Gorgon Gas Development and Jansz Feed Gas Pipeline

Terrestrial and Subterranean Environment Protection Plan

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1 Introduction

1.1 Proponent

Chevron Australia Pty Ltd (CAPL) is the proponent and the person taking the action for the Gorgon Gas Development on behalf of the following companies (collectively known as the Gorgon Joint Venturers):

- Chevron Australia Pty Ltd
- Shell Development (Australia) Pty Ltd
- Mobil Australia Resources Company Pty Limited
- Osaka Gas Gorgon Pty Ltd
- Tokyo Gas Gorgon Pty Ltd
- JERA Gorgon Pty Ltd.

1.2 Project

CAPL have developed the gas reserves of the Greater Gorgon Area for processing in the Gorgon Gas Treatment Plant (GTP) on Barrow Island, which is located off the Pilbara coast 85 km north-north-east of Onslow in Western Australia (WA) (Figure 1-1).

Subsea gathering systems and pipelines deliver feed gas from the Gorgon and Jansz–Io gas fields to the west coast of Barrow Island. The underground feed gas pipeline system then traverses Barrow Island to the east coast where the GTP is located. The GTP includes natural gas trains that produce liquefied natural gas (LNG) as well as condensate and domestic gas. Carbon dioxide, which occurs naturally in the feed gas, is separated during the production process and injected into deep rock formations below Barrow Island. The LNG and condensate are loaded onto tankers from a jetty and then transported to international markets. Gas for domestic use is exported by pipeline from Barrow Island to the domestic gas collection and distribution network on the WA mainland.

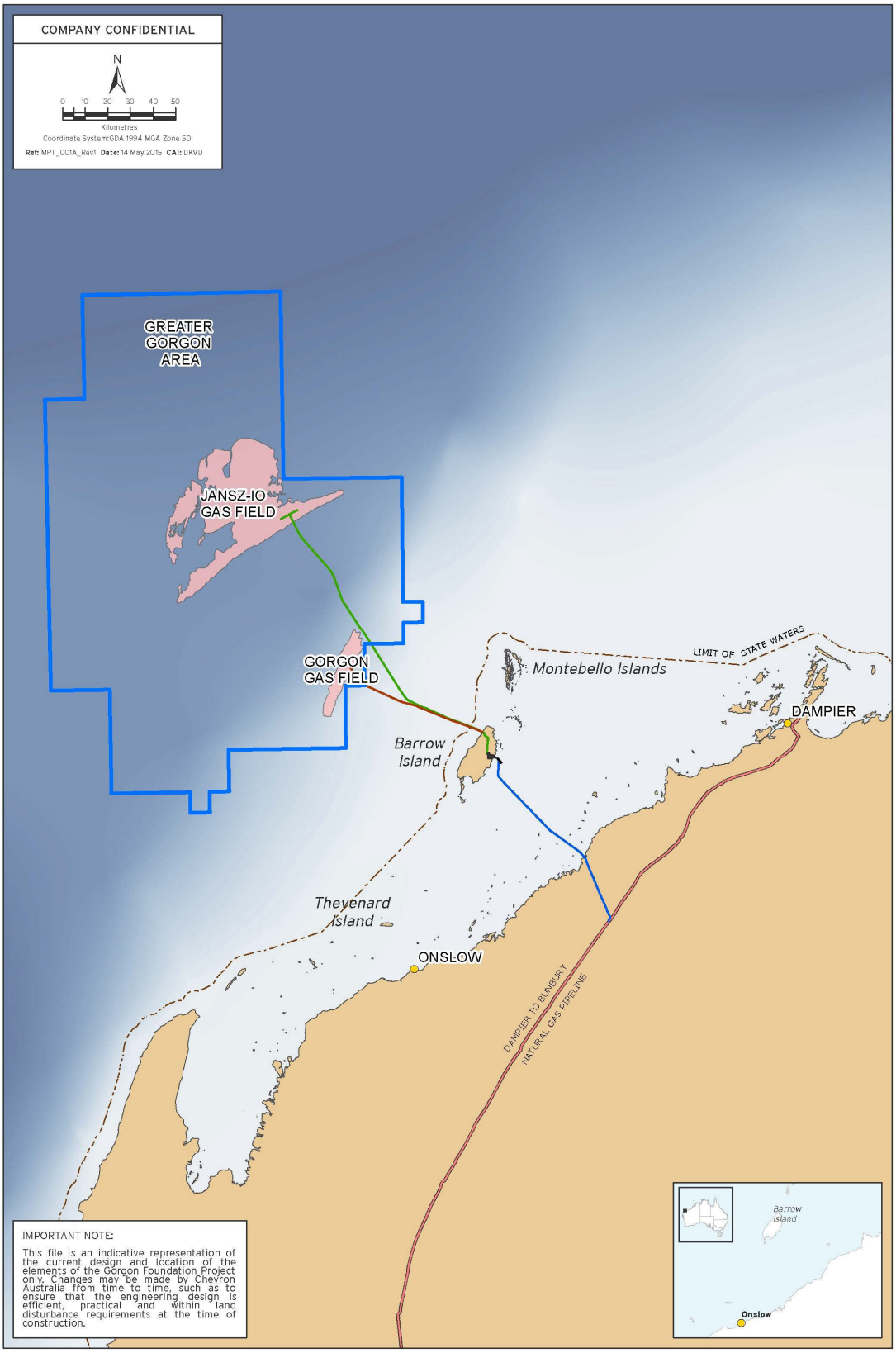

Figure 1-1: Location of Barrow Island and the Greater Gorgon Area

1.3 Environmental Approvals

Table 1-1 describes State (WA) and Commonwealth approvals for the components of the Gorgon Gas Development.

These approvals, and projects as approved under these approvals, have been and may continue to be amended (or replaced) from time to time.

Table 1-1: State and Commonwealth Approvals

Project Approval Stage	State	Commonwealth
Jansz Feed Gas Pipeline	Ministerial Statement (MS) 769 (Ref. **1**) 28 May 2008	EPBC Reference: 2005/2184 (Ref. **2**). 22 March 2006
Initial Gorgon Gas Development (2 LNG Trains)	Initial Gorgon Gas Development comprising two LNG Trains – MS 748 (Ref. 3). This was superseded by MS 800 (Ref. **4**). 6 September 2007	Initial Gorgon Gas Development comprising two LNG Trains – EPBC Reference: 2003/1294 (Ref. **6**). 3 October 2007
Revised and Expanded Gorgon Gas Development (3 LNG Trains)	MS 800 (Ref. **4**) provides approval for both the initial Gorgon Gas Development and the Revised and Expanded Gorgon Gas Development (compromising three LNG Trains), which together are known as the Gorgon Gas Development. This statement supersedes MS 748. 10 August 2009	The Revised and Expanded Gorgon Gas Development (EPBC Reference: 2008/4178 [Ref. **5**]) was approved, and the conditions for the initial Gorgon Gas Development (EPBC Reference: 2003/1294 [Ref. **6**]) were varied. 26 August 2009
Dredging Amendment	MS 865 (Ref. **7**) provides approval to establish a restart mechanism in the event of a project-attributable coral health management trigger. This statement is an amendment to Conditions 18, 20, and 21 of MS 800. 8 June 2011	Not applicable (N/A)
Additional Support Area	MS 965 (Ref. **8**) applies the conditions of MS 800 to an Additional Support Area. 2 April 2014	The conditions for the initial Gorgon Gas Development (EPBC Reference: 2003/1294 [Ref. **6**]).and for the Revised and Expanded Gorgon Gas Development (EPBC Reference: 2008/4178 [Ref. **5**]) were varied. 15 April 2014
Fourth Train Expansion[1]	MS 1002 (Ref. 9) applies the conditions of MS 800 to the Fourth Train Expansion, and has additional conditions. 30 April 2015	EPBC Reference: 2011/5942 (Ref. 10). 12 May 2016

[1] This Plan applies to the Fourth Train Expansion once this scope commences.

1.4 Purpose of this Plan

1.4.1 Requirement for this Plan

1.4.1.1 State Environmental Approval Requirement

This Plan is required under Condition 7.1 of MS 800 and MS 769:

> *Prior to commencement of construction of any of the terrestrial facilities identified in Condition 6.3, the Proponent shall submit a Terrestrial and Subterranean Environment Protection Plan (the Plan) that meets the objectives identified in Condition 7.4 and the requirements of Condition 7.5 as determined by the Minister, unless otherwise allowed by Condition 7.2.*

1.4.1.2 Commonwealth Environmental Approval Requirement

A revision of this Plan is currently being assessed by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). The requirements for this Plan under Condition 6.1 of EPBC Reference: 2003/1294 and 2008/4178 are:

> *Prior to commencement of construction of any of the terrestrial facilities identified in Condition 5.2, the person taking the action shall submit a Terrestrial and Subterranean Environment Protection Plan (the Plan) that meets the objectives identified in Condition 6.4 and the requirements of Condition 6.5 as determined by the Minister, unless otherwise allowed by Condition 6.2.*

1.4.2 Objectives of this Plan

The stated objectives of this Plan in Condition 7.4 of MS 800 and MS 769 are:

i. *To reduce the adverse impacts from the construction and operation of the terrestrial facilities (within the Terrestrial Disturbance Footprint) as far as practicable; and*

ii. *To ensure that construction and operation of the terrestrial facilities does not cause Material or Serious Environmental Harm outside and below the Terrestrial Disturbance Footprint*

The stated objectives of this Plan in Condition 6.4 of EPBC Reference: 2003/1294 and 2008/4178 are to:

i. *To reduce the adverse impacts from the construction and operation of the terrestrial facilities listed in condition 5.2, as far as practicable; and*

ii. *To ensure that construction and operation of the terrestrial facilities listed in condition 5.2 does not cause Material or Serious Environmental Harm outside the Terrestrial Disturbance Footprint, including below the surface of the land*

1.4.3 Contents of this Plan

Table 1-2 lists the State and Commonwealth Condition requirements of this Plan and the sections in this Plan that fulfil them.

Note: This requirements text is based on MS 800. Additional words in these requirements from MS 769 are contained in [square brackets]; additional words in the requirements from EPBC Reference: 2003/1294 and EPBC Reference: 2008/4178 are contained in (parentheses), except when they are abbreviations – this revision of this Plan has been approved to meet the requirements of MS 800 and MS 769.

Table 1-2: Condition Requirements Addressed in this Plan

Approval Decision	Condition No.	Condition Requirement	Section in this Plan
	The Plan shall (must) include the following:		
MS 800 MS 769	7.5 i	Management measures to reduce the adverse impacts (including from light and noise) from the construction and operation of the terrestrial facilities listed in Condition 6.3 (5.2) as far as practicable; and	Section 4
EPBC Reference: 2003/1294 and 2008/4178	6.5 i		
MS 800 MS 769	7.5 ii	Management measures to ensure that construction and operation of the terrestrial facilities (listed in 5.2) does (do) not cause Material or Serious Environmental Harm outside the Terrestrial Disturbance Footprint, including below the surface of the land.	Section 4
EPBC Reference: 2003/1294 and 2008/4178	6.5 I		
	The measures required by 7.5.i. and ii. (6.5 I and ii) shall address but not be limited to:		
MS 800 MS 769	7.6 i	Vegetation Clearing Audit Procedures to determine the extent of clearing and rehabilitation on an annual basis;	Section 4.5 Vegetation Clearing and Audit Common User Procedure (Ref. 28)
EPBC Reference: 2003/1294 and 2008/4178	6.6 I		
MS 800 MS 769	7.6 ii	Procedures in relation to and protocols for capturing, relocating, handling, housing, caring for and reporting to the DEC [now DBCA] threatened or listed fauna found within the Terrestrial Disturbance Footprint that are not required by DEC [now DBCA] for translocation;	Section 4.7 Fauna Handling and Management Common User Procedure (Ref. 27)
EPBC Reference: 2003/1294 and 2008/4178	6.6 II		
MS 800 MS 769	7.6 iii	Procedures to avoid secondary impacts to fauna as a consequence of risks such as animals being trapped in construction trenches or subject to vehicle strike;	Section 4.7 Fauna Handling and Management Common User Procedure (Ref. 27) Traffic Management Common User Procedure (Ref. 29)
EPBC Reference: 2003/1294 and 2008/4178	6.6 III		
MS 800 MS 769	7.6 iv	Measures including detailed drainage and containment designs for all works and infrastructure that control stormwater run-off outside the Terrestrial Disturbance Footprint with the aim of ensuring that runoff is consistent with the pre-development runoff regime as far as practicable, and any recharge does not cause pollution; and	Section 4.3
EPBC Reference: 2003/1294 and 2008/4178	6.6 IV		
MS 800 MS 769	7.6 v	Performance Standards against which achievement of the objectives of this condition can be determined.	Section 5
EPBC Reference: 2003/1294 and 2008/4178	6.6 V		
MS 800 MS 769	7.7	The Proponent shall report any Material or Serious Environmental Harm outside the Terrestrial Disturbance Footprint to the DEC [now DWER] and DEWHA [now DCCEEW] within 48 hours of detection.	Section 6

Approval Decision	Condition No.	Condition Requirement	Section in this Plan
EPBC Reference: 2003/1294 and 2008/4178	3.2	All plans, reports, programs or systems (however described) required under this approval must include the following elements:	
EPBC Reference: 2003/1294 and 2008/4178	3.2.1	a description of the EPBC listed species and their habitat likely to be impacted by the components of the action which are the subject of that plan, report, program or system (however described);	Appendix B
EPBC Reference: 2003/1294 and 2008/4178	3.2.2	an assessment of the risk to these species from the components of the action the subject of that plan, relevant to that plan, report, program or system (however described);	Appendix B
EPBC Reference: 2003/1294 and 2008/4178	3.2.3	details of the management measures proposed in relation to these species if it is a requirement of the condition requiring that plan, report, program or system (however described);	Section 4
EPBC Reference: 2003/1294 and 2008/4178	3.2.5	performance standards in relation to that species if it is a requirement of the condition requiring that plan, report, program or system (however described);	Section 5

Any matter specified in this Plan is relevant to the Gorgon Gas Development or Jansz Feed Gas Pipeline only if that matter relates to the specific activities or facilities associated with that particular development.

The sections in this Plan listed in Table 1-2 to meet the conditions of EPBC Reference: 2003/1294 and 2008/4178 shall be read and interpreted as only requiring implementation under EPBC Reference: 2003/1294 and 2008/4178 for managing the impacts of the Gorgon Gas Development on, or protecting, EPBC Act matters (see Appendix B). The implementation of matters required only to meet the requirements of MS 800 and MS 769 are not the subject of the EPBC Reference: 2003/1294 and 2008/4178.

2 Relevant Facilities and Activities

This Plan sets out management of potential environmental impacts to the terrestrial and subterranean environment from construction and operational activities associated with the terrestrial facilities falling under MS 800, MS 769, and EPBC Reference: 2003/1294 and 2008/4178 environmental approvals.

2.1 Terrestrial Facilities

This Plan applies to the Terrestrial Facilities of the Gorgon Gas Development and the Terrestrial Facilities of the Jansz Feed Gas Pipeline, which are shown in Figure 2-1. The Gorgon Gas Development Terrestrial Facilities are defined in Condition 6.3 of MS 800 and Condition 5.2 of EPBC Reference: 2003/1294 and 2008/4178 as the:

- Gas Treatment Plant
- Carbon Dioxide Injection system
- Associated Terrestrial Infrastructure forming part of the proposal
- Areas impacted for seismic data acquisition
- Onshore Feed Gas Pipeline System and terrestrial component of the shore crossing.

Terrestrial Facilities also include those defined in Condition 6.3 of MS 769 (the Onshore Feed Gas Pipeline System and terrestrial component of the Shore Crossing) and those defined in Schedule 1 of MS 965 (the Additional Support Area) (Ref. 8).

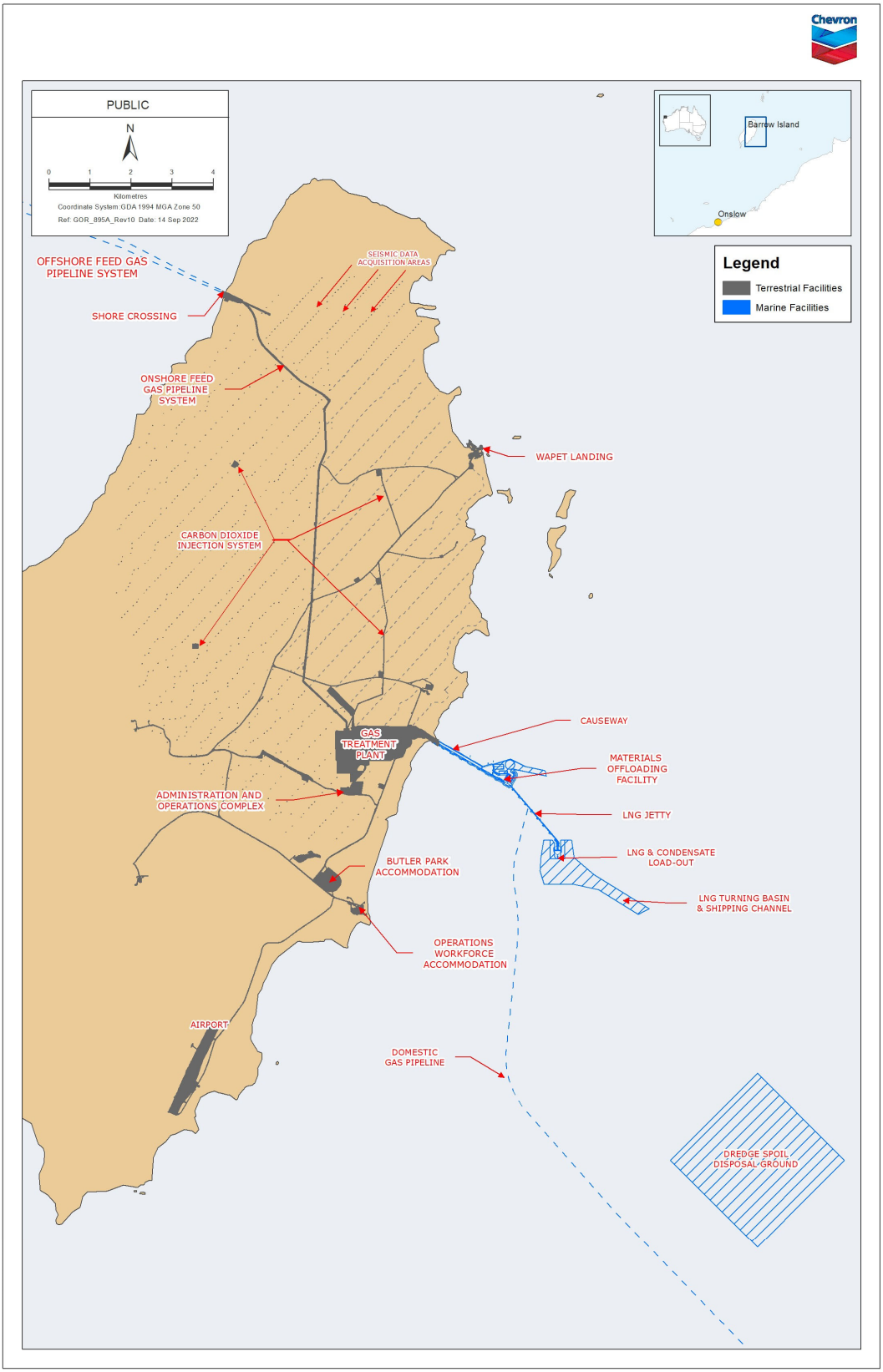

Figure 2-1: Gorgon Gas Development Facilities on Barrow Island

3 Risk Assessment

CAPL has prepared the ABU OE Risk Management Process (Ref. 30) to assess and manage health, environment, and safety (HES) risks, which it internally requires its employees, contractors, etc. to comply with.

A number of environmental risk assessments have been completed for the Gorgon Gas Development. A strategic risk assessment was undertaken during the preparation of the Draft EIS/ERMP to determine the environmental acceptability of the Development, and to identify key areas of risk requiring mitigation (Ref. 11).

This original assessment was reviewed as part of the development of the Gorgon Gas Development Revised and Expanded Proposal (Ref. 12), in light of the changes to the Gorgon Gas Development (described in Section 1.3). The outcomes of these assessments have been reviewed and considered during the preparation of this Plan.

Impacts from the Jansz Gas Feed Pipeline on Barrow Island and the surrounding State territorial waters have been assessed in the Draft EIS/ERMP (Ref. 11).

Impacts from the Jansz Feed Gas Pipeline in Commonwealth Marine Area have been assessed in the EPBC Referral assessment processes (Ref. 32, Ref. 33).

Additional detailed risk assessments have been undertaken for specific scopes of work, using CAPL's RiskMan2 Procedure (Ref. 31).

The Gorgon Gas Development Environmental Basis of Design (Ref. 21) defines the environmental design requirements for the Gorgon Gas Development facilities. Deviations from the requirements of the Environmental Basis of Design document have been subjected to an As Low As Reasonably Practicable (ALARP) assessment and environmental risks should be managed to ALARP levels and lower (i.e. the risk acceptability test is applied to design decisions).

Table 3-1 summarises the risk assessments that have been undertaken to date, and that have provided input into this Plan.

Table 3-1: Risk Assessments Relevant to this Plan

Scope of Risk Assessment	Method	Documentation	Year
Entire Scope of the Approved Development	AS/NZS 4360:2004	Draft Environmental Impact Statement/Environmental Review and Management Programme (EIS/ERMP; Ref. 11)	2005
Entire Scope of the Revised and Expanded Proposal	AS/NZS 4360:2004	Gorgon Gas Development Public Environmental Review (PER; Ref. 12)	2008

3.1 Methodology

The methodology for the environmental risk assessments undertaken during the EIS/ERMP process is documented in Chapter 9 of the Draft EIS/ERMP (Ref. 11).

The risk assessments were undertaken in accordance with the following standards:

- Australian Standard/New Zealand Standard (AS/NZS) 4360:2004 Risk management (Standards Australia/Standards New Zealand 2004b)

- AS/NZS Handbook 203:2006 Environmental Risk Management – Principles and Process (Standards Australia/Standards New Zealand 2006)
- AS/NZS 3931:1998 Risk Analysis of Technological Systems – Application Guide (Standards Australia/Standards New Zealand 1998).

The main components of the RiskMan2 risk assessment methodology include:

- **Hazard Identification:** Identifying potential hazards that are applicable to Gorgon Gas Development activities and determining the hazardous events to be evaluated.
- **Hazard Analysis:** Determining the possible causes that could lead to the hazardous events identified; the consequences of the hazardous events; and the safeguards and controls currently in place to mitigate the events and/or the consequences.
- **Risk Evaluation:** Evaluating the risks using the Chevron Integrated Risk Prioritization Matrix (Appendix C). The risk ranking is determined by a combination of the expected frequency of the hazard occurring (likelihood) and the consequence of its occurrence. Note that when assessing the consequence, no credit is given to the hazard controls; hazard controls are taken into account in determining the likelihood of the event.
- **Residual Risk Treatment:** Reviewing the proposed management controls for each of the risks identified and proposing additional controls or making recommendations, if required.

Using the Chevron Integrated Risk Prioritization Matrix (Appendix C), identified risks are categorised into four groups, which determine the level of response and effort in managing the risks. The risk-ranking categories have been used in the development of this Plan to determine whether the residual risks were acceptable or whether further mitigation was required.

3.2 Outcomes

The potential impacts associated with the Gorgon Gas Development and Jansz Feed Gas Pipeline are described in detail in the Draft EIS/ERMP (Ref. 11) and Gorgon Gas Development PER (Ref. 12). These impacts and the residual risks are summarised in Table 3-2. These risks have been categorised into risks related to the different phases, e.g. Construction, Commissioning, Non-routine or Routine Operations. Information on the potential impacts and residual risks identified for the CO_2 Seismic Baseline Survey Program is provided in the CO_2 Seismic Baseline Survey Program Environmental Management Plan (Ref. 13).

The major environmental issues investigated during the environmental assessment process for the Revised Proposal included cumulative air, light, and noise emissions impacts. The cumulative risk for the terrestrial environment on Barrow Island has been ranked as Medium (with mitigation safeguards in place when assessing consequence) (Ref. 11). This risk level is related to the remote likelihood of a combination of threats that together are critical threats (i.e. widespread, long-term impact on populations or extinction of a Barrow Island race of a listed species) to terrestrial fauna and flora on Barrow Island.

The cumulative risk for the subterranean environment on Barrow Island was also ranked as Medium (with mitigation safeguards in place when assessing consequence) (Ref. 11). This risk level is related to the remote likelihood of a critical threat to a subterranean fauna population such as through a catastrophic

release of CO_2 into the superficial aquifer, leading to the loss of local populations of listed fauna.

Additional potential impacts related to associated stressors were identified through consultation with DEC (now DBCA/DWER) in August 2009 and these are included in Table 3-2 (identified with *). However, because these potential impacts were incorporated subsequent to the risk assessment and identification of residual risks during the EIS/ERMP process, the residual risk rating for each stressor (i.e. low, medium, or high) has not been reclassified.

As a result of approval under Section 45C of the EP Act for the use of sea water for construction earthworks on the GTP, additional consultation occurred with DEC (now DBCA/DWER) in April 2010, which resulted in the inclusion of sea water and its potential impacts in the risk assessment (identified with ^ in Table 3-2; see also Appendix B).

3.3 Risk to Matters of National Environmental Significance

Condition 3.2.1 of EPBC Reference: 2003/1294 and 2008/4178 requires a description of the EPBC Act listed species likely to be impacted by the components of the action that is the subject of this Plan. That description is provided in the Identification of Terrestrial and Subterranean Matters of National Environmental Significance (NES) and their Habitat, as amended from time to time (Ref. 34; Appendix B).

A detailed definition and description of the significant ecological elements on Barrow Island, which include relevant matters of NES, is contained in the TSBSEIR (Ref. 14) and the Draft EIS/ERMP (Ref. 11).

Condition 3.2.2 of EPBC Reference: 2003/1294 and 2008/4178 requires an assessment of the risk to EPBC Act listed species from the components of the action. The risks identified during the assessments noted in Table 3-1 include the risks to the listed species in Ref 34; Appendix B.

Table 3-2: Residual Risks Associated with Environmental Factors

Environmental Factor	Stressor	Causes	Potential Impacts	Residual Risk[1]
Soil and Landform	Clearing and earthworks	**Construction and Commissioning** Clearing and earthworks associated with construction of the Terrestrial Facilities (e.g. trenching, access tracks, laydown areas).	• soil compaction • soil inversion • disturbance to significant geological features (e.g. caves) • changes in landform • *erosion, caused by wind, water, and sedimentation	M
		Operations Minor clearing and earthworks. Re-clearing survey lines for CO_2 seismic survey program, every 5–10 years.		L
	Liquid and solid waste disposal	**Construction and Commissioning** Generation and disposal of liquid and solid wastes including: hydrotest water; domestic waste and sewage; waste chemicals and oil; drilling waste (e.g. drilling cuttings and fluid); produced formation water.	• soil contamination • *erosion, caused by wind, water, and sedimentation	M
		Operations Generation and disposal of liquid and solid waste, including: domestic waste and sewage; waste chemicals and oil, drilling waste (e.g. drilling cuttings and fluid) and produced formation water.		L
	Leaks or spills	**Construction, Commissioning and Non-routine Operations** Spill during storage and transport of fuel or hazardous material; spill or leak during waste storage and disposal; failure of plant, equipment, or pipelines; leakage of storage tanks and bunds; horizontal directional drilling fluid release.	• soil contamination • *erosion, caused by wind, water, and sedimentation	M
	^Seawater application	**Construction** Use of sea water for earthworks associated with construction of the GTP.	• increase in salinity levels in soil profile • alterations to vegetation rehabilitation	M

Environmental Factor	Stressor	Causes	Potential Impacts	Residual Risk[1]
Surface and Groundwater	Clearing and earthworks	**Construction and Commissioning** Clearing and earthworks associated with construction of the Terrestrial Facilities (e.g. access tracks and laydown areas).	• sedimentation of natural drainage systems • disturbance to natural drainage patterns	M
		Operations Minor clearing and earthworks. Re-clearing survey lines for CO_2 seismic survey program, every 5–10 years.		L
	Physical presence	**Construction, Commissioning, and Operations** Presence of sealed/hardstand areas associated with the Terrestrial Facilities.	• change in water infiltration and recharge rates • increased run-off • change in groundwater level • *altered drainage patterns	M
	Liquid and solid waste disposal	**Construction and Commissioning** Generation and disposal of liquid and solid wastes including: hydrotest water; domestic waste and sewage; waste chemicals and oil; drilling waste (e.g. drilling cuttings and fluid); produced formation water. Use of drilling muds.	• surface water and groundwater contamination • local loss of stygofauna	M
		Operations Generation and disposal of liquid and solid waste, including: domestic waste and sewage; and waste chemicals and oil; drilling waste (e.g. drilling cuttings and fluid) and produced formation water.		L
	Leaks or spills	**Construction, Commissioning, and Non-routine Operations** Spill during storage and transport of fuel or hazardous material; spill or leak during waste storage and disposal; failure of plant, equipment, or pipelines; leakage of storage tanks and bunds; horizontal directional drilling fluid release.	• surface water and groundwater contamination • local loss of stygofauna	M

Environmental Factor	Stressor	Causes	Potential Impacts	Residual Risk[1]
	^Seawater application	**Construction** Use of sea water for earthworks associated with construction of the GTP.	• surface water and groundwater contamination (salinity) • local increase in groundwater levels and mounding • local loss of troglofauna and stygofauna	M
Air Quality	Atmospheric emissions	**Construction, Commissioning and Operations** Combustion and fugitive emissions including SO_2, NO_x, CO_2, CO, CH_4, NMVOCs, H_2S, Hg and particulates. Low levels of vehicle and equipment exhaust (NO_x, SO_x). **Commissioning and Non-routine Operations** CO_2 leak; pipeline or equipment failure; flaring; smoke and particulates from fire; gas venting during start-up, shutdown and upset conditions .	• decrease in local and regional air quality • decrease in global air quality resulting from greenhouse gas emissions	L
	Clearing and earthworks	**Construction and Commissioning** Dust generation associated with clearing, earthworks, and vehicle movements.	• localised reduction in air quality	L
		Operations Localised dust generation associated with minor clearing, earthworks, and vehicle movements. Wind erosion of unsealed surfaces.		L
Flora and Vegetation Communities	Clearing and earthworks	**Construction and Commissioning** Clearing and earthworks associated with construction of the Terrestrial Facilities (e.g. access tracks and laydown areas).	• loss and/or disturbance to restricted flora and vegetation species and communities • erosion or removal of topsoil and seed bank • spread of *Setaria verticillata* (associated with construction of the Shore Crossing for the Feed Gas Pipeline System) • change in soil profile and drainage due to earthworks may change dominance patterns in communities	H (restricted flora and vegetation communities)
		Operations Minor clearing and earthworks. Re-clearing survey lines for CO_2 seismic survey program, every 5–10 years.		L (restricted flora and vegetation communities)
		Construction, Commissioning, and Operations Minor clearing and earthworks.		L

Environmental Factor	Stressor	Causes	Potential Impacts	Residual Risk[1]
		Re-clearing survey lines for CO_2 seismic survey program, every 5–10 years.		(general flora and vegetation communities)
	Fire	**Construction and Commissioning** Ignition during drilling and blasting, welding or grinding activities; vehicle exhausts. **Operations** Ignition during maintenance activities; vehicle exhausts; fallout of burning particles from flare.	• long-term loss of vegetation community • alteration of vegetation community composition • maintenance of unnatural fire regime to protect infrastructure with consequent loss of habitat diversity • secondary effects if infrastructure damaged (e.g. may cause leakage of greywater pipes)	M
	Atmospheric emissions	**Construction, Commissioning and Operations** Low levels of vehicle and equipment exhaust (NO_x, SO_x). Combustion and fugitive emissions including SO_2, NO_x, CO_2, CO, CH_4, NMVOCs, H_2S, Hg and particulates. **Commissioning and Non-routine Operations** CO_2 leak; pipeline or equipment failure; flaring; smoke and particulates from fire; gas venting during start-up, shutdown and upset conditions.	• physiological effects of deposition of pollutants on flora and vegetation • localised change in taxon dominance due to nitrogen enrichment and soil acidity • alteration of community composition • reduced growth due to soil acidity or CO_2 • increased growth due to uptake of nitrogen or CO_2	L
	Light/ shade/ heat/ cold	**Construction, and Commissioning and Operations** Temporary shading from stockpiles, temporary equipment, etc. Heat and reflected light from infrastructure.	• decrease in plant growth or localised loss of vegetation within shaded areas	L
	Dust	**Construction and Commissioning** Clearing and earthworks associated with construction of the Terrestrial Facilities (e.g. access tracks and laydown areas); vehicle and machinery movements on unsealed roads and exposed surfaces; wind erosion of stockpiles; rock crushing and screening.	• reduced photosynthetic activity of plants (Thompson *et al.* 1984) • increased absorption of near-infrared radiation and elevated leaf temperatures (Sharifi *et al.* 1997)	L

Environmental Factor	Stressor	Causes	Potential Impacts	Residual Risk[1]
		Operations Localised dust generation associated with minor clearing, earthworks, and vehicle movements. Wind erosion of unsealed surfaces.		
	Unpredicted CO_2 migration	**Non-routine Operations** Failure of CO_2 injection facilities; failure of subsurface containment.	• increased or decreased plant growth depending on concentration of CO_2 • mortality of plants in the event of an ongoing severe leak	L
	Leaks or spills	**Construction, Commissioning, and Non-routine Operations** Spill during storage and transport of fuel or hazardous material; spill or leak during waste storage and disposal; failure of plant, equipment, or pipelines; leakage of storage tanks and bunds; horizontal directional drilling fluid release	• localised loss of vegetation • reduced plant growth • soil contamination affecting regrowth • *soil erosion • *altered vegetation association	L
	^Seawater application	**Construction** Use of sea water for earthworks associated with construction of the GTP.	• overspray or surface water run-off onto vegetation • decrease in plant growth or localised loss of vegetation • alterations to vegetation rehabilitation	M
Terrestrial Fauna	Clearing and earthworks	**Construction and Commissioning** Clearing and earthworks associated with construction of the Terrestrial Facilities (e.g. access tracks and laydown areas).	• direct displacement or loss of individuals • increased resource competition in adjacent areas • habitat fragmentation • *habitat loss	M
		Operations Minor clearing and earthworks. Re-clearing survey lines for CO_2 seismic survey program, every 5–10 years.		L
	Physical interaction (including vehicle movements)	**Construction and Commissioning** Vehicular traffic; operation of equipment and machinery; workforce activities; presence of infrastructure.	• direct behavioural disturbance • injury or fatality (i.e. road kill)	M

Environmental Factor	Stressor	Causes	Potential Impacts	Residual Risk[1]
		Operations As above, but at lower frequency.	• possible obstruction of fauna movements • *habitat fragmentation • *habitat loss	
	Leaks or spills	**Construction, Commissioning, and Non-routine Operations** Spill during storage and transport of fuel or hazardous material. spill or leak during waste storage and disposal; failure of plant, equipment, or pipelines; leakage of storage tanks and bunds; horizontal directional drilling fluid release.	• smothering or acute toxicity to habitat and/or fauna • chronic toxicity to sensitive habitat and/or fauna • increased risk of fire • *drowning and/or other mortality	L
	Light or shade	**Construction and Commissioning** Shading from infrastructure. Artificial lighting at night from construction sites and flare. **Operations** As above. **Commissioning and Non-routine Operations** Flaring during process upset or emergency.	• congregation of fauna in shaded areas • risk to sheltering fauna from periodically moving machinery • possible increase in range of shade-dependent fauna • attraction of insects to light may increase the availability of food for adaptable birds and bats • possible changes in community structure in area affected by light spill	M
	Atmospheric emissions	**Construction, Commissioning and Operations** Low levels of vehicle and equipment exhaust (NO_x, SO_x). Combustion and fugitive emissions including SO_2, NO_x, CO_2, NMVOCs, H_2S, Hg and particulates. **Commissioning and Non-routine Operations** CO2 leak; pipeline or equipment failure; flaring; smoke and particulates from fire; gas venting during start-up, shutdown and upset conditions..	• sub-lethal effect from inhalation of pollutants • sub-lethal effect from ingestion of pollutant on vegetation or in water • potential direct toxic effect on fauna from non-routine emission of H_2S or BTEX • asphyxiation from CO_2 inhalation in burrows or low-lying habitats	L
	Dust	**Construction and Commissioning** Clearing of vegetation and removal of topsoil.	• minor physiological effects on fauna in immediate area	L

Environmental Factor	Stressor	Causes	Potential Impacts	Residual Risk[1]
		Earthmoving, such as levelling of the site, excavation, drilling, and transport of fill within the site. Movement of heavy machinery and vehicles on unpaved surfaces. Blasting. **Operations** Localised dust generation associated with minor clearing, earthworks, and vehicle movements. Wind erosion of unsealed surfaces.	• negligible effects on vegetated habitats and forage plants	
	Unpredicted CO_2 migration	**Non-routine Operations** Failure of CO_2 injection facilities or subsurface containment. Emergency venting of CO_2 to atmosphere if injection system breaks down.	• release of large volumes of CO_2 to the atmosphere with potential for accumulation at ground surface during still weather • asphyxiation of fauna in low-lying areas (e.g. fauna burrows) • exceedance of greenhouse gas emissions budget	L
	Heat and/or cold	**Construction, Commissioning and Operations** Heat from sources such as power generators, turbines, air coolers, flare, pipelines, earthmoving equipment, welding units, and vehicles. Cold from pipelines. Feed gas pipeline will be at ambient temperature.	• heat plume from flare and air coolers could injure/kill birds flying over Gas Treatment Plant • attraction of insects and reptiles to heat in cold weather • *attraction of fauna to shelter in or under piping and to moisture	L
	Noise and vibration	**Construction, Commissioning** Blasting; Earthworks; vehicle movements, and the operation of equipment. Seismic survey.	• physiological impacts to fauna in immediate vicinity due to blast overpressure • short-term behavioural changes • disturbance of fauna in vicinity of seismic source discharges	M
		Operations GTP operation; operation of vehicles and equipment; flaring; seismic survey program every 5–10 years.		M
	Fire	**Non-routine Construction, Commissioning, and Operations**	• temporary loss of habitat • injury or mortality in fire	M

Environmental Factor	Stressor	Causes	Potential Impacts	Residual Risk[1]
		Vehicles, drilling and blasting activities, and welding sparks are potential ignition sources. Flare event dislodging hot build-up from inside ground flare. Run-off of water or foam used in fire control near infrastructure.	• damage to infrastructure potentially causing gas or liquid leaks • effects on soil or water quality from run-off containing nutrients and chemicals	
Subterranean Fauna	Clearing and earthworks	**Construction and Commissioning** Clearing and earthworks for the GTP and associated infrastructure. Excavation of material to a depth of 8 m during site preparation. Use of drilling muds. Shallow blasting of cap rock over 40–60% of the GTP site. Installation of ~750 piles, possibly to a depth of ~32 m.	• direct loss of troglofauna and habitat within GTP Footprint • run-off during construction causing sedimentation of aquifer • localised loss of stygofauna	H
		Operations Minor clearing and earthworks.		L
	Physical presence	**Construction, Commissioning, and Operations** Impermeable surfaces with no groundwater recharge over 30–40% site (45–60 ha).	• reduced groundwater recharge under the GTP affecting humidity and groundwater in subterranean environment where surface water is diverted to drains • local loss of troglofauna and stygofauna	M
	Wastewater discharge	**Construction, Commissioning, and Operations** Use of treated greywater to control dust.	• contamination and nutrient loading of subterranean habitats at the GTP site	M
	Noise and vibration	**Construction and Commissioning** Shallow blasting of cap rock over 40–60% of the GTP site. Installation of ~750 piles, possibly to a depth of ~32 m.	• direct loss of habitat or rupture of subsurface karst lenses • vibration effects (sedimentation/partial collapse of karstic formations) • *local loss of troglofauna and stygofauna	M
	Leaks or spills	**Construction, Commissioning, and Non-routine Operations**	• potential contamination of subterranean habitat	M

Environmental Factor	Stressor	Causes	Potential Impacts	Residual Risk[1]
		Spill during storage and transport of fuel or hazardous material; spill or leak during waste storage and disposal; failure of plant, equipment, or pipelines; leakage of storage tanks and bunds; horizontal directional drilling fluid release.	• acute toxicity to troglofauna and/or stygofauna	
	Unpredicted CO_2 migration	**Non-routine Operations** Failure of CO_2 injection facilities or subsurface containment.	• acidification of groundwater with potential loss of stygofauna • potential for leaking CO_2 to settle above the watertable (due to difference in density to water and air) affecting troglofauna (i.e. asphyxiation)	L
	^Seawater application	**Construction** Use of sea water for earthworks associated with construction of the GTP.	• groundwater contamination (salinity) • local increase in groundwater levels and mounding • local loss of troglofauna and stygofauna	M

Notes:

1 L=Low, M=Medium, H=High.

** Stressors identified in consultation with the WA Department of Parks and Wildlife (in August 2009; now DBCA), subsequent to a full risk assessment process being undertaken as part of the EIS/ERMP (Ref. 11).*

^ Stressors identified in consultation with the WA Department of Parks and Wildlife (in April 2010; now DBCA), subsequent to a full risk assessment process being undertaken as part of the EIS/ERMP (Ref. 11).

3.4 Terrestrial Disturbance Footprint

In relation to the Terrestrial Disturbance Footprint (TDF), the objectives for management of potential impacts, as stated in Condition 7.4 of MS 800 and MS 769, and Condition 6.4 of EPBC Reference: 2003/1294 and 2008/4178, are to:

- reduce the adverse impacts from the construction and operation of the Terrestrial Facilities within the Terrestrial Disturbance Footprint as far as practicable (MS 769)
- reduce the adverse impacts from the construction and operation of the Terrestrial Facilities as far as practicable (MS 800 and EPBC Reference: 2003/1294 and 2008/4178)
- ensure the construction and operation of the Terrestrial Facilities does not cause Material or Serious Environmental Harm outside and below the Terrestrial Disturbance Footprint (MS 769)
- ensure the construction and operation of the Terrestrial Facilities does not cause Material or Serious Environmental Harm outside the Terrestrial Disturbance Footprint, including below the surface of the land (MS 800 and EPBC Reference: 2003/1294 and 2008/4178).

The TDF is as defined in the Terrestrial and Subterranean Baseline State and Environment Impact Report (Ref. 14), as amended from time to time. The TDF includes the Gorgon Gas Development and Jansz Feed Gas Pipeline Footprints and a zone beyond them that contains the area that may be disturbed by construction or operations activities associated with the Terrestrial Facilities. In accordance with Condition 7.4 of MS 800, CAPL will aim to reduce adverse impacts from the construction and operation of the Terrestrial Facilities as far as practicable. As required under Condition 7.4 of MS 769, CAPL will also aim to reduce Material and Serious Environmental Harm from the construction and operation of the Terrestrial Facilities as far as practicable inside the TDF (excluding the Gorgon Gas Development Footprint), noting that CAPL shall not cause or allow Material or Serious Environmental Harm outside the TDF (in accordance with Condition 6.6 of MS 800).

The environmental management measures proposed for reducing adverse impacts from Gorgon Gas Development and Jansz Feed Gas Pipeline activities are discussed in Section 4.

4 Management Measures

4.1 Overview

Measures to reduce adverse impacts associated with the Gorgon Gas Development and Jansz Feed Gas Pipeline were developed and included in the Draft EIS/ERMP (Ref. 11). Environmental management measures were also derived from the risk assessments conducted to date, discussions with stakeholders, and lessons learned from existing developments. The management measures proposed meet the objectives set out in Section 1.4.2, and primarily relate to management within the TDF for activities associated with the Gorgon Gas Development and Jansz Feed Gas Pipeline.

The management measures have been incorporated into this Plan where appropriate. CAPL implements a systematic approach towards implementing environmental management measures associated with the Gorgon Gas Development and Jansz Feed Gas Pipeline.

The following sections outline management measures for the key environmental stressors identified in Table 3-2, and align with those measures that meet Condition 7.6 of MS 800 and MS 769, and Condition 6.6 of EPBC Reference: 2003/1294 and 2008/4178. The key environmental risks were identified from proposal-related stressors having a residual risk level of medium or high (see Section 3.1). The stressors are:

- liquid and solid waste disposal (Section 4.2)
- leaks or spills (Section 4.4)
- clearing and earthworks (Section 4.5)
- physical presence (surface water management) (Section 4.3)
- fire (Section 4.6)
- physical interaction (including vehicle movements) (Section 4.7)
- light and shade (Section 4.8)
- noise and vibration (Section 4.9)
- wastewater discharge (Section 4.2)
- seawater application.

Management measures are either described or referenced to the relevant documentation in the following sections. In addition, the management of stormwater, including detailed drainage and containment design, is also described below as required by Condition 7.6.iv of MS 800 and MS 769 and Condition 6.6.iv EPBC Reference: 2003/1294 and 2008/4178.

The measures outlined below include the measures required in respect of the matters of National Environmental Significance (NES) listed in the TSBSEIR (Ref. 14), as required by EPBC Reference: 2003/1294 and 2008/4178.

4.2 Solid and Liquid Waste Disposal (including Wastewater Discharge)

A Solid and Liquid Waste Management Plan (SLWMP; Ref. 15) is required under Condition 30.1 of MS 800, Condition 16.1 of MS 769, and Condition 20 of EPBC Reference: 2003/1294 and 2008/4178. The management of solid and liquid waste, except surface-collected liquid wastes (e.g. stormwater) and closed drains, is

described in the SLWMP. Therefore, this Terrestrial and Subterranean Environment Protection Plan focuses on the management of surface water (stormwater and surface water run-off).

4.3 Surface Water Management

4.3.1 Environmental Design Objectives

In relation to the design of the surface water drainage systems, the key considerations for minimising environmental impact are to:

- mirror as closely as reasonably practicable the natural hydrological regime of the existing environment
- minimise contamination of surface and ground water of the surrounding environment
- maximise infiltration of clean stormwater, where practicable, to minimise environmental impact to stygofauna.

In relation to mirroring the natural hydrological regime, the drainage system is designed to collect uncontaminated stormwater and redistribute it to the groundwater aquifer and to the surrounding terrestrial environment in a manner that minimises channelisation and erosion. Infiltration to the groundwater table beneath the GTP, Butler Park, and the Administration Area will be facilitated by maximising unpaved areas, where practicable, and by integrating special design features in the uncontaminated stormwater and surface water run-off drain systems.

In relation to contamination, the surface water drainage system is designed to segregate, intercept, treat, and/or dispose of streams of potential contamination from the GTP. The specific systems for surface water management were outlined in detail in the GTP works approval and are subject to ongoing regulation via the Gorgon LNG Project Part V licence.

The management of seawater application for construction earthworks on the GTP is discussed in Section 4.10.

4.3.2 Stormwater and Surface Run-off System Overview

The stormwater and surface water run-off system is intended to be designed as a segregated system depending on the level of contamination or origin of the intercepted surface water. Treatment and/ or disposal is provided commensurate to the level of contamination. The system includes (see Figure 4-1):

- Class 1 Drainage System: Run-off from areas of the GTP or associated terrestrial infrastructure, which are deemed to be always or frequently contaminated, are collected via the Class 1 Drainage System. The drainage is treated to a level required for its co-disposal along with the process and sanitary wastewater collected from the GTP into the designated produced water disposal wells. Contaminated run-off from the Class 1 catchment area will be transferred via a closed piping system to an oily water collection tank and then piped to a Corrugated Plate Interceptor (CPI) for oil/water separation. Oil and sludge accumulate in the CPI and is periodically removed and disposed of in line with the requirements of the SLWMP (Ref. 15). The treated effluent will be piped to the waste water disposal tanks and disposed of via dedicated disposal wells. Some infrequent, small flows of contaminated

process waters will also be drained into the Class 1 contaminated drainage system.

- Class 2 Drainage System: Potentially contaminated run-off from areas of the GTP or associated terrestrial infrastructure and uncontaminated process water such as demineralised water, potable water, service water, and condensed water are collected and closed-piped to the Stormwater Holding Pond, tested, and if found to meet appropriate environmental discharge criteria, discharged to the clean stormwater system (Class 3 Drainage System). If the water quality is found to exceed the environmental discharge criteria, the collected run-off is disposed via the dedicated produced water disposal wells. Water quality acceptance criteria for the Class 2 potentially contaminated run-off are defined within the Gorgon LNG Project Part V licence. The first flush (i.e. first 25 mm) of stormwater run-off from the Class 2 catchment areas is considered potentially contaminated. Clean water (volumes exceeding the initial 25 mm first flush) overflows to the Class 3 system and is ultimately discharged to the terrestrial environment.
- Class 3 Drainage System: The Class 3 system covers uncontaminated stormwater from clean areas (Class 3 drainage) and overflow (post first flush volumes) from the Class 2 system at the GTP. Class 3 drains are also provided at Butler Park, and the Administration and Operations Complex (collecting run off from areas such as building roofs and open areas away from equipment). Class 3 drainage is collected and diverted to the terrestrial environment in a manner that minimises sediment carryover and prevents erosion.
- Class 4 Drainage System: Off-site drainage channels intercepted as a result of the selected location for the GTP, Butler Park (Construction Village), and Administration and Operations Complex have been diverted away from these facilities to the natural environment using measures such as cut-off drains at the top of the cut batters or perimeter drains diverting water to the weired stormwater ditches of the Class 3 system.

Paving or concrete (i.e. ‘paved areas’) segregates the four drainage system classes. Paved areas include:

- areas required to be load bearing
- areas subject to contamination by spillages that could damage natural ground and water systems or exceed site discharge limits for aqueous effluents.

Paving in areas where spillages may occur are sloped into the appropriate collection systems leading to one of the three segregated drainage systems (Class 1, Class 2, or Class 3) or to a closed bund or sump, thus providing a facility for removal by a vacuum truck.

Rainwater on unpaved areas and roads in excess of the rainwater filtered to the ground is routed to the uncontaminated Class 3 drainage system and discharged to the surrounding terrestrial environment in a manner that minimises channelisation and erosion.

4.3.3 Management Measures to Minimise Environmental Impacts

4.3.3.1 Design and Operation of Stormwater and Surface Run Off System

The following requirements are intended to be met by the Class 1 drainage system, where practicable:

- An appropriate specification will be applied to all piping and drainage channel design to minimise the risk of leakage to the environment and contamination of soil and groundwater.
- Underground piping or drainage system components transporting contaminated run-off will be managed to ensure adequate leak detection.
- The Class 1 drainage system will incorporate a water trap or similar device that will form a barrier to hydrocarbon vapour and liquids, including LNG, entering the drainage system.
- Class 1 run-off will pass through a Corrugated Plate Interceptor (CPI) to separate the dispersed oil fraction prior to disposal via the produced water disposal wells.
- Remote Class 1 run-off will be collected and disposed of via a vacuum truck to the Oily Water Collection Tank or other appropriate tie in to the system.

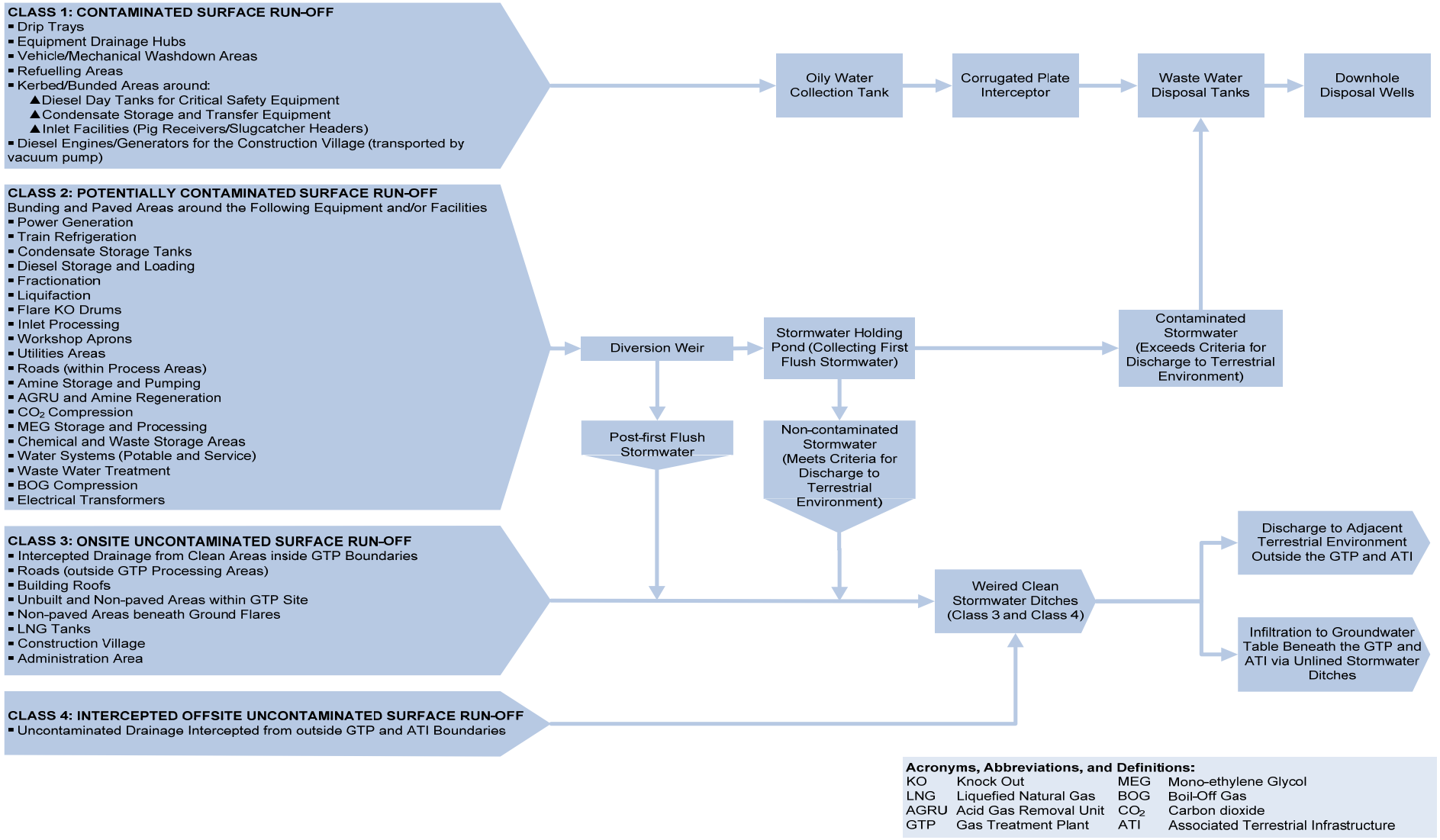

Figure 4-1: Overview of the Gorgon GTP Stormwater and Surface Water Run-off System

The following requirements are intended to be met by the Class 2 drainage system, where practicable:

- Management of the Stormwater Holding Pond will allow sediment to settle and hydrocarbons are skimmed as required.
- An appropriate specification will be applied to all piping and drainage channel design to minimise the risk of leakage to the environment and contamination of soil and groundwater to as low as reasonably practicable.
- Underground piping or drainage system components transporting potentially contaminated run-off will be managed to ensure adequate leak detection.
- The design of the Class 2 drainage system will incorporate a water trap or similar device that will form a barrier to hydrocarbon vapours and liquids, including LNG, entering the drainage system.
- Class 2 drainage trenches surrounding process equipment that is capable of spilling flammable liquids, including LNG or refrigerant, will be segregated into fire zones through the use of separation barriers extending up half the depth of the trench such that volumes of LNG or refrigerant exceeding the capacity of that section of trench will flow into the next section of trench rather than overflowing to adjacent unpaved areas. Each section of trench will incorporate a water trap connection to the Class 2 drainage system header.
- Firewater from the Class 2 catchment areas will be collected until volumes exceed the capacity of the Stormwater Holding Pond, at which point firewater will be diverted to the Class 3 drains. (Note: the Stormwater Holding Pond and associated Class 2 piping can hold the equivalent volume of firewater used in a four-hour firefighting event associated with a major fire within the GTP before the water requires diversion).Bund requirements within the Class 2 catchment area are outlined in Section 4.3.3.2.
- The Stormwater Holding Pond will be equipped with adequate containment and leak detection.

The following requirements are intended to be met by the Class 3 drainage system, where practicable:

- The Class 3 drainage system will be an open drain system, which is designed to minimise suspended sediment discharge to the environment.
- The Class 3 drainage system will mirror the natural hydrological cycle as close as reasonably practicable by:
    - minimising erosion and sediment carryover both within the GTP, Butler Park , and the Administration and Operations Complex sites, and at discharge points to the environment through the use of erosion control measures including vegetation cover, jute mesh or geotextile, rip-rap or stone pitching, gabions and grout-filled mattresses, concrete or concrete-filled bags, drop structures and chutes, pipes, ‘D’ base channels, weirs, ripping or ‘moonscaping’.
    - redistributing clean stormwater collected within the Class 3 drains via infiltration drains to ensure groundwater recharge; and redistribution trenches to prevent redistribution through channels or point sources.
- The Class 3 drain system will accept clean overflow from the Class 2 and Class 4 systems.

- The size, cross-sectional shape, and gradient of channels will be designed to avoid scouring and sudden changes in velocity. Channels with high velocities are intended to be lined, while drop structures will be constructed where slopes are steep.

The following requirements are intended to be met by the Class 4 drainage system, where practicable:

- The size, cross-sectional shape, and gradient of the channel will be designed to avoid scouring and sudden changes in velocity. Channels with velocities sufficient to cause significant scour are intended be lined, while drop structures should be constructed where slopes are steep.
- The Class 4 drainage system will mirror the natural hydrological cycle as close as reasonably practicable by:
  - diverting and redistributing run-off high in the catchment
  - minimising sediment carryover to the environment
  - using vegetation cover to ensure that any collection and redistribution of flow minimises erosion. Where there is insufficient vegetation cover, alternatives may include the use of jute mesh or geotextile, rip-rap or stone pitching, gabions and grout-filled mattresses, concrete or concrete-filled bags, drop structures and chutes, pipes, base channels, weirs, ripping or 'moonscaping'.

Operation of the drainage system is subject to ongoing regulation via the EP Act Part V licence for the Gorgon LNG Project.

4.3.3.2 Bunding and Curbing

Bunding or curbing is intended to be provided around hazardous liquid material storage, including in chemical, hydrocarbon, and hazardous waste storage areas and areas where spills of hazardous liquids could occur.

The following is a summary of the key design requirements for temporary and permanent bunds:

- Bunding will be provided for hazardous liquid storage volumes equal or greater than 250 litres. Smaller vessels will be stored in chemical storage areas, which also need to be bunded.
- Temporary and permanent bunds will be constructed using waterproof reinforced concrete, steel, or an alternative material, which is deemed to be appropriate for the specific application.
- Temporary bunding facilities for use during construction will be designed to the same standard as permanent facilities, where practicable. As such it may be advantageous to provide self-bunded tanks for temporary installations where practicable.
- Portable bunding may be used. Acceptable forms of portable bunding include self-bunded pallets (stored undercover when there is a risk of rain) and self-bunded tanks.
- All components of bunds must be impervious and chemically resistant to the liquid contained. Bunds with the potential to collect flammable and combustible substances will be constructed of fire-resistant materials.

- Tanks containing hazardous liquid will incorporate an adequate leak detection system which should be designed to the American Petroleum Institute (API) Standard Welded Steel Tanks for Oil Storage (Ref. 16).
- On-plot permanent bunds will be graded to a sump and drained by gravity via a normally closed valve (or similar device) to the relevant class drainage system as identified in Figure 4-1. Where gravity drainage is not practicable, a sump and pump with local pump controls shall be provided to the relevant class drainage system.
- Remote permanent bunds (where hard connections to the appropriate drainage system are not possible) will be graded to a sump and be provided with an appropriate connection for a vacuum truck or mobile pump system to empty accumulated run-off.
- Operating procedures require bund drain valves to be closed at all times, including during a rainfall event, and will specify water quality testing requirements prior to disposal. If the water is free of contaminants, it will be released outside the bund.
- Where practicable, bunding is intended to incorporate fauna protection measures as listed in Section 4.3.3.2.

Bunding and curbing design is intended to incorporate the requirements of the following standards, where relevant and practicable:

- AS 1940:2017: The Storage and Handling of Flammable and Combustible Liquids (Ref. 17)
- API 650: Welded Steel Tanks for Oil Storage (Ref. 16).

4.3.3.3 Fauna Protection Measures

Pits, sumps, ponds, gutters, trenches, and drains on Barrow Island will potentially act as pit traps for fauna, including small and large marsupials and reptiles. Therefore, pits are intended to be covered with a grating or solid plate where reasonably practicable so as to prevent the ingress of fauna. In addition, sumps, basins, gutters, trenches, or drains with the potential to trap fauna will be provided with a means of escape, where practicable.

The number of persistent water bodies should be minimised on site, and, where practicable, sumps and retention basins should be kept dry.

4.3.3.4 Management Measures Specific to Construction Activities

The following measures will be applied, where applicable, to manage the potential for chemical and hydrocarbon contamination or sediment run-off during construction activities.

Prevention of Chemical/Hydrocarbon Contamination

The relevant Class 1 and/or Class 2 drainage system components associated with chemical storage, chemical loading, diesel loading, diesel transfer, vehicle refuelling, and power generation (temporary) facilities are intended to be constructed as an integral part of the construction of these facilities.

Contaminated run-off from these areas will be collected in sumps or bunds, thus providing a facility for removal by vacuum truck.

Hydrocarbon-contaminated water will be treated and disposed of in line with the requirements of the SLWMP (Ref. 15).

Drainage from concrete batching plant(s) and truck washout areas will be re-used where safe and practicable. If re-use is not practicable, washout will be collected, treated, and disposed of as per the SLWMP (Ref. 15).

Prevention of Sediment Run-off

Construction civil works can potentially result in elevated levels of suspended solids in run-off.

Measures to minimise sediment carryover as a result of civil works will include, where practicable:

- use of erosion barriers, flow diversion devices and sedimentation sumps. Where the installation of sediment sumps is not feasible, sediment flowing off the construction site will be controlled using an alternative method, e.g. silt fencing, geotextile fabric
- installation of contour banks to intercept and disperse run-off on steep disturbed slopes, where practicable
- planning and management of clearing earthworks to minimise land clearing requirements and limit the area of exposed topsoil to the minimum required for safe execution of construction activities.

Procedural controls to maintain drain systems in a safe and operable state include:

- regular visual inspections and additional inspections prior to and after heavy rains
- removal of sediment build-up and reinstatement of any damaged elements of the drain systems as soon as reasonably practicable.

4.3.4 Closed Drains

A closed drain system for the GTP will be provided to ensure that hydrocarbon liquids drained from vessels (e.g. during maintenance activities) are collected in a safe and environmentally responsible manner so as to reduce fugitive emissions of volatile hydrocarbons to the atmosphere and avoid flammable hazards.

It is intended that hydrocarbon liquids collected in the closed drain system will be recovered to process, or to the condensate storage system for sale with the condensate product. Where hydrocarbon liquids cannot practicably be recovered to process or to the condensate storage system, they will be managed in line with the SLWMP (Ref. 15).

4.4 Leaks or Spills

CAPL is not abstracting groundwater from, or injecting liquids into, the superficial aquifer on Barrow Island at this stage of the Gorgon Gas Development and Jansz Feed Gas Pipeline. Therefore, the potential pathways reasonably foreseeable for impacts to groundwater are via leaks or spills and influences on recharge arising from changes in surface water regimes.

In addition to the measures outlined in Sections 4.2 and 4.3, management of potential impacts of leaks and spills will, where reasonably practicable, include these additional measures:

- Wherever practicable, non-hazardous (or least hazardous) materials will be selected for use on site.
- Hazardous material storage areas will be designed and engineered in accordance with applicable industry standards to safely handle the volumes and operating conditions required for each substance.
- Tanks and machinery will be equipped with appropriate spill and leak protection devices in accordance with applicable design standards and specifications.
- Legal requirements pertaining to hazardous materials and substances will be adhered to for packaging, segregating, storing, transporting, transferring, and handling.
- An inventory of hazardous materials stored at work sites will be maintained on site.
- Major maintenance of vehicles and equipment will be conducted at designated maintenance areas.
- Bulk transfer lines will be fitted with dry break couplings. These will be fit-for-purpose, not outside design life limits, and regularly checked for damage to prevent leaks.
- Personnel will be trained in their roles, functions, and responsibilities, including emergency response, prior to refuelling or fuel transfer.
- Relevant personnel will be trained in spill response.
- Sufficient and appropriate equipment, materials, and resources will be available, and maintained, to respond to a spill incident.
- Upon detection of a spill or leak, the person shall report the incident in accordance with the Gorgon Gas Development Incident Reporting Procedures.
- Spills shall be contained and cleaned up immediately and product Safety Data Sheets (SDSs) consulted as applicable to guide clean-up actions.

Impacts to surface water regimes will be limited through the solid and liquid waste management measures specified in Section 4.2.

4.5 Clearing and Earthworks

Vegetation clearing audit procedures are required under Condition 7.6.i of MS 800 and MS 769, and Condition 6.6.i of EPBC Reference: 2003/1294 and 2008/4178; they are described in detail in the Vegetation Clearing and Audit Common User Procedure (Ref. 28).

CAPL has prepared an internal Vegetation Clearing Permit System to address vegetation clearing for the Gorgon Gas Development and Jansz Feed Gas Pipeline that it internally requires its employees and contractors to comply with, where reasonably practicable.

4.6 Fire

A Fire Management Plan (Ref. 18) is required under Condition 12 of MS 800, Condition 11 of MS 769, and Condition 9 of EPBC Reference: 2003/1294 and 2008/4178. Measures to manage planned fires (e.g. for vegetation clearing purposes) and respond to incidents involving fires are detailed in the Fire

Management Plan (Ref. 18). Any fauna injured during planned fire activities will be managed by measures detailed in the Fauna Handling and Management Common User Procedure (Ref. 27). Management measures relating to rehabilitation of those areas requiring rehabilitation following burning are addressed within the Post-Construction Rehabilitation Plan (Ref. 19).

4.7 Physical Interaction (including Vehicle Movements)

The management of traffic in relation to fauna is required under Condition 7.6.iii of MS 800 and MS 769, and Condition 6.6iii of EPBC Reference: 2003/1294 and 2008/4178, and is described in detail in the Traffic Management Common User Procedure (Ref. 29).

Management of fauna handling and other secondary impacts to fauna are required under Condition 7.6.ii and 7.6.iii of MS 800 and MS 769, and Condition 6.6.ii and 6.6.iii of EPBC Reference: 2003/1294 and 2008/4178, and are described in detail in the Fauna Handling and Management Common User Procedure (Ref. 27).

4.8 Light

The management of light emissions for the Gorgon Gas Development and Jansz Feed Gas Pipeline will focus primarily on its effect on marine turtles, and implicitly its effect on nocturnally-active birds or mammals that may also be affected by bright lights (see the TSBSEIR [Ref. 14]). A Long-term Marine Turtle Management Plan (LTMTMP; Ref. 20) is required under Condition 16.1 of MS 800, Conditions 13.4(ii)d and 14.4v of MS 769, and Condition 12.1 of EPBC Reference: 2003/1294 and 2008/4178. Management and monitoring of light, including principles to manage light emissions from construction or operations that do not affect coastal areas, is described in the LTMTMP. If required, additional management measures may be investigated based on incidents or observations of environmental occurrences (e.g. mass aggregations of fauna) that are deemed significant.

4.9 Noise and Vibration

Noise emissions for the Gorgon Gas Development and Jansz Feed Gas Pipeline will be managed for its effect on terrestrial fauna (key receptors are the White-winged Fairy-wren [Barrow Island], and mammals) and nesting marine turtles. The TSBSEIR (Ref. 14) indicates that no significant fauna on Barrow Island are thought to have a critical reliance on hearing to either avoid predators, or to locate and hunt prey. However, noise interference with communications between White-winged Fairy-wrens (Barrow Island) was used as the basis for defining a 1000 m environmental impact TDF.

Noise and vibration design criteria for the GTP and Utilities Areas, informed by the Environment Basis of Design (Ref. 21) and the Health and Safety Basis of Design (Ref. 22), were based on human health/worker exposure criteria, stipulated in relevant legislation and standards. Individual equipment noise levels have been specified in accordance with Australian Standards and the ALARP principle and a cumulative noise study has been carried out to establish cumulative noise levels from the whole of the GTP (these were reported in the PER [Ref. 12]).

Measures to manage and, where practicable, reduce noise from the GTP are described in the LTMTMP (Ref. 20).

Measures to manage noise associated with the construction of the Feed Gas Pipeline System Shoreline Crossing on the west coast of Barrow Island are described in the Horizontal Directional Drilling Management and Monitoring Plan (Ref. 23).

Noise and vibration monitoring on beaches either side of Town Point is summarised further in the LTMTMP (Ref. 20). Noise monitoring for terrestrial receptors is linked to the ecological monitoring program, as explained in the TSEMP (Ref. 25).

4.10 Seawater Application

The water supply for construction activities, such as earthworks and dust suppression will use freshwater, treated greywater, and seawater on the GTP site. The aim of seawater application is to complement the use of available freshwater and treated greywater within specific limits, and specific areas and stages of construction activities on the GTP site.

The application of seawater on the GTP site will be managed by:

- establishing a 50 m buffer zone, within the perimeter of the GTP boundary, to reduce the potential of seawater over-spray or run-off to surrounding vegetation and by only using freshwater or treated greywater in the buffer zone
- using freshwater and treated greywater in preference to seawater, where available and practicable to do so
- reducing seawater volumes to lowest practicable and technical effective levels and not exceeding 4500 kL/day
- using designated seawater and freshwater trucks, with seawater trucks only to be used on the GTP Footprint
- employing additional construction drainage control measures, if required, to prevent direct surface run-off of seawater beyond the GTP boundary
- considering other potential practicable control measures in detailed execution plans; e.g. varying the sequence of locations of application, effective distribution using specified vehicles which remain in the GTP site boundary, volume use monitoring
- removing topsoil prior to applying seawater for construction activities.

Groundwater monitoring for terrestrial receptors is part of the ecological monitoring program as explained in the TSEMP (Ref. 25). In addition to the TSEMP (Ref. 25), monthly groundwater monitoring of groundwater level and salinity will occur for at least the first six months from commencement of seawater application at existing down hydraulic gradient groundwater monitoring boreholes. The results of the monthly groundwater monitoring will be provided to DWER. If the results of the monthly groundwater monitoring demonstrate any adverse impacts to terrestrial receptors or any effects beyond those expected from the seawater application groundwater modelling (Ref. 24), immediate action will be taken to prevent further impacts in consultation with DWER which may include, but not be limited to: modifying the buffer zone; application methodology; application rates; and monitoring program.

The seawater application groundwater modelling predictions are presented in Section 5.3.2 of the Gorgon Project Application for Consideration under

Section 45C of the EP Act (Ref. 24). The following is an excerpt from this document:

> *"As identified in the assessment (Golder Associates 2009), the maximum lateral movement of the mound is interpreted to be less than 100 m from the edge of the area of seawater application. The results also suggest that the majority of mounding may occur directly below the area of seawater application, with maximum mounding heights of one metre or less beyond the seawater application area."*

The process for reporting of environmental incidents resulting from seawater application will be in accordance with the reporting requirements listed in Table 6-1.

4.11 Management Triggers

CAPL applies management triggers to inform appropriate management responses when a level of change has been observed. Management triggers have been applied to ecological monitoring.

CAPL will implement a process to guide an appropriate management response in relation to changes detected in ecological elements that exceed management trigger levels. The type of response (e.g. 'alert', 'review', 'action' for ecological monitoring) will be guided by the level of detected change in the trend over time, and the type of parameter affected. Each level of response will not preclude the need for immediate management actions.

These management triggers, as they relate to the terrestrial environment, are described in the Terrestrial and Subterranean Environment Monitoring Program (Ref. 25).

5 Performance Objectives and Standards

Environmental performance is 'the measurable results of an organisation's management of its environmental aspects' (Ref. 35). CAPL measures environmental performance through:

- **Environmental performance objectives** – the objectives of the Plan as defined by Condition 7.4 of MS 800 and Condition 6.4 of EPBC Reference: 2003/1294 and 2008/4178
- **Environmental performance standards** – defined, in accordance with Schedule 2 of MS 800, as 'matters which are developed for assessing performance, not compliance, and are quantitative targets or where that is demonstrated to be not practicable, qualitative targets, against which progress towards achievement of the objectives of conditions can be measured'.

Table 5-1 lists the environmental performance objectives and standards that were developed to enable CAPL to assess environmental performance for management of adverse impacts and Project stressors.

The standards in Table 5-1 were developed specifically for assessing performance, not compliance. Failure to meet the standards does not represent failure to implement this Plan; rather, it indicates that a performance objective may not have been met and management action or a review of the environmental performance objectives and standards may be needed.

Table 5-1: Objectives and Performance Standards

Objectives	Performance Standards
To reduce the adverse impacts from the construction and operation of the Terrestrial Facilities as far as practicable	• Develop an Environment Protection Plan that addresses each of the requirements specified in Condition 7.6 of Statements No. 800 and 769, and Condition 6.6 of EPBC Reference: 2003/1294 and 2008/4178 • Implement the management measures described in the Plan
To ensure the construction and operation of the Terrestrial Facilities does not cause Material or Serious Environmental Harm outside the Terrestrial Disturbance Footprint (TDF), including below the surface of the land	Report any Material or Serious Environmental Harm outside the Terrestrial Disturbance Footprint (TDF)

6 Reporting

6.1 Incident Reporting

Table 6-1 lists the environmental incident reporting requirements, including timing specific to this Plan.

Table 6-1: Incident Reporting Requirements

Incident	Reporting to	Timing
Threatened or listed fauna cared for, injured, or killed within the Terrestrial Disturbance Footprint	DWER	Annual Performance Report
Material or Serious Environmental Harm outside the Terrestrial Disturbance Footprint (attributable to the Gorgon Gas Development)	DWER/DCCEEW	Within 48 hours of detection[1]
Significant impacts detected by the monitoring program for matters of National Environmental Significance	DCCEEW	Within 48 hours of detection[1]
Harm or mortality to EPBC Act Listed terrestrial fauna attributable to the Gorgon Gas Development	DCCEEW	Monthly reporting (with report submitted not later than 14 days after the end of the reporting period).

1 *Detection of ecological change may only become apparent following receipt of monitoring data analysis.*

7 Acronyms and Abbreviations

Table 7-1 defines the acronyms and abbreviations used in this document.

Table 7-1: Acronyms and Abbreviations

Acronym / Abbreviation	Definition
ABU	Australian Business Unit
Additional Support Area	Gorgon Gas Development Additional Construction, Laydown and Operations Support Area
ALARP	As Low As Reasonably Practicable Defined as a level of risk that is not intolerable, and cannot be reduced further without the expenditure of costs that are grossly disproportionate to the benefit gained.
API	American Petroleum Institute
AS	Australian Standard
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 relevant EPBC Act relevant listed threatened species and threatened ecological communities and listed migratory species, at risk of Material Environmental Harm or Serious Environmental Harm.
BTEX	Benzene, toluene, ethylbenzene and xylene aromatic hydrocarbon compounds present in petroleum; may be primary pollutants of soils and groundwater associated with petroleum products.
Bund	An area of containment, such as a dam, wall, or other artificial embankment.
CAPL	Chevron Australia Pty Ltd
Carbon Dioxide (CO_2) Injection System	The mechanical components required to be constructed to enable the injection of reservoir carbon dioxide, including but not limited to compressors, pipelines and wells.
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2 Seismic Baseline Survey Program	The CO_2 Seismic Baseline Survey Program as described in the CO_2 Seismic Environmental Management Plan
CO_2 Seismic Survey Program	The program of seismic surveys to be undertaken over the life of the CO_2 Injection Project to monitor injected CO_2 in accordance with the Section 13 Approval.
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 Period	The period from the date on which the Gorgon Joint Venturers first commence construction of the Proposal until the date on which the Gorgon Joint Venturers issue a notice of acceptance of work under the Engineering, Procurement and Construction Management contract, or equivalent contract entered into in respect of the second LNG train of the GTP.
CPI	Corrugated Plate Interceptor
Cth	Commonwealth of Australia
Cut Batters	Cut earthen walls with a sloping face

Acronym / Abbreviation	Definition
DBCA	Western Australian Department of Biodiversity, Conservation, and Attractions (from 1 July 2017; formerly Department of Parks and Wildlife) (DBCA dates: from 1 Jul 2017 to [ongoing])
DCCEEW	Department of Climate Change, Energy, the Environment and Water [DCCEEW] (from 1 July 2022; incorporates environment functions from the former Department of the Environment and Energy)
DEC	Former Western Australian Department of Environment and Conservation, then split into Department of Environment Regulation and Department of Parks and Wildlife. Now Department of Biodiversity, Conservation, and Attractions (DBCA; from 1 July 2017) and Department of Water and Environmental Regulation (DWER; from 1 July 2017). (DEC dates: 1 Jul 2006 to 30 Jun 2013; was an amalgamation of the former Department of the Environment and the Department of Conservation and Land Management)
DEWHA	Former Commonwealth Department of the Environment, Water, Heritage and the Arts (now DCCEEW) (DEWHA dates: from 3 Dec 2007 to 14 Sep 2010)
DotE	Former Commonwealth Department of the Environment (now DCCEW) (DotE dates: from Oct 1997 to Oct 1998; then from 18 Sep 2013 to 19 Jul 2016)
DotEE	Former Commonwealth Department of the Environment and Energy (formerly Department of the Environment and Water [DEW]; Department of the Environment, Water, Heritage and the Arts [DEWHA]; and Department of Sustainability, Environment, Water, Population and Communities; and Department of the Environment [DotE]) (DotEE dates: from 19 Jul 2016 to 31 Jan 2020) (Energy functions split from this department and incorporated into the new Department of Industry, Science, Energy and Resources 1 Feb 2020) (Environment functions split from this department in incorporated into the new Department of Climate Change, Energy, the Environment and Water [DCCEEW] 1 July 2022–ongoing)
DPaW	Former Western Australian Department of Parks and Wildlife (now DBCA)
DWER	Western Australian Department of Water and Environmental Regulation (formerly Department of Environment Regulation and Office of the Environmental Protection Authority (from 1 July 2017 to [ongoing])
Ecological Element	Element listed in Condition 6.1 of MS 800 and MS 769 and Condition 5.1 EPBC Act Reference: 2003/1294 and 2008/4178.
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.
Environmental Harm	Has the meaning given by Part 3A of the *Environmental Protection Act 1986* (WA).
EP Act	Western Australian *Environmental Protection Act 1986*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPBC Reference: 2003/1294	Commonwealth Ministerial Approval (for the Gorgon Gas Development) as amended or replaced from time to time.
EPBC Reference: 2005/2184	Commonwealth Ministerial Approval (for the Jansz Feed Gas Pipeline) as amended or replaced from time to time.
EPBC Reference: 2008/4178	Commonwealth Ministerial Approval (for the Revised Gorgon Gas Development) as amended or replaced from time to time.
EPBC Reference: 2011/5942	Commonwealth Ministerial Approval (for the Fourth Train Expansion Proposal) as amended or replaced from time to time.
Feed Gas Pipeline System	Means pipelines, electrical cables, hydraulic, and fibre-optic connections between the offshore fields and the Gas Treatment Plant on Barrow Island that

Acronym / Abbreviation	Definition
	have an onshore section buried in the pipeline easement between North White's Beach and the Gas Treatment Plant.
Gorgon Gas Development	The Gorgon Gas Development as approved under Statement Nos. 800 and 965, and EPBC References: 2003/1294 and 2008/4178 (as varied by the Commonwealth Environment Minister), 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.
GTP	Gas Treatment Plant
H_2S	Hydrogen sulfide
ha	Hectare
ISO	International Organization for Standardization
Jansz Feed Gas Pipeline	The Jansz Feed Gas Pipeline as approved in MS 769 and EPBC Reference: 2005/2184 as amended or replaced from time to time.
Karst	An area of irregular limestone in which erosion has produced fissures, sinkholes, underground streams, and caverns.
kL	Kilolitre
km	Kilometre
LNG	Liquefied Natural Gas
LTMTMP	Long-term Marine Turtle Management Plan
m	Metre
Management Triggers	Are quantitative, or where this is demonstrated to be not practicable, qualitative matters above or below whichever relevant additional management measures must be considered.
Material Environmental Harm	Environmental Harm that is neither trivial nor negligible.
MEG	Monoethylene glycol
MGA 50, GDA 94	Map Grid of Australia Zone 50 (WA); projection based on the Geocentric Datum of Australia 1994
mm	Millimetre
MS	Ministerial Statement (WA)
MS 1002	Western Australian Ministerial Statement 1002, issued for the Gorgon Gas Development Fourth Train Expansion Proposal, as amended from time to time.
MS 748	Western Australian Ministerial Statement No. 748 (for the Gorgon Gas Development) as amended from time to time [superseded by MS 800].
MS 769	Western Australian Ministerial Statement No. 769 (for the Jansz Feed Gas Pipeline) as amended from time to time.
MS 800	Western Australian Ministerial Statement No.800, issued for the Revised and Expanded Gas Development, as amended from time to time. MS 800 supersedes the Gorgon Gas Development as originally approved by MS 748. The conditions of MS 800 also apply to the Additional Support Area under MS 965.
MS 865	Western Australian Ministerial Statement No. 865 (for the Gorgon Gas Development).

Acronym / Abbreviation	Definition
MS 965	Western Australian Ministerial Statement No. 965, issued for the Additional Support Area, as amended from time to time. Statement No.965 applies the conditions of MS 800 to the Additional Support Area."
N/A	Not Applicable
NES	[Matters of] National Environmental Significance, as defined in Part 3, Division 1 of the EPBC Act (Cth).
NO_x	Nitrogen oxides (NO and NO_2)
OE	Operational Excellence
Operations (Gorgon Gas Development)	In relation to MS 800 and EPBC Reference: 2003/1294 and 2008/4178, for the respective LNG trains, this is the period from the date on which the Gorgon Joint Venturers issue a notice of acceptance of work under the Engineering, Procurement and Construction Management contract, or equivalent contract entered into in respect of that LNG train of the GTP; until the date on which the Gorgon Joint Venturers commence decommissioning of that LNG train.
Operations (Jansz Feed Gas Pipeline)	In relation to MS 769, for the pipeline, this is the period from the date on which the Proponent issues a notice of acceptance of work under the Engineering, Procurement and Construction Management contract, or equivalent contract entered into in respect of that pipeline; until the date on which the Proponent commences decommissioning of that pipeline.
PER	Public Environmental Review for the Gorgon Gas Development Revised and Expanded Proposal dated September 2008, as amended or supplemented from time to time.
Performance Standards	Are matters which are developed for assessing performance, not compliance, and are quantitative targets or where that is demonstrated to be not practicable, qualitative targets, against which progress towards achievement of the objectives of conditions can be measured.
Practicable, 'as far as practicable', 'where practicable'	Practicable means reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge. For the purposes of EPBC Reference: 2003/1294 and 2008/2178, which include the term 'practicable', when considering whether the draft plan meets the requirements of these conditions, the Commonwealth Minister will determine what is 'practicable' having regard to local conditions and circumstances including but not limited to personnel safety, weather or geographical conditions, costs, environmental benefit and the current state of scientific and technical knowledge.
SDS	Safety Data Sheet
Section 13 Approval	The document dated 14 September 2009 setting out the conditions and restrictions of the Barrow Island Act 2003 Minister's approval granted to the Gorgon Joint Venturers under Section 13 of that Act to inject carbon dioxide into the Dupuy Formation beneath Barrow Island as varied, added to or substituted for in accordance with condition 19 of that document.
Serious Environmental Harm	Environmental harm that is: • irreversible, of a high impact or on a wide scale; or • significant or in an area of high conservation value or special significance and is neither trivial nor negligible.
Significant Fauna	Fauna identified as significant ecological elements in the Terrestrial and Subterranean Baseline State and Environmental Impact Report.
Significant Impact	An impact on a Matter of National Environmental Significance, relevant to EPBC Reference: 2003/1294, 2005/2185, and 2008/4178 that is important, notable or of consequence having regard to its context or intensity.
SLWMP	Solid and Liquid Waste Management Plan

Acronym / Abbreviation	Definition
SO_2	Sulfur dioxide
SO_x	Sulfur oxides (SO and SO_2)
SRE	Short-range Endemic; taxonomic group of invertebrates that are unique to an area, found nowhere else, and have naturally small distributions (i.e. <10 000 km^2)
Stormwater	Natural run-off of rainwater that occurs during or after storms or heavy rainfall events.
Stygofauna	Groundwater-dwelling aquatic fauna.
TAPL	Texaco Australia Pty Ltd
Taxon (plural: taxa)	A taxon (plural taxa), or taxonomic unit, is a name designating an organism or a group of organisms.
TDF	*See* Terrestrial Disturbance Footprint
TEG	Triethylene glycol
Terrestrial Disturbance Footprint	The area to be disturbed by construction or operations activities associated with the Terrestrial Facilities listed in Condition 6.3 of MS 800, Condition 6.3 of MS 769, and Condition 5.2 of EPBC Reference: 2003/1294 and 2008/4178, and set out in the Terrestrial and Subterranean Baseline State and Environmental Impact Report required under Condition 6.1 of MS 800 including the Additional Support Area approved by MS 965, Condition 6.1 of MS 769, and Condition 5.1 of EPBC Reference: 2003/1294 and 2008/4178.
Terrestrial Facilities	In relation to MS 800 and EPBC Reference: 2003/1294 and 2008/4178, the Terrestrial Facilities are the: • Gas Treatment Plant • Carbon Dioxide Injection System • Associated Terrestrial Infrastructure forming part of the Proposal • Areas impacted for seismic data acquisition • Onshore Feed Gas Pipeline System and terrestrial component of the Shore Crossing. Terrestrial Facilities also include those defined in Condition 6.3 of MS 769 (the Onshore Feed Gas pipeline system and the terrestrial component of the Shore Crossing) and Schedule 1 of MS 965 (the Additional Support Area).
Threatened Ecological Communities	Ecological communities listed as critically endangered, endangered, or vulnerable under Section 181 of the EPBC Act (Cth).
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).
Troglofauna	Obligate cave- or karst-dwelling terrestrial subterranean fauna occurring above the watertable.
TSBSEIR	Terrestrial and Subterranean Baseline State and Environmental Impact Report
TSEMP	Terrestrial and Subterranean Environment Monitoring Program
VOC	Volatile Organic Compounds; organic chemical compounds that have high enough vapour pressures under normal conditions to vaporise and enter the atmosphere.
WA	Western Australia

8 References

The following documentation is either directly referenced in this document or is a recommended source of background information.

Table 8-1: References

Ref. No.	Description	Document ID
1.	Government of Western Australia, Minister for the Environment, David Templeman MLA. 2008. *Statement that a Proposal may be Implemented – Jansz Feed Gas Pipeline: Barrow Island Nature Reserve (Ministerial Statement No. 769), 28 May 2008.* Perth, Western Australia. Available from: http://www.epa.wa.gov.au/sites/default/files/1MINSTAT/000748.pdf	
2.	Commonwealth Government of Australia, Assistant Secretary Environmental Assessment Branch, Anne-Marie Delahunt. 2006. *Decision to Approve the taking of an Action – Jansz Feed Gas Pipeline (EPBC Reference: 2005/2184), 22 March 2006*. Canberra, Australian Capital Territory.	
3.	Government of Western Australia, Minister for the Environment, David Templeman MLA, 2007. *Statement that a Proposal may be Implemented – Gorgon Gas Development: Barrow Island Nature Reserve (Ministerial Statement No. 748), 6 September 2007*. Perth, Western Australia. Available from: http://www.epa.wa.gov.au/sites/default/files/1MINSTAT/000748.pdf	
4.	Government of Western Australia, Minister for the Environment, Youth, Donna Faragher JP MLC. 2009. *Statement that a Proposal may be Implemented – Gorgon Gas Development Revised and Expanded Proposal: Barrow Island Nature Reserve (Ministerial Statement No. 800), 10 August 2009.* Perth, Western Australia. Available from: http://www.epa.wa.gov.au/sites/default/files/1MINSTAT/00800.pdf	
5.	Commonwealth Government of Australia, Minister for the Environment, Water, Heritage and the Arts, Peter Garrett. 2009. *Approval – Gorgon Gas Development (EPBC Reference: 2008/4178), 26 August 2009*. Canberra, Australian Capital Territory. Available from: https://australia.chevron.com/-/media/australia/our-businesses/documents/epbc_reference_2008_4178___2003_1294.pdf	
6.	Commonwealth Government of Australia, Minister for the Environment and Water Resources, Malcolm Turnbull. 2007. *Approval – Gorgon Gas Development (EPBC Reference: 2003/1294), 3 October 2007*. Canberra, Australian Capital Territory.	
7.	Government of Western Australia, Minister for the Environment, Water, Bill Marmion MLA. 2011. *Statement to Amend Conditions Applying to the Gorgon Gas Development Revised and Expanded Proposal Barrow Island Nature Reserve (Ministerial Statement No. 865) 7 June 2011*. Perth, Western Australia. Available from: http://www.epa.wa.gov.au/sites/default/files/Ministerial_Statement/Statement%20No.%20865_0.pdf	
8.	Government of Western Australia, Minister for the Environment; Heritage. Albert P. Jacob JP MLA. 2014. *Statement that a Proposal may be Implemented – Gorgon Gas Development Additional Construction Laydown and Operations Support Area (Ministerial Statement 965)*. Perth, Western Australia. Available from: http://www.epa.wa.gov.au/sites/default/files/1MINSTAT/Statement%20No.%20965.pdf	
9.	Government of Western Australia, Minister for the Environment; Heritage. Albert Jacob MLA. 2015. *Statement that a Proposal may be Implemented – Gorgon Gas Development Fourth Train Expansion Proposal (Ministerial Statement 1002), 30 April 2015*. Perth, Western Australia. Available from: http://www.epa.wa.gov.au/sites/default/files/1MINSTAT/Statement%20No.%201002.pdf	

Ref. No.	Description	Document ID
10.	Commonwealth Government of Australia, 2016. Assistant Secretary Assessment (WA, SA, NT) and Air Branch. Approval – Gorgon Gas Development – Fourth Train Expansion (EPBC 2011/5942), 12 May 2016. Canberra, Australian Capital Territory	
11.	Chevron Australia. 2005. *Draft Environmental Impact Statement/Environmental Review and Management Programme for the Proposed Gorgon Gas Development*. Chevron Australia, Perth, Western Australia. Available from: https://australia.chevron.com/-/media/australia/our-businesses/documents/Draft-EIS-ERMP_full-report.pdf	
12.	Chevron Australia. 2008. *Gorgon Gas Development Revised and Expanded Proposal Public Environmental Review*. Chevron Australia, Perth, Western Australia. Available from: https://australia.chevron.com/-/media/australia/our-businesses/documents/gorgon_revised_proposal_per_final_main_report_20080909.pdf	
13.	Chevron Australia. 2009. *Gorgon Project: CO_2 Seismic Baseline Survey Environmental Management Plan.* Rev. 2. Chevron Australia, Perth, Western Australia.	G1-NT-REPX0001679
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16.	American Petroleum Institute. 2013. *API Standard 650, Welded Tanks for Oil Storage.* American Petroleum Institute, Washington DC.	
17.	Standards Australia. 2017. AS 1940:2017 *The storage and handling of flammable and combustible liquids*. Sydney, Australia.	
18.	Chevron Australia. 2015. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Fire Management Plan*. Rev. 1.0. Chevron Australia, Perth, Western Australia. Available from: https://australia.chevron.com/-/media/australia/our-businesses/documents/gorgon-emp-fire-management-plan.pdf	GOR-COP-01238
19.	Chevron Australia. 2019. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Post-Construction Rehabilitation Plan.* Rev. 3.0. Chevron Australia, Perth, Western Australia. Available from: https://australia.chevron.com/-/media/australia/our-businesses/documents/gorgon-emp-post-construction-rehabilitation-plan.pdf	G1-NT-PLNX0000303
20.	Chevron Australia. 2018. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Long-term Marine Turtle Management Plan.* Rev. 1.0. Chevron Australia, Perth, Western Australia. Available from: https://australia.chevron.com/-/media/australia/our-businesses/documents/gorgon-emp-long-term-marine-turtle-management-plan.pdf	GOR-COP-01728
21.	Chevron Australia. 2008. *Gorgon Project: Environmental Basis of Design.* Rev. 2. Chevron Australia, Perth, Western Australia.	G1-TE-H-0000-PDBX001
22.	Chevron Australia. 2008. *Gorgon Project: Health and Safety Basis of Design*. Rev. 1. Chevron Australia, Perth, Western Australia.	G1-TE-H-0000-PDBX002
23.	Chevron Australia. 2011. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Horizontal Directional Drilling Management and Monitoring Plan*. Rev. 2. Chevron Australia, Perth, Western Australia.	G1-NT-PLNX0000299
24.	Chevron Australia. 2010. *Gorgon Project Application for Consideration under Section 45C of the EP Act*	
25.	Chevron Australia. 2020. *Gorgon Project: Terrestrial and Subterranean Environment Monitoring Program.* Rev. 2.0. Chevron Australia, Perth, Western	GOR-COP-01696

Ref. No.	Description	Document ID
	Australia. Available from: https://australia.chevron.com/-/media/australia/our-businesses/documents/gorgon-terrestrial-and-subterranean-environment-monitoring-program.pdf	
26.	Chevron Australia. 2019. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Short-Range Endemics and Subterranean Fauna Monitoring Plan*. Rev. 4. Chevron Australia, Perth, Western Australia. Available from: https://australia.chevron.com/-/media/australia/our-businesses/documents/gorgon-emp-short-range-endemics-and-subterranean-fauna-monitoring-plan.pdf	G1-NT-PLNX0000295
27.	Chevron Australia. 2014. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Fauna Handling and Management Common User Procedure*. Chevron Australia, Perth, Western Australia.	G1-PP-HES-PRC-0009
28.	Chevron Australia. 2014. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Vegetation Clearing and Audit Common User Procedure.* Rev. 3. Chevron Australia, Perth, Western Australia.	G1-PP-HES-PRC-0012
29.	Chevron Australia. 2014. *Gorgon Gas Development and Jansz Feed Gas Pipeline Traffic Management Common User Procedure.* Rev. 3. Chevron Australia, Perth, Western Australia.	G1-PP-HES-PRC-0010
30.	Chevron Australia. 2018. *ABU OE Risk Management Process.* Rev. 12.0. Chevron Australia, Perth, Western Australia.	OE-03.01.01
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34.	Chevron Australia. 2010. *Gorgon Gas Development and Jansz Feed Gas Pipeline: Appendix: Identification of Terrestrial and Subterranean Matters of National Environmental Significance (NES) and their Habitat.* Chevron Australia, Perth, Western Australia.	G1-NT-REPX0002886
35.	Standards Australia/Standards New Zealand. 2004. *ISO 14001:2004 Environmental Management Systems – Requirements with Guidance for Use*. Standards Australia/Standards New Zealand, Sydney/Wellington.	

Appendix A Compliance Reporting Table

Section No.	Actions	Timing
4.3.3.1	The following requirements are intended to be met by the Class 1 drainage system, where practicable: • An appropriate specification will be applied to all piping and drainage channel design to minimise the risk of leakage to the environment and contamination of soil and groundwater. • Underground piping or drainage system components transporting contaminated run-off will be managed to ensureadequate leak detection. • The Class 1 drainage system will incorporate a water trap or similar device that will form a barrier to hydrocarbon vapour and liquids, including LNG, entering the drainage system. • Class 1 run-off will pass through a Corrugated Plate Interceptor (CPI) to separate the dispersed oil fraction prior to disposal via the produced water disposal wells. • Remote Class 1 run-off will be collected and disposed of via a vacuum truck to the Oily Water Collection Tank or other appropriate tie in to the system.	Construction Operations
4.3.3.1	The following requirements are intended to be met by the Class 2 drainage system (of the Gas Treatment Plant), where practicable: • Management of the Stormwater Holding Pond will ensure sediment is allowed to settle and hydrocarbons are skimmed as required. • An appropriate specification will be applied to all piping and drainage channel design to minimise the risk of leakage to the environment and contamination of soil and groundwater to as low as reasonably practicable. • Underground piping or drainage system components transporting potentially contaminated run-off will be managed to ensure adequate leak detection. • The design of the Class 2 drainage system will incorporate a water trap or similar device that will form a barrier to hydrocarbon vapours and liquids, including LNG, entering the drainage system. • Class 2 drainage trenches surrounding process equipment that is capable of spilling flammable liquids, including LNG or refrigerant, will be segregated into fire zones through the use of separation barriers extending up half the depth of the trench such that volumes of LNG or refrigerant exceeding the capacity of that section of trench will flow into the next section of trench rather than overflowing to adjacent unpaved areas. Each section of trench will incorporate a water trap connection to the Class 2 drainage system header. • Firewater from the Class 2 catchment areas will be collected until volumes exceed the capacity of the Stormwater Holding Pond, at which point firewater will be diverted to the Class 3 drains (Note: the Stormwater Holding Pond and associated Class 2 piping can hold the equivalent volume of firewater used in a four-hour firefighting event associated with a major fire within the Gas Treatment Plant before the water requires diversion). • Bund requirements within the Class 2 catchment area are outlined in Section 4.3.3.2. • The Stormwater Holding Pond will be equipped with adequate containment and leak detection.	Construction Operations

Section No.	Actions	Timing
4.3.3.1	The following requirements are intended to be met by the Class 3 drainage system, where practicable: • The Class 3 drainage systems will be an open drain system, which is designed to minimise suspended sediment discharge to the environment. • The Class 3 drainage system will mirror the natural hydrological cycle as close as reasonably practicable by: – minimising erosion and sediment carryover both within the Gas Treatment Plant, Butler Park, and the Administration and Operations Complex sites, and at discharge points to the environment through the use of erosion control measures including vegetation cover, jute mesh or geotextile, rip-rap or stone pitching, gabions and grout-filled mattresses, concrete or concrete-filled bags, drop structures and chutes, pipes, 'D' base channels, weirs, ripping or 'moonscaping'. – redistributing clean stormwater collected within the Class 3 drains via infiltration drains to ensure groundwater recharge; and re-distribution trenches to prevent re-distribution through channels or point sources. • The Class 3 drain system will accept clean overflow from the Class 2 and Class 4 system. • The size, cross-sectional shape and gradient of channels will be designed to avoid scouring and sudden changes in velocity. Channels with high velocities are intended to be lined, while drop structures will be constructed where slopes are steep.	Construction Operations
4.3.3.1	The following requirements are intended to be met by the Class 4 drainage system, where practicable: • The size, cross-sectional shape and gradient of the channel will be designed to avoid scouring and sudden changes in velocity. Channels with velocities sufficient to cause significant scour are intended be lined, while drop structures should be constructed where slopes are steep. • The Class 4 drainage system will mirror the natural hydrological cycle as close as reasonably practicable by: – diverting and redistributing run-off high in the catchment – minimising sediment carryover to the environment – using vegetation cover to ensure that any collection and redistribution of flow minimises erosion. Where there is insufficient vegetation cover, alternatives may include the use of jute mesh or geo-textile, rip-rap or stone pitching, gabions and grout-filled mattresses, concrete or concrete-filled bags, drop structures and chutes, pipes, base channels, weirs, ripping or 'moonscaping'.	Construction Operations
4.3.3.2	Bunding or curbing is intended to be provided around hazardous liquid material storage, including in chemical, hydrocarbon, and hazardous waste storage areas and areas where spills of hazardous liquids could occur.	Construction Operations
4.3.3.2	The following is a summary of the key design requirements for temporary and permanent bunds: • Bunding will be provided for hazardous liquid storage volumes equal or greater than 250 litres. Smaller vessels will be stored in chemical storage areas, which also need to be bunded. • Temporary and permanent bunds will be constructed using waterproof, reinforced concrete, steel or an alternative	Construction Operations

Section No.	Actions	Timing
	material, which is deemed to be appropriate for the specific application. • Temporary bunding facilities for use during construction will be designed to the same standard as permanent facilities, where practicable. As such it may be advantageous to provide self-bunded tanks for temporary installations where practicable. • Portable bunding may be used. Acceptable forms of portable bunding include self-bunded pallets (stored undercover when there is a risk of rain) and self-bunded tanks. • All components of bunds must be impervious and chemically resistant to the liquid contained. Bunds with the potential to collect flammable and combustible substances will be constructed of fire-resistant materials. • Tanks containing hazardous liquid will incorporate an adequate leak detection system which should be designed to the American Petroleum Institute (API) Standard Welded Steel Tanks for Oil Storage (Ref. 16). • On-plot permanent bunds will be graded to a sump and drained by gravity via a normally closed valve (or similar device) to the relevant class drainage system as identified in Figure 4.1. Where gravity drainage is not practicable, a sump and pump with local pump controls shall be provided to the relevant class drainage system. • Remote permanent bunds (where hard connections to the appropriate drainage system are not possible) will be graded to a sump and be provided with an appropriate connection for a vacuum truck or mobile pump system to empty accumulated run-off. • Operating procedures will require bund drain valves to be closed at all times, including during a rainfall event, and will specify water quality testing requirements prior to disposal. If the water is free of contaminants, it will be released outside the bund. • Where practicable, bunding is intended to incorporate fauna protection measures as listed in Section 4.3.3.3.	
4.3.3.3	Pits are intended to be covered with a grating or solid plate where reasonably practicable so as to prevent the ingress of fauna.	Construction Operations
4.3.3.3	Sumps, basins, gutters, trenches, or drains with the potential to trap fauna will be provided with a means of escape, where practicable.	Construction Operations
4.3.3.4	The relevant Class 1 and/ or Class 2 drainage system components associated with chemical storage, chemical loading, diesel loading, diesel transfer, vehicle refuelling, and power generation (temporary) facilities are intended to be constructed as an integral part of the construction of these facilities. Contaminated run-off from these areas will be collected in sumps or bunds, thus providing a facility for removal by vacuum truck.	Construction
4.3.3.4	Hydrocarbon-contaminated water will be treated and disposed of in line with the requirements of the SLWMP.	Construction
4.3.3.4	Drainage from concrete batching plant(s) and truck washout areas will be reused where safe and practicable. If re-use is not practicable, washout will be collected, treated, and disposed of as per the SLWMP.	Construction
4.3.3.4	Measures to minimise sediment carry over as a result of civil works will include, where practicable:	Construction

Section No.	Actions	Timing
	• use of erosion barriers, flow diversion devices and sedimentation sumps. Where the installation of sediment sumps is not feasible, sediment flowing off the construction site will be controlled using an alternative method, e.g. silt fencing, geo-textile fabric. • Installation of contour banks to intercept and disperse run-off on steep disturbed slopes, where practicable. • planning and management of clearing earthworks to minimise land clearing requirements and limit the area of exposed topsoil to the minimum required for safe execution of construction activities.	
4.3.4	A closed drain system for the Gas Treatment Plant will be provided to ensure that hydrocarbon liquids drained from vessels, (e.g. during maintenance activities) are collected in a safe and environmentally responsible manner so as to reduce fugitive emissions of volatile hydrocarbons to the atmosphere and avoid flammable hazards. It is intended that hydrocarbon liquids collected in the closed drain system will be recovered to process, or to the condensate storage system for sale with the condensate product. Where hydrocarbon liquids cannot practicably be recovered to process or to the condensate storage system, they will be managed in line with the SLWMP.	Construction Operations
4.4	Management of potential impacts of leaks and spills will, where reasonably practicable, include these additional measures: • Wherever practicable, non-hazardous (or least hazardous) materials will be selected for use on site. • Hazardous material storage areas will be designed and engineered in accordance with applicable industry standards to safely handle the volumes and operating conditions required for each substance. • Tanks and machinery will be equipped with appropriate spill and leak protection devices in accordance with applicable design standards and specifications. • Legal requirements pertaining to hazardous materials and substances will be adhered to for packaging, segregating, storing, transporting, transferring and handling. • An inventory of hazardous materials will be maintained on site. • Major maintenance of vehicles and equipment will be conducted at designated maintenance areas. • Bulk transfer lines will be fitted with dry break couplings. These will be fit-for-purpose, not outside design life limits, and regularly checked for damage to prevent leaks. • Personnel will be trained in their roles, functions and responsibilities, including emergency response, prior to refuelling or fuel transfer. • Relevant personnel will be trained in spill response. • Sufficient and appropriate equipment, materials, and resources will be available, and maintained, to respond to a spill incident. • Upon detection of a spill or leak, the person shall report the incident in accordance with Incident Reporting Procedures. • Spills shall be contained and cleaned up immediately and product Material Safety Data Sheets (MSDSs) consulted as applicable to guide clean-up actions.	Construction Operations
4.10	The application of seawater on the Gas Treatment Plant site will be managed by:	Construction

Section No.	Actions	Timing
	• Establishing a 50 m buffer zone, within the perimeter of the Gas Treatment Plant boundary, to reduce the potential of seawater over-spray or run-off to surrounding vegetation and by only using freshwater or treated grey in the buffer zone • Where available and practicable to do so, prioritise using freshwater and treated grey water in preference to seawater • Seawater volumes reduced to lowest practicable and technical effective levels and not to exceed 4500 kL/day • Designated seawater and freshwater trucks, with seawater trucks to only be used on the Gas Treatment Plant Footprint • Additional construction drainage control measures, if required, will be employed to prevent direct surface run-off of seawater beyond the Gas Treatment Plant boundary. • Consideration of other potential practicable control measures in detailed execution plans e.g. varying the sequence of locations of application, effective distribution utilising specified vehicles which remain in the Gas Treatment Plant site boundary, volume use monitoring • Removal of topsoil prior to applying seawater for construction activities.	
Table 7.1	Threatened or listed fauna cared for, injured, or killed within the Terrestrial Disturbance Footprint will be reported to the DBCA in the Annual Performance Report.	All Phases
Table 7.1	Report significant impacts detected by the monitoring program for matters of National Environmental Significance to DCCEEW within 48 hours of detection.	All Phases
Table 7.1	Report harm or mortality to EPBC Act Listed terrestrial fauna attributable to the Gorgon Gas Development to DCCEEW in monthly reporting (with report submitted not later than 14 days after the end of the reporting period).	All Phases

Appendix B Identification and Risk Assessment of Terrestrial Matters of National Environmental Significance (NES)

Appendix C Chevron Integrated Risk Prioritization Matrix

Chevron Integrated Risk Prioritization Matrix

Legend (where Likelihood is with confirmed safeguards and Consequence is without safeguards)

Risk Levels 1-4: Elevated Risk. Risk reduction required.

Risk Level 5: Risk reduction is required. If risk reduction action cannot be reasonably taken, BU management approval must be obtained

Risk Levels 6: Confirm that management systems are in place. Further risk reduction unless unreasonable.

Risk Levels 7-10: Manage risk. Further risk reduction at management discretion.

Likelihood Descriptions & Index			Decreasing Likelihood	Decreasing Consequence/Impact					
Likelihood Descriptions	Likelihood Indices			6	5	4	3	2	1
				Incidental	Minor	Moderate	Major	Severe	Catastrophic
Expected to occur	1	Likely		6	5	4	3	2	1
Conditions may allow to occur	2	Occasional		7	6	5	4	3	2
Exceptional conditions may allow to occur	3	Seldom		8	7	6	5	4	3
Reasonable to expect will not occur	4	Unlikely		9	8	7	6	5	4
Has occurred once or twice in the industry	5	Remote		10	9	8	7	6	5
Rare or unheard of	6	Rare		10	10	9	8	7	6

Consequence Descriptions & Index (without safeguards)	Consequence Descriptions	Consequence Indices: 6 Incidental	5 Minor	4 Moderate	3 Major	2 Severe	1 Catastrophic
	Workforce Health & Safety	One or more illness or injuries resulting in limited treatment	One or more illnesses or injuries requiring treatment but not severe	One or more severe illnesses or injuries	One to four illnesses with significant life shortening effects or fatalities	Multiple illnesses resulting in significant life shortening effects or multiple fatalities (5-50)	Multiple illnesses resulting in significant life shortening effects or multiple fatalities (>50)
	Public Health & Safety	One or more illness or injuries not resulting in treatment	One or more illness or injuries resulting in limited treatment	One or more illnesses or injuries requiring treatment but not severe	One or more severe illnesses or injuries	One to ten illnesses with significant life shortening effects or one to ten fatalities	Multiple illnesses resulting in significant life shortening effects or multiple fatalities (>10)
	Environment	Limited environmental impact	Localized, short term environmental impact	Localized, long-term environmental impact	Short-term, widespread environmental impact	Long-term, widespread environmental impact	Persistent, landscape scale environmental impact