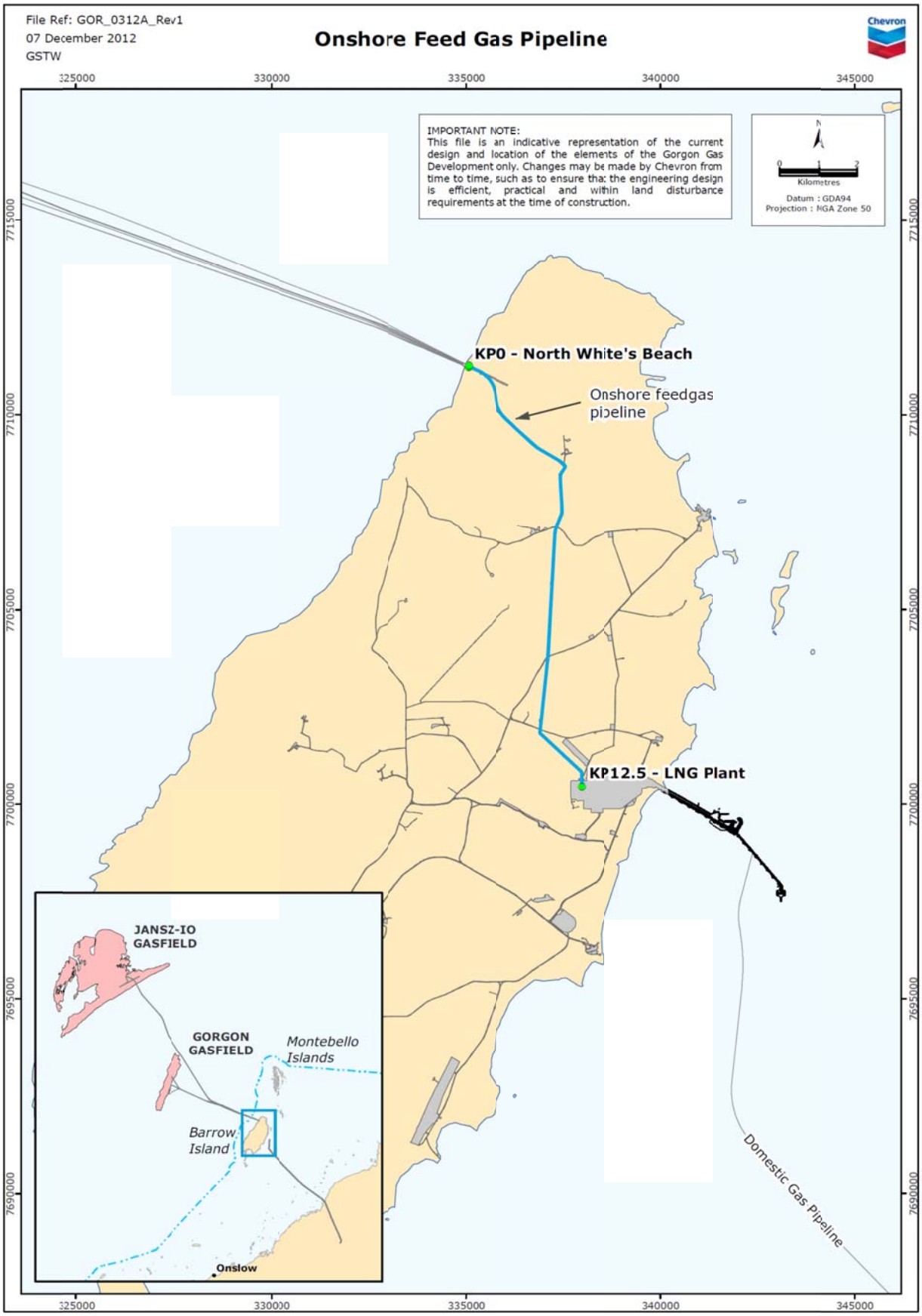

Figure 1-1 Location of Project Area and Onshore Feed Gas Pipeline

2.0 Description of the Environment

2.1.1 Physical Environment

Barrow Island has relatively low elevation (up to 30 m above sea level) and is characterised by gentle undulations, eroded ridges, valley floor flood plains and some incised creek channels. The geology of Barrow Island generally consists of calcarenite and limestone overlain by alluvium, colluvium and aeolian sand.

The west coast of Barrow Island is exposed to direct wind and wave action from the Indian Ocean. The coastline topography varies from rocky, weathered, sheer cliffs to less steep, traversable inclines. Typically, narrow sandy beaches occur between weathered rocky headlands. The western half of Barrow Island is characterised by steep formed valleys, escarpments and exposed limestone ridges.

Limestone ridges occur throughout the central upland plateaus of the Island. The terrain ranges from steeper slopes in the west, to flatter, more gentle undulations as the ridges continue east. The broad valleys and flats around the limestone ridges form the seasonal drainage lines.

The location of the shore crossing, North Whites Beach, comprises coastal sands overlying shoreline limestone platforms. An outcrop of limestone forms an extensive rock platform between the water and the sand, and runs parallel to the sandy beach. The primary dunes are steep and comprise coastal sand.

2.2 Biological Environment

2.2.1 Flora and Vegetation

More than 400 vascular plant taxa have been recorded on Barrow Island (Chevron Australia 2008). The Poaceae (grass) family has the most representation with 57 species recorded to date, followed by 31 species each for the Asteraceae (daisy) and Papilionaceae (pea) families. The Malvaceae (mallow) family is represented by 30 species and the Chenopodiaceae (chenopod) family is represented by 24 species.

No Declared Rare Flora (DRF), pursuant to the *Wildlife Conservation Act 1950* (WA), or Threatened Flora species, pursuant to the EPBC Act, have been recorded on Barrow Island.

No plant communities listed under the EPBC Act have been recorded or are known to occur on Barrow Island. No Threatened Ecological Community (TEC) as listed by DPAW's Threatened Ecological Database has been recorded or is known to occur on Barrow Island.

There is one Priority 3 flora species (PF3) *Corchorus congener,* which may occur along the onshore pipeline route; however, this species is relatively abundant and widespread in a variety of habitats on Barrow Island (Astron Environmental Services 2009).

2.2.2 Subterranean Fauna

The Gorgon Gas Development Footprint overlies only a very small portion of the subterranean fauna habitat on Barrow Island. The geology of Barrow Island is conducive to supporting highly rich subterranean fauna with widespread distributions. Preliminary geological reviews suggest that strata on the Island (e.g. interbedded sand/limestone) are relatively. Although surveys to date have largely focused on the LNG Plant site, it is expected that subterranean fauna along the pipeline ROW would not be significantly different to what has been found elsewhere on the Island.

2.2.3 Terrestrial Fauna

2.2.3.1 Avifauna

The land birds of the Pilbara region include transient species that move throughout the region, and resident or regular species that are more frequent to particular sites. Fifty-one species of

terrestrial avifauna have been recorded on Barrow Island; however, only 16 of these species are residents or regular migrants to the Island. The most common of these are the Spinifex-bird *Eremiornis carteri*, White-winged Fairy-wren (Barrow Island) *Malurus leucopterus edouardi*, Singing Honeyeater *Lichenostomus virescens*, White-breasted Wood Swallow *Artamus leucorhynchus* and the Welcome Swallow *Hirundo neoxena*.

The White-winged Fairy-wren is restricted to Barrow Island and is listed under Schedule 1 of the *Wildlife Conservation Act 1950* (WA) and as Vulnerable under the EPBC Act (Cth). The species is abundant in most habitats on Barrow Island, especially those with complex vegetation structure.

The areas of open *Erythrina* shrubland and the claypan to the east of the HDD site are restricted habitats, and appear to be seasonally important for the Island's population of Singing Honeyeaters.

Surveys for littoral birds have been conducted for the entire coastline of Barrow Island. Littoral birds are widely distributed around Barrow Island, in particular mudflats and rocky intertidal pavements. The highest abundances of littoral avifauna on Barrow Island are associated with the extensive tidal mudflats in the south and south-east of the Island. North Whites Beach is not considered a significant shore bird site.

2.2.3.2 Mammals

Barrow Island supports 13 species of resident terrestrial mammals, with a further two species of bat recorded as vagrants to the Island. Six of the resident mammals are included either as specially protected fauna under Schedule 1 of the *Wildlife Conservation Act 1950* (WA) or listed as vulnerable under the EPBC Act (Cth).

All of the mammal species that are considered to have conservation significance are widespread on the island, with the exception of the Black-flanked Rock-wallaby and the Water Rat. Both of these are restricted to certain habitat types on Barrow Island. The Black-flanked Rock-wallaby inhabits coastal limestone outcrops and cliffs. The Water Rat inhabits coastal beach habitats. As the onshore pipeline route does not traverse these areas, both of these species are not anticipated to occur within the ROW.

Boodies are dependent upon their warrens and are expected to have limited ability to disperse into surrounding areas; however, no warrens have been found in the immediate vicinity of the HDD or ROW. The closest known active warren is approximately 350 m away from the HDD site.

Overall, there are no fauna habitats unique to the Gorgon Gas Development Footprint; therefore, it is considered highly unlikely that unusual concentrations of mammals should be present in areas to be cleared for the construction of the Onshore Pipelines.

2.2.3.3 Marine Turtles

Of the six marine turtles known to occur in north-western Australian waters, Green (*Chelonia mydas*), Flatback (*Natator depressus*) and, to a lesser extent, Hawksbill (*Eretmochelys imbricata*) Turtles are commonly found at Barrow Island. All three turtle species are protected under the *Wildlife Conservation Act 1950* (WA) and listed as Schedule 1 species, and listed as Vulnerable under the EPBC Act (Cth).

Barrow Island is a regionally important nesting area for Green Turtles and Flatback Turtles, whilst Hawksbill Turtles nest at low densities around the Island.

2.2.3.4 Other Reptiles and Amphibians

A total of 45 reptile and amphibian species have been recorded on Barrow Island. Of these, 24 species have been recorded in the Gorgon Gas Development and Jansz Feed Gas Pipeline terrestrial footprint area. No reptiles are considered restricted to the footprint and there is no indication that any habitats in the footprint would support higher herpetofauna diversity than anywhere else on Barrow Island (Chevron Australia 2005).

None of the terrestrial reptile species on Barrow Island are listed as Threatened Species under the *Wildlife Conservation Act 1950* (WA) or the EPBC Act (Cth). The Perentie (*Varanus giganteus*) is ecologically significant on the Island as it is an abundant top-level predator. It is a generalist carnivore and scavenger with the Island population estimated to be around 3,000 individuals.

The single frog species (*Cyclorana maini*) on Barrow Island breeds in seasonal watercourses across the Island, including those traversed by the onshore pipeline.

2.3 Cultural Heritage

2.3.1 Cultural Heritage Sites

An archaeological site was detected near the south-east end of the stringing area at the HDD site.

Although there are no known sites within the onshore pipeline ROW, the pipeline does traverse areas considered to have the potential to host surface or subsurface cultural heritage materials. On Barrow Island, these typically include claypans, coastal dunes and areas adjacent to drainage lines. Potential European heritage values are limited to maritime heritage, in particular, shipwrecks off Barrow Island.

2.3.2 Native Title

There are no lodged native title claims over the Gorgon and Jansz gas fields and Barrow Island. However native title rights over onshore and offshore seas have been recognised by Australian courts, and it is possible that a future claim could be made to the offshore areas of the Gorgon and Jansz gas fields. The vesting of Barrow Island as a nature reserve will have extinguished Native Title to the island.

2.4 Socio-economic Environment

There is no resident population on Barrow Island. The Island has been actively used for petroleum exploration and production purposes since 1957 and access to the Island is restricted to personnel associated with oilfield operations, DPAW staff, and Gorgon Gas Development and Jansz Feed Gas Pipeline staff.

Construction of the onshore pipeline system will be managed to minimise disruption to existing services including operational pipelines, operating wells and roads.

2.4.1 Existing services

Road crossings are at KP0.37, KP3.75, KP5.35, KP 8.8, KP10.6 and KP11.8. The pipeline will remain buried at road crossings.

There are a number of known above-ground WA Oil pipelines crossings along the pipeline route. The Gorgon and Jansz pipelines, cables and tubes will be installed below these services.

There are a number of operating well sites located across Barrow Island. The pipeline route does not intercept any of these well sites.

2.5 Conservation Areas

The following conservation areas are located within the region of the onshore feed gas pipeline:

- Barrow Island Nature Reserve
- Barrow Island Marine Park
- Barrow Island Marine Management Area

3.0 Description of Activity

The onshore feed gas pipelines, control tubes and cables will be installed below ground in a trench system commencing at the shore crossing point on North White's Beach and traversing the island in a 30 m wide by 12.4 km long pipeline Right of Way (ROW) to a pig launching and receiving compound at the LNG Plant on the eastern side of the island. The ROW is located entirely within the TDF.

Construction of the onshore pipelines and umbilicals will comprise the following major components:

- Mobilisation and preparation of the pipeline ROW, including survey, clearing, and grading
- Fabrication and construction of the onshore pipelines from the shore crossing tie-in point at North Whites Beach to a launcher/receiver compound adjacent to the LNG plant
- Installation of the splice pits at North Whites Beach and installation of the onshore control cables and tubes from the splice pits to a launcher/receiver compound adjacent to the LNG plant;
- Installation of umbilicals
- Flooding, gauging and testing of the pipelines (both onshore and offshore)
- Installation of temporary and permanent support facilities
- Demobilisation and site reinstatement

The anticipated schedule for completion of the Onshore Pipelines installation is shown in Table 3-1. It must be noted that this schedule includes achieved completion dates as well as future dated start and completion dates that are an indicative representation based on the current design.

Table 3-1 Indicative Schedule of Activities for the Onshore Pipelines Installation

Phase of Construction	Start Date	Completion Date	Approx. Duration
Mobilisation and site preparation	Mar 2011	July 2011	5 months
Trenching and pipelines installation	June 2011	Apr 2014	34 months
Cables and Tubes installation	Mar 2014	Nov 2014	9 months
Facilities installation (Inlet Area)	Mar 2012	Apr 2014	26 months
Umbilical pull-in	Feb 2013	May 2013	4 months
Precommissioning activities	Apr 2014	Jun 2014	3 months
Tie-ins and completions	Jun 2014	Aug 2014	3 months
Demobilisation and site reinstatement	Nov 2014	Apr 2015	6 months

4.0 Environmental Hazards and Controls

A number of environmental risk assessments have been completed for the Gorgon Gas Development and Jansz Feed Gas Pipeline in accordance with AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines and AS/NZS Handbook 203:2006 Environmental Risk Management – Principles and Process.

The outcomes of these assessments have been reviewed and considered during the preparation of this Environment Plan. Based on the outcomes of the risk assessments completed to date, key risk categories and environmental aspects have been identified as shown in Appendix 1.

The key environmental risks were ascertained to be:

- Atmospheric Emissions, i.e. dust, air toxins, inert gases, ODS, and GHG;
- Physical Presence in Environment, i.e. introduction of non-indigenous species, fire, lighting, noise and vibration, erosion, waste;
- Discharges to Environment, i.e. accidental leaks and spills, liquid waste, use of recycled water, damage to existing services, precommissioning activities, drilling activities, sediments; and
- Use of Natural Resources, i.e. overuse of potable water, loss of topsoil.

Additional information regarding chemical disclosure of the deep well anode ground bed drilling activities is included in Appendix 2.

5.0 Management Approach

The Environment Plan has been prepared to ensure that the installation and pre-commissioning activities of the onshore feed gas pipeline are conducted in a manner that protects environmental values and reduces impacts to the environment as far as practicable.

Chevron Australia is committed to conducting activities associated with the Gorgon Gas Development and Jansz Feed Gas Pipeline in an environmentally responsible manner, and aims to implement best practice environmental management as part of a program of continual improvement. To meet this commitment, objectives have been defined that relate to the management of the identified environmental risks for the Gorgon Gas Development.

All personnel (including contractors and subcontractors) are required to attend environmental inductions and training relevant to their role on the Gorgon Gas Development and Jansz Feed Gas Pipeline. Training and induction programs facilitate the understanding personnel have of their environmental responsibilities, and increase their awareness of the management and protection measures required to reduce potential impacts on the environment.

Chevron Australia has prepared the internal Australasian Business Unit (ABU) Compliance Assurance process to manage compliance. An internal Audit Schedule has been developed and will be maintained for the Gorgon Gas Development and Jansz Feed Gas that includes audits of the Development's environmental performance and compliance with development Conditions, State and Commonwealth legislation.

The Gorgon Gas Development and Jansz Feed Gas Pipeline will use a number of routine internal reporting formats to implement the requirements of this Plan. These reports include information on a number of relevant environmental aspects, such as details of environmental incidents (if any), environmental statistics and records, records of environmental audits and inspections undertaken, status of environmental monitoring programs, and tracking of environmental performance against performance indicators and targets.

6.0 Consultation

Regular consultation with stakeholders has been undertaken by Chevron Australia throughout the development of the environmental impact assessment management documentation for the Gorgon Gas Development and Jansz Feed Gas Pipeline. This stakeholder consultation has included engagement with the community, government departments, industry operators, and contractors to Chevron Australia via planning workshops, risk assessments, meetings, teleconferences, and the Public Environmental Review (PER) and Environmental Impact Statement/ Environmental Review and Management Programme (EIS/ERMP) formal approval processes.

Additionally, consultations and/or notifications have been undertaken with the following stakeholders, and will continue as required:

- Department of Parks and Wildlife (DPAW)
- Department of Mines and Petroleum (DMP)
- Department of the Environment (DotE)
- Shire of Roebourne

7.0 Contacts

Further information regarding the Gorgon Gas Development and Jansz Feed Gas Pipeline is available at the Chevron Australia website; http://www.chevronaustralia.com.

Further information may also be obtained by directing all enquiries to the following contact details:

Mark Vaughan
Onshore Construction Manager

ASK@Chevron.com
Toll free number: 1800 782 957
PO Box 7869 Cloister Square WA 6850

Appendix 1 Hazards and Controls

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
Atmospheric emissions	Excessive dust during trenching, padding, excavation: • Damage to vegetation off ROW • Fauna disturbance	• Dust management procedures will be implemented. These procedures will include the requirement to implement dust suppression methods. • The trenching machine will be fitted with dust suppression equipment.
Atmospheric emissions	Dust generated from abrasive blasting: • Reduction in air quality	• Dust management procedures will be implemented. These procedures will include the requirement to implement dust suppression methods. • Construction specifications detail requirement for recovery of abrasive blasting materials with a vacuum unit and reuse of abrasive blasting material will occur.
Atmospheric emissions	General dust emissions from driving on ROW and dust generated off unpaved surfaces: • Damage to vegetation off ROW • Fauna disturbance	• Dust management procedures will be implemented. These procedures will include the requirement to implement dust suppression methods. • Speed limits will be in place along the ROW.
Atmospheric emissions	Dust generated from pipeline cleaning with air: • Reduction in air quality	• Dust management procedures will be implemented. These procedures will include the requirement to implement dust suppression methods.
Atmospheric emissions	Generation of toxic gases from welding: • Reduction in air quality	• These activities will be conducted over a large work area (length of ROW) and over the duration of the construction period, therefore environmental impact within the TDF is anticipated to be low.
Atmospheric emissions	N_2 gas discharge during dewatering: • Fauna injury and/’or death • Excessive noise	• During venting large quantities will not be released at ground level. • Exclusion zones will be in place prior to venting. • Venting location will be within a cleared area where fauna have largely already been removed. • Equipment will be appropriately sized for the task and operated in accordance with appropriate industry and equipment standards, including noise specifications. • Occupational health and safety (OHS) noise limits shall be complied with as a minimum standard. • Equipment covers, mufflers and other noise suppression equipment will be fitted and maintained.

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
		• Silencers will be in place for air and N_2 discharge. • Project personnel will record observations of unusual fauna behaviour around the work site as part of the normal site housekeeping/inspection process.
Atmospheric emissions	Release of ozone depleting substances from air-conditioning, refrigerants: • Destruction of ozone layer	• All chemicals proposed to be used will be subject to a HES assessment to ensure that least hazardous options are selected and waste disposal risks considered. • No chemicals will be permitted on site without prior assessment of the HES risks and approval by Chevron. • The use of ODS in new refrigeration systems will be avoided. Any systems containing ODS that require recharging or replacement will be exchanged to an ozone 'friendly' system. • All personnel handling ODS will be certified and shall hold all necessary permits and licences required under the *Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995* (Cth). The Contractor will adhere to the requirements for recording and reporting the use and disposal of ODS under those regulations.
Atmospheric emissions	General exhaust emissions from use of heavy machinery, vehicles and equipment with combustion engines including diesel generators: • Localised reduction in air quality, contributes to greenhouse gas emissions	• Fuel use will be reduced by implementing measures to minimise the number of vehicle movements such as using buses for personnel transfer, limiting the number of light vehicles available to personnel and considering vehicle movements in daily planning activities to eliminate unnecessary movements. • Construction vehicles and equipment will be regularly maintained.
Physical presence	Unauthorised vegetation clearing: • Potential long term impact on restricted vegetation community or species	• Ground and vegetation disturbance procedures will be used to manage the clearing activities. A Ground and Vegetation Disturbance Certificate will be required prior to any vegetation disturbance. • Signage, boundary markers and/or fencing will be in place along the ROW. • Dedicated turning, overtaking and parking areas will be provided to ensure vehicles do not drive on to vegetation. • Personnel access to areas outside the camp facilities and work sites shall be strictly controlled.
Physical presence	Damage to vegetation outside of ROW from vehicles driving off tenure: • Damage to vegetation • Fauna injury and/or death • Potential spread of weeds	• All personnel required to drive on Barrow Island will undertake the required training and be approved by Chevron. • Signage, boundary markers and/or fencing will be in place along the ROW. • Vehicle movements will be minimised (for example, using buses to transfer personnel to the work site). • Traffic management procedures will be developed and in place and shall cover communications protocols

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
		for working in the tightly restricted ROW. • Dedicated turning, overtaking, and parking areas will be provided to ensure vehicles do not drive on to vegetation. • Personnel access to areas outside the camp facilities and worksites shall be strictly controlled. • Off-road driving is prohibited unless authorised.
Physical presence	Loss of significant or restricted vegetation within approved footprint: • Removal of significant or restricted vegetation/flora • Reduction in distribution of vegetation/flora on BWI	• Ground and vegetation disturbance procedures will be used to manage the clearing activities. A Ground and Vegetation Disturbance Certificate will be required prior to any vegetation disturbance. • Signage, boundary markers and/or fencing will be in place along the ROW. • Dedicated turning, overtaking and parking areas will be provided to ensure vehicles do not drive on to vegetation. • Personnel access to areas outside the camp facilities and work sites shall be strictly controlled • All personnel required to drive on Barrow Island will undertake the required training and be approved by Chevron. • Vehicle movements will be minimised (for example, using buses to transfer personnel to the work site). • Traffic management procedures will be developed and in place and shall cover communications protocols for working in the tightly restricted ROW. • Off-road driving is prohibited unless authorised.
Physical presence	Spread of weeds during clearing and stripping from moving from weed infested area to non weed infested area (including from unidentified weed infestations): • Poor rehabilitation • Long term environmental change or reduction in biodiversity	• The Ground and Vegetation Disturbance Certificate process requires a check for weeds prior to clearing, including implementation of hygiene procedures (such as brush-downs) and management of weed-risk soil and vegetation. • The Contractor will develop and implement a Quarantine Management Plan. • Any introduced flora species detected shall be mapped, including an appropriate buffer area. This information will be provided to the Contractor for incorporation into site plans and procedures. • Weed infestation and/or risk areas are to be shown on all relevant construction plans and drawings. • The project-wide Weed Hygiene Common User Procedure will be implemented. • A site-specific weed hygiene management program, including weed management procedures, will be developed and implemented. • Stockpiles of topsoil and vegetation will be clearly marked to enable easy identification and minimise the

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
		risk of contamination or weed infestation, and regularly inspected for weeds.
Physical presence	Breach of quarantine on mobilisation from importing non quarantine compliant goods: • Quarantine breach • Potential introduction of non-indigenous species	• The Contractor will develop and implement a Quarantine Management Plan.
Physical presence	Fauna interaction with vehicle and machinery movements: • Fauna injury and/or death	• All work-site personnel and visitors shall be inducted regarding the proper response to wildlife encounters (including interaction with fauna, littering, feeding, approaching and unexpected fauna encounters). • Vehicle speed limits are in place on Barrow Island and will be further managed along the ROW. • Designated personnel (Fauna Handlers) will be trained in fauna handling procedures and only these personnel shall handle fauna. • Fauna handling procedures will be developed, outlining the implementation of fauna handling, capturing, removal and relocation requirements.
Physical presence	Increased fauna interaction from overspray of water on roads, resulting from increased vegetation growth and attracting additional fauna to road verge: • Increased fauna injury and/or death	• Road verges and the application of water for dust suppression will be subject to inspection and management.
Physical presence	Fauna interaction with machinery during clearing, stripping, earthworks: • Impact to fauna population • Death or injury to individual fauna	• Sites will be inspected for fauna immediately prior to clearing and earthworks, and large fauna shall be moved out of areas to be cleared. • Fauna management measures will be listed in the work method statement attached to Ground and Vegetation Disturbance Certificate. • Inspections of cleared areas shall be made immediately after clearing, and Fauna Handlers shall be called if injured or displaced animals are found.
Physical presence	Obstruction of fauna movement during trenching: • Impact to fauna population	• Soft crossings may be installed across open trenches at regular intervals and may include foam plugs, ramped gangplanks or similar, to enable native fauna to cross the trench.

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
Physical presence	Flooding of trench: • Fauna injury and/or death	• An adverse weather plan, covering all aspects of construction, will be developed and implemented. • Pipeline trenching operations shall avoid the cyclone season (November to April) where practicable. Where this is not practicable, the adverse weather plan shall specifically address additional measures required. • Following heavy rain falls, trenches shall be inspected and assessed for water pooling as soon as practical. Trenches containing water shall be dewatered to minimise drowning of fauna.
Physical presence	Fauna in trench, excavations or general work sites: • Fauna injury and/or death	• Fauna Handlers will inspect and clear all major open excavation (deeper than 500 mm) and open trenches daily for trapped fauna. This will be undertaken no later than three hours after sunrise, and no earlier than four hours before sunset and during the day as required. • All trenches and excavations will be inspected for fauna before placement of any items into the trench or excavation no more than two hours prior to the activity. These inspections can be undertaken by general personnel, and a Fauna Handler notified to assist if the excavation requires removal of fauna. • Fauna found in trenches will be removed by Fauna Handlers in accordance with the fauna handling procedures. • In the event that fauna mortality attributed to heat exhaustion increases dramatically or is considered excessive, trenches will be cleared by Fauna Handlers within two hours after sunrise, and across the day as required. • Temporary fencing or similar measures will be used for deep (>1.5 m) trenches to reduce the entrapment of larger fauna on Barrow Island. • The ends of the trench fencing will be closed each evening at the cessation of work to prevent fauna entering the trench. • Where fauna exclusion barriers are in place earthen ramps will be constructed at the beginning and end of each trench, and the maximum distance between ramps shall not exceed 1200 m. Where fauna exclusion barriers are not in place temporary escape ramps will be constructed at least every 250 m along trenches and at regular intervals along any other pits. • Where excavations are to be left open for longer than 24 hours without activity, fauna exit structures (e.g. ramps, mats or ladders) will be used to provide fauna with an escape, or, if not practicable, a fauna exclusion barrier will be used to enclose the perimeter of the excavation. • Escape ramp slopes will be no greater than 45° to enable native fauna to exit the trench. • Soft crossings may be installed across open trenches at regular intervals and may include foam plugs, ramped gangplanks or similar, to enable native fauna to cross the trench.

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
		• Shelter for native fauna shall be provided at regular intervals within open trenches at the end of each shift or on days when there is no work taking place. Shelters shall be inspected for fauna sheltering on, or under, the structures daily and immediately prior to removal of the structures. • With the exception of cables and tubes, the length of continuous single pipeline trench (excluding bell holes for tie-ins) open at any one time will be controlled and not more than 2 km in length. • Pipes will be inspected for fauna prior to fit up for welding and lowering in of the pipe or prior to fitting end caps. Any fauna present in, under or around pipes will be allowed to escape, or removed by Fauna Handlers in accordance with fauna handling procedures. • Unless otherwise approved, a maximum pipe string of 1000 m will be welded and lowered in at any time. • Openings in the welded pipe strings will be provided at convenient locations to assist the passage of fauna. • Welded pipe strings will have end caps fitted to prevent fauna entering the pipe strings. • Enclosures or fencing around hazardous materials storage areas and potentially contaminated areas will be erected and maintained to reduce fauna contact with contaminants. • Side slopes will be designed to allow animals to escape using fauna exit structures (e.g. exit ramps, fauna ladders, scramble mats) or using covers (e.g. a grate or solid plate) to prevent fauna access, reducing fauna entrapment in areas such as sumps, pits, basins or drains. • Lids will be used on tanks where design permits. • Rubbish bins will be fitted with lids where practicable, or alternative fauna escape provisions will be implemented where lids are not practicable.
Physical presence	Fauna falling into splice pit: • Fauna injury and/or death	• Fauna control measures will be implemented at the splice pit as relevant as per the above.
Physical presence	Spill of liquid N_2 during pipe freezing for tie-ins: • Fauna injury and/or death	• The nitrogen storage tanks will be double skinned, with multiple relief valves, double isolations and bursting discs.
Physical presence	Fauna impact from water winning: • Fauna injury and/or death	• The water winning intake will be screened and of low velocity at the screen.
Physical presence	Fire from smoking outside of designated areas: • Damage to vegetation	• All personnel will be required to undertake an induction prior to working on Barrow Island that will include fire management requirements, such as procedures for smoking in the workplace.

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
	• Fauna injury and/or death	• Fire management along the ROW will be in accordance with the Fire Management Plan.
Physical presence	Fire during welding, grinding: • Damage to vegetation off ROW • Fauna injury and/or death	• Once the ROW is cleared, ignition sources/activities that have the potential to ignite fires will be kept at least 5 m away from flammable material, unless appropriate shielding/ barriers are in place to prevent fires. • Hot work procedures and Job Hazard Analyses (JHAs) will be implemented. Welding procedures will be approved and qualified.

Physical presence	Fire during clearing. stripping, earthworks:
	• Environmental impact outside tenure
	• Loss of, or disturbance to, vegetation and habitat
		• Sufficient and appropriate equipment, materials and resources will be available to respond to a fire including trained emergency response personnel. Appropriate fire fighting equipment will be stored at all suitable work sites in accordance with relevant regulations and approved plans.
		• All vegetation clearing machinery exhausts will be fitted with spark arrestors or similar devices.
		  • Equipment will be regularly maintained.
		  • Once the ROW is cleared, ignition sources/activities that have the potential to ignite fires will be kept at least 5 m away from flammable material (e.g. vegetation, stockpiles of dead vegetative matter, and packaging materials) unless appropriate shielding/barriers are in place to prevent fires.
		• Storage of fuels and chemicals will be in accordance with AS 1940:2004.
		• The use of petrol-fuelled vehicles is prohibited.
		  • Off-road driving is prohibited unless authorised.
		  • Firebreaks will be in place around any temporary buildings in accordance with the *Bush Fires Act 1954* (WA) and building licence requirements.

Physical presence	Artificial lighting during night activities affecting fauna: • Short-term behavioural changes to fauna; fauna injury and/or death	• Lighting control measures will be in accordance with LTMTMP. • Pipeline construction activity is planned to occur during day light hours only. Additional work may be required at night time (such as equipment maintenance, road maintenance and precommissioning activities). Where night work is proposed, lighting control measures will be implemented.
Physical presence	Excessive noise and vibration during trenching: • Fauna disturbance	• Equipment will be appropriately sized for the tasks and operated in accordance with appropriate industry and equipment standards, including noise specifications. • Equipment covers, mufflers and other noise suppression equipment will be fitted and maintained.
Physical presence	Excessive noise and vibration from vehicles and machinery operations and general site works:	• Equipment will be appropriately sized for the tasks and operated in accordance with appropriate industry and equipment standards, including noise specifications.

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
	• Fauna disturbance	• Equipment covers, mufflers and other noise suppression equipment will be fitted and maintained. • Project personnel will record observations of unusual fauna behaviour around work site as part of the normal site housekeeping/inspection process. • Occupational health and safety (OHS) noise limits shall be complied with as a minimum standard. • Driving on the beach during peak turtle nesting and hatching season (October to April) is prohibited unless required under specific or unusual conditions (to be assessed on a case-by-case basis and approved by Chevron). Driving on the beach is to be avoided at all other times.
Physical presence	Noise and vibration during dewatering: • Fauna injury and/or death	• Equipment will be appropriately sized for the tasks and operated in accordance with appropriate industry and equipment standards, including noise specifications. • Equipment covers, mufflers and other noise suppression equipment will be fitted and maintained. • Silencers will be in place for air and N_2 discharge.
Physical presence	Temporary storage of spoils off ROW during trenching and excavation: • Transfer of weeds • Potential for erosion or loss of spoil	• Contractor will ensure stored materials are adequately surveyed and signed to enable restoration of previous soil profiles within the shore crossing area. Photographs shall be taken of sites following clean-up and reinstatement . Photographs shall be taken from surveyed and pegged reference points.

Physical presence	Inadequate reinstatement leading to instability of sand dune area:
	• Localised short term degradation
		• Site reinstatement procedures will be prepared and implemented.
		• Erosions control measure will be installed in sand dune areas where required.
		  • Reinstatement of worksites and access roads shall be undertaken with soils and rock profile to match the state that existed prior to the commencement of construction.
		  • Temporary artificial drainage, erosion, and sediment control measures (e.g. geotextile matting, filter fencing, etc.) will be removed once stability is achieved in sand dune areas.
		  • Should compacted hardstands be present in dunal areas being reinstated, they will be ripped or scarified prior to spreading topsoil (under no circumstances shall ripping or scarifying take place over the trench lines).
		  • Any topsoil salvaged within the dunes shall be spread evenly to a maximum depth of 15 cm over the areas from which it was removed.

Physical	Waste disposal from welding, joint coating, NDT,	• A waste management plan or procedure will be developed for the construction activities and shall address

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
presence	breakers: • Soil contamination • Reduction in visual amenity	waste minimisation, waste storage and waste disposal. • Regular site inspections will be undertaken including housekeeping, storage and containment of hydrocarbons, chemicals and other substances, including wastes. • Waste management risks are to be identified in relevant JHA's.
Physical presence	Inappropriate solid waste management: • Localised short term soil contamination • Reduced visual amenity	• Regular solid and liquid waste collections will be in place by a servicing contractor, and in accordance with the Solid and Liquid Waste Management Plan. • Regular site inspections will be undertaken including housekeeping, storage and containment of hydrocarbons, chemicals and other substances, including wastes.
Physical presence	Change to soil profile from installation, backfill and reinstatement: • Changes to soil profile • Localised irreversible degradation	• Reinstatement of worksites and access roads shall be undertaken with soils and rock profile to match the state that existed prior to the commencement of construction. • Natural ground contours will be re-established. • Topsoil, vegetation and trenched material will be placed back in same location where-ever possible. • On-site Environmental personnel will monitor topsoil respreading. • Vegetation and rock groupings salvaged during clearing operationswill be returned to the same site. Vegetation mulch will be spread where available on the contour to restrict surface run-off and reduce erosion.
Physical presence	Changes to drainage from installation, backfill and reinstatement: • Washout of trench • Subsidence of trench	• Trialling of bedding and padding compaction techniques will be conducted to achieve specification requirements. • Trench breakers will be installed in areas determined to be at risk of washout. • Crowned profiles will be installed over the trenches to accommodate small amounts of settling.

Physical presence	Unsuccessful reinstatement of ROW from uneven spread of topsoil, inadequate management of topsoil and/or new weed infestation:
	• Localised, irreversible degradation
		• The ROW will be contoured and erosion control banks will be installed where warranted.
		• On-site Environmental personnel will monitor topsoil respreading.
		  • Any topsoil salvaged within the dunes will be spread evenly to a maximum depth of 15 cm over the areas from which it was removed.
		  • Topsoil stripped from areas where weeds are identified will be managed separately.
		  • Vegetation and rock groupings salvaged during clearing operations will be returned to the same site. Vegetation mulch will be spread where available on the contour to restrict surface run-off and reduce

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
		erosion.
Physical presence	Change in surface drainage due to service track not being at natural ground level: • Erosion • Sediment discharge • Localised change to ecosystem	• Pipeline service track engineering includes long-term drainage structures and profile. • Natural ground contours will be re-established.
Physical presence	Surplus construction materials/ equipment left onsite: • Unable to meet the reinstatement criteria	• Demobilisation inspections will include requires for all temporary infrastructure to b removed prior to handover.
Physical presence	Impact to cultural heritage site or artefact during clearing and stripping: • Impact to cultural heritage site or artefact	• All ground-breaking work will be initiated under the Ground and Vegetation Disturbance Certificate process, which requires validation that the relevant cultural surveys have been undertaken prior to work commencing. • In areas along the pipeline ROW considered to have potential to host cultural heritage materials, a Chevron Australia Representative (for cultural heritage monitoring) will be in place as part of clearing procedures.
Discharges	Leaks/ spills from equipment (e.g. hydraulic fluids, oil and grease, diesel), leaks from refuelling and/or paint and joint coating spills: • Localised soil contamination • Fauna injury and/or death	• All chemicals proposed to be used will be subject to a HES assessment to ensure the least hazardous options are selected and waste disposal risks considered. • Volumes of chemicals stored will be fit-for-purpose. • Fuels, oils, solvents and other chemicals will be stored in appropriate facilities on the ROW (bunding and containment). • Hydrocarbons and chemical storage (including wastes) will be appropriately bunded or contained and regularly maintained. • Regular site inspections will be undertaken including housekeeping, storage and containment of hydrocarbons, chemicals and other substances, including wastes. • Drip trays will be used during refuelling. • A spill response plan will be developed and implemented. It will include information such as emergency response team contacts, responsibilities, resources and call-out details, as well as clean-up strategies. • Spill kits and adequate bins for separation and segregation of wastes will be in place along the ROW. All equipment will be thoroughly cleaned, maintained and function tested prior to mobilisation to Barrow Island.

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
		• Regular servicing of vehicles and equipment will be undertaken and with appropriate spill and waste management measures in place. • Exclusion areas will be designated where servicing and refuelling equipment will not take place.
Discharges	Spills of subsea umbilical hydraulic fluids (onshore) during umbilical precommissioning top up: • Soil contamination	• A chemical selection procedure will be used to ensure health, environment, and safety (HES) requirements are met and the least toxic option selected. • Volumes of chemicals stored will be fit for purpose. • Top-up of umbilical fluids will be completed within the splice pit (concrete construction).

Discharges	Hazardous chemicals used in joint coating, NDT, painting, breakers:
	• Soil and water contamination
	• Fauna injury and/or death
		• The primary method of joint coating material application will be automated units (not manually painted on, reducing drips and spills).
		  • All chemicals proposed to be used will be subject to a HES assessment to ensure the least hazardous options are selected and waste disposal risks considered.
		  • Hydrocarbons and chemical storage (including wastes) will be appropriately bunded or contained and regularly maintained.
		  • Spill kits and adequate bins for separation and segregation of wastes will be provided.
		  • Regular site inspections will be undertaken including housekeeping, storage and containment of hydrocarbons, chemicals and other substances, including wastes.

Discharges	Inappropriate liquid waste management:
	• Localised short term soil contamination
	• Reduced visual amenity
		• A waste management plan or procedure will be developed for the construction activities and shall address waste minimisation, waste storage and waste disposal.
		  • Spill kits and adequate bins for separation and segregation of wastes will be provided.
		• Regular site inspections will be undertaken including housekeeping, storage and containment of hydrocarbons, chemicals and other substances, including wastes.
		• Regular solid and liquid waste collections will be in place by a servicing contractor, and in accordance with the Solid and Liquid Waste Management Plan.
		• Waste management risks are to be identified in relevant JHAs.
		  • Hydrocarbons and chemical storage (including wastes) will be appropriately bunded or contained and regularly maintained.

Discharges	Disposal of water/ oil mix during dewatering:	• A waste management plan or procedure will be developed for the construction activities and shall address

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
	• Soil contamination	waste minimisation, waste storage and waste disposal. • Regular solid and liquid waste collections will be in place by a servicing contractor, and in accordance with the Solid and Liquid Waste Management Plan. • Regular site inspections will be undertaken including housekeeping, storage and containment of hydrocarbons, chemicals and other substances, including wastes. • Waste management risks are to be identified in relevant JHAs. • Hydrocarbons and chemical storage (including wastes) will be appropriately bunded or contained and regularly maintained.
Discharges	Recycled water used as dust suppression is substandard quality: • Soil contamination • Potential impact to karst formation	• A testing program will be in place to ensure recycled water is of an appropriate quality for use. • In areas of open karst features (i.e. sink holes), recycled water will not be applied.
Discharges	Damage to existing pipeline (WA Oil) when laying new lines across operational lines resulting in spill (oil diesel or PFW): • Soil contamination	• Where pipeline bypasses are required, appropriate containment measures will be implemented and equipment measures will be implemented and equipment readily available to respond to unforeseen spills or leaks.
Discharges	Spill of hazardous chemicals including biocides, O_2 scavengers, dyes, MEG and inhibitors during precommissioning: • Soil contamination • Possible fauna injury and/or death	• To ensure that the risk from inadvertent loss from pipeline rupture or leak are minimised, a number of safeguards will be implemented, including but not limited to; post-installation pressure testing to the requirements AS2885.5, Non-Destructive Testing of welds, pressure testing of all equipment as part of Factory Acceptance Test and System Integration Test. • Should a pipeline leak be identified, an assessment will be carried out to determine the appropriate management response. • Hydrocarbons and chemical storage (including wastes) will be appropriately bunded or contained and regularly maintained.
Discharges	Spill of treated sea water during precommissioning : • Soil contamination • Possible fauna injury and/or death	• To ensure that the risk from inadvertent loss from pipeline rupture or leak are minimised, a number of safeguards will be implemented, including but not limited to; post-installation pressure testing to the requirements AS2885.5, Non-Destructive Testing of welds, pressure testing of all equipment as part of Factory Acceptance Test and System Integration Test. • Should a pipeline leak be identified, an assessment will be carried out to determine the appropriate

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
		management response.
Discharges	Leak of pipe testing fluids to ground during precommissioning: • Soil contamination	• To ensure that the risk from inadvertent loss from pipeline rupture or leak are minimised, a number of safeguards will be implemented, including but not limited to; post-installation pressure testing to the requirements AS2885.5, Non-Destructive Testing of welds, pressure testing of all equipment as part of Factory Acceptance Test and System Integration Test. • Should a pipeline leak be identified, an assessment will be carried out to determine the appropriate management response.
Discharges	Discharge of hydrotest water during tie-ins of MEG and Utility pipelines during pipe freeze: • Soil contamination	• During pipe-freezing activities, drainage from the pipework will be collected into temporary containers and recycled.
Discharges	Discharge of drilling mud to ground: • Soil contamination	• All wastes generated by the drilling activity will be collected for disposal. • Collection receptacles shall have secondary containment measures in place. • Waster-based drilling muds will be used. • Any drilling fluids or additives will be assessed under the chemical selection process which ensures health, environment and safety requirements are met and the least toxic options selected.
Discharges	Uncontrolled stormwater release off the site during clearing and stripping: • Contamination of surrounding land • Change in drainage patterns • Loss of top soil	• Temporary drainage systems will be installed along the ROW to manage surface stormwater flows during the construction period.
Discharges	Erosion of trenched spoils on ROW during trenching and excavation: • Sediment and sediment laden water discharged of ROW	• Control measures will not prevent or unnecessarily restrict water flows and will be designed to accommodate locally significant rainfall events. • Topsoil stockpiles (including temporary piles during clearing) will not be stored in low-lying drainage areas. • If required, excess spoil may be removed and stored at a suitable location off-site if its storage along the ROW is likely to compromise boundary integrity. • Regular inspections of stockpiled materials will include the ROW boundary.

Category	Environmental Aspect and Consequence/Impact	Management and Mitigation Measures
Discharges	Dewatering of flooded trench: • Sediment laden water discharged off ROW	• Trench and excavation dewatering procedures will include measures to reduce soil erosion, scouring and turbidity and will l consider the characteristics of the receiving environment.
Discharges	Wash out of bedding materials during backfilling: • Discharge of sediment and sediment laden water off ROW	• Temporary drainage systems will be installed along the ROW to manage surface stormwater flows during the construction period. • Trench breakers installed in areas determined to be at risk of washout.
Use of natural resources	Excessive use of potable water: • Depletion of scarce natural resource	• Potable water will only be used where such quality is required.
Use of natural resources	Erosion, removal or compaction of topsoil and seed bank during clearing, stripping, stockpiling: • Poor reinstatement and localised long term changes to ecosystem	• A Ground and Vegetation Disturbance Procedure will be implemented. • Personnel and all mobile plant/equipment will be restricted to designated areas. • Stockpiles/windrows of vegetation and topsoil will be managed to prevent erosion. • Stockpiles/windrows of vegetation and topsoil will not be stored in drainage channels, gullies, or low-lying areas. • Stockpiles/windrows of vegetation and topsoil will be left undisturbed until required for reinstatement works. • Site reinstatement procedures will be prepared and implemented for the ROW as soon as practicable. • Stockpiles are not to exceed 2 m in height. • Vegetation and rock groupings salvaged during clearing operations will be returned to the same site. Vegetation mulch will be spread where available on the contour to restrict surface runoff and reduce erosion.
Use of natural resources	Inadequate collection of topsoil during clearing and stripping: • Unable to reinstate • Long term environmental change or reduction in biodiversity	• Topsoil will be collected to an approximate depth of 5 cm. • Clearing, stripping, and stockpiling activities will be supervised.

Appendix 2 Chemical Disclosure – Deep Well Anode Ground Bed

A. SYSTEM DETAILS

Operator:	Chevron Australia Pty Ltd
Project / Well:	Gorgon Project: Cathodic Protection Deep Well Anode Ground Bed
System:	Well Drilling
Total Volume of System:	5,000L

B. PRODUCT LIST

Product Name	Supplier Name	Purpose	Product in System Fluid (%)	Toxicity and Ecotoxicity Information	MSDS attached (Y/N)
AMC Aus-Det Xtra	AMC	Surface wetting agent (surfactant)	0.57% (5.7g/L)	**Acute toxicity:** • Oral (Rat) LD50: 5190 mg/kg • Reported Dermal (Rabbit) LD50: >3160 mg/kg **Chronic toxicity:** • Oral LD50 (Rat): 5,500 mg/kg • Eye irritation (Draize, Rabbit): slight irritant (1) • Fish toxicity (*Leuciscus idus*) 96hr LC50: >1000 mg/l • Bacterial toxicity (Warburg test): >2000 mg/l • COD: 2010 mg O2/g • Ecotoxicity: 48 hour LC50 (*Daphnia magna*): 490 mg/L • Non hazardous to aquatic organisms **Biodegradation / Bioaccumulation:** • Log octanol/water partition coefficient (log Pow) is estimated to be <3 • No bioconcentration is expected because of the relatively high water solubility	Y
AMC Bio-Vis Xtra	AMC	Drilling fluids viscosifier	0.8% (8g/L)	**Acute toxicity:** • Oral (Rat) TDLo: >140 mg/kg	Y

Product Name	Supplier Name	Purpose	Product in System Fluid (%)	Toxicity and Ecotoxicity Information	MSDS attached (Y/N)
				• Oral (Rat) LD50: >27000 mg/kg **Chronic toxicity:** • Irritation: Nil Reported **Biodegradation / Bioaccumulation:** • Inherently biodegradable at a low rate of biodegradation and are generally of low toxicity to fish • Polysaccharides are generally not bioaccumulative and are easily decomposed by biodegradation	
AMC Aus-Gel Xtra	AMC	Primary product for high-viscosity drilling mud systems	10% (100g/L)	**Acute toxicity (Sodium Carbonate as ingredient):** • Oral (Rat) LD50: 4090mg/kg • inhalation (Rat) LC50: 2300mg/m3/2h • Oral (Human) LD: 714mg/kg • Oral (Mouse) LD50: 6600mg/kg • Inhalation (Mouse) LC50: 1200mg/m3/2h • Inhalation (Guinea Pig) LC50: 800mg/m3/2h **Chronic toxicity (Sodium Carbonate as ingredient):** • Skin irritation leading to contact dermatitis **Biodegradation / Bioaccumulation (Sodium Carbonate as ingredient):** • Low bioaccumulation expected **Acute toxicity (Silica Crystalline-Quartz as ingredient):** • Inhalation (Human) LCLo: 0.3mg/m3/10Y • Inhalation (Rat) LCLo: 50mg/m3/6H/71W **Chronic toxicity (Silica Crystalline-Quartz as ingredient):** • Crystalline Silica is a Group 1 carcinogen, respiratory (IARC) **Biodegradation / Bioaccumulation (Silica Crystalline-Quartz as ingredient):** • Not applicable given inorganic and naturally occurring in soil	Y

Product Name	Supplier Name	Purpose	Product in System Fluid (%)	Toxicity and Ecotoxicity Information	MSDS attached (Y/N)
AMC Liqui-Pol	AMC	Viscosifier	11.4%	**Acute toxicity:** • Anionic polyacrylamide is not considered toxic by any exposure route **Chronic toxicity:** • Not applicable as anionic polyacrylamide is not considered toxic by any exposure route **Biodegradation / Bioaccumulation:** • Inherently Biodegradable; 68% of the oil will degrade into CO2 within 28 days using the OECD 301F test method and will not persist.	Y
Water (potable)	Water treatment plant on BWI	For use with Liqui-pol	76.66%	Nil	N/A
AMC PAC R	AMC	Viscosifier	0.57% (5.7g/L)	**Acute toxicity:** • Oral (Rat) LD50: 27000 mg/kg • Oral (Rat) TDLo: 140 mg/kg **Chronic toxicity:** • Nil irritation reported **Biodegradation / Bioaccumulation:** • Inherently biodegradable at a low rate of biodegradation and are generally of low toxicity to fish • Polysaccharides are generally not bioaccumulative and are easily decomposed by biodegradation • This product has been tested for BTEX and no detectable levels have been identified in the product within the instrumentation detection limits	Y
Total			**100%**		

C. CHEMICAL LIST

Chemicals Within System	CAS Number	Mass Fraction
Alkaline salts	7758-29-4	0.20%
Non-ionic detergents (Polyoxyethylene Lauryl Ether)	9002-92-0	0.50%
Water	7732-18-5	76.66%
Polysaccharide polymers blend	9000-30-0	2.15%
Bentonite	1302-78-9	9.21%
Polyacrylamide	25987-30-8	3.42%
Sodium carbonate	497-19-8	0.50%
Silica crystalline	14808-60-7	0.10%
Emulsifiers and Surfactants (Sodium Lauryl Ether Sulphate)	68585-34-2	6.69%
Sodium carboxymethylcellulose	9004-32-4	0.57%
Total		**100 %**

A. SYSTEM DETAILS

Operator:	Chevron Australia Pty Ltd
Project / Well:	Gorgon Project: Cathodic Protection Deep Well Anode Ground Bed
System:	Well Construction
Total Volume of System:	20 kg (10L water and 10kg of AMC Hardset)

B. PRODUCT LIST

Product Name	Supplier Name	Purpose	Product in System Fluid (%)	Toxicity and Ecotoxicity Information	MSDS attached (Y/N)
AMC Hard Set	AMC	Fast setting cement for installation of deep well anode	50%	**Acute toxicity (Limestone as an ingredient)**: • Oral (Rat) LD50: 6450 mg/kg **Chronic toxicity (Limestone as an ingredient)**: • Skin (Rabbit): 500 mg/24h-moderate **Acute toxicity (Silica Amorphous as an ingredient)**: • Dermal (Rabbit) LD50: >5000 mg/kg • Inhalation (Rat) LC50: >0.139 mg/l/14h • Oral (Rat) LD50: 3160 mg/kg **Chronic toxicity (Silica Amorphous as an ingredient)**: • Eye (Rabbit): Non-irritating • Skin (Rabbit): Non-irritating **Biodegradation / Bioaccumulation**: • No bioaccumulation data exists because of the nature of this product (ie AMC Hard Set is generally used for the installation of drill collars and standpipes and is generally installed at depths between 0 – 600mm below ground level. Therefore there is negligible risk of input into the environment).	Y

Product Name	Supplier Name	Purpose	Product in System Fluid (%)	Toxicity and Ecotoxicity Information	MSDS attached (Y/N)
Water (potable)	Water treatment plant on BWI	For use with Hard Set	50%	Nil	N/A
Total			**100%**		

C. CHEMICAL LIST

Chemicals Within System	CAS Number	Mass Fraction (%)
Limestone	1317-65-3	17.5
Silica amorphous	7631-86-9	5.0
Bauxite	1318-16-7	5.0
Gypsum	13397-24-5	22.5
Water	7732-18-5	50.0
Total		**100 %**