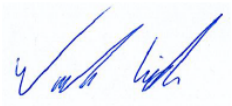
Offshore Environment Plan

TGP-698-PA-HSE-003

QR4-007PA-EP

Document title	Version	Document no.	Legacy document no.	Review period/Date
Offshore Environment Plan	12	TGP-698-PA-HSE-003	QR4-007PA-EP	1 July 2024

Approved by:

Role	Name	Signature	Date
General Manager	Wacek Lipski		16 December 2019

Preparation Record

Rev	Description	Originator	Reviewed	Approved	Date
12	**Amended following NOPSEMA request for further written information**	**N. Baulch**	**W. Lipski**	**W. Lipski**	**Dec 2019**
11	5 Year Review	Nuffield Group	N. Baulch	W. Lipski	Oct 2019
10	Amendments to reflect organisational changes in 2015, including change of facility operator, and changes in legislation and regulatory / statutory authorities – Internal Issue Only	ERS Pty Ltd / TGPPL	W. Lipski	J. Delicato	Nov 2017
9	Amendments as per NOPSEMA resubmission requirements	ERS Pty Ltd / OSDAS	B. Parsons	B. Parsons	Nov 2014
8	Amendments as per NOPSEMA resubmission requirements	Monarc Environmental / OSDAS	B. Parsons	B. Parsons	Feb 2014
7	Amendments as per NOPSEMA resubmission requirements	Monarc Environmental	B. Parsons	B. Parsons	August 2013
6	5 Year Review Amendments to reflect: • Change of owner/operator • New Offshore Regulatory Authority and their EP requirements • Requirements of Regulatory Authorities	Monarc Environmental	B. Parsons	B. Parsons	February 2013
5	Amendments to reflect: • DEPI requirements; • Cessation of operating and maintenance agreement with Jemena.	A Bambridge	A. Bambridge		April 2011
4	Amendments made in conjunction with Monarc Environmental to reflect DPI requirements	A Bambridge	A. Bambridge	J. Cleland	June 2010
3	Company name change from TGP BBI Pty Ltd to Tasmanian Gas Pipeline Pty Ltd	A Bambridge	A. Bambridge	J. Cleland	February 2010
2	Change of pipeline ownership to BBI Pty Ltd and change of company structure from Alinta Asset Management to Jemena	Tas Gas Networks in conjunction with Monarc Environmental	A. Bambridge	J. Cleland	Nov 2009
1	First Amendment (prepared in conjunction with Monarc Environmental Pty Ltd)	Gas Transmission South (AAM)	F. Nelson	J. van Weel	30 Sept 2007
0		Duke Energy International	JT	JM	19 April 2002

CONTENTS

Appendices

Tables

Figures

ENVIRONMENT PLAN SUMMARY

This TGP Offshore Environment Plan Summary has been prepared from material provided in this Environment Plan. The summary consists of the following as required by regulation 11(4):

Summary material requirement	Relevant section of EP containing EP Summary material
The location of the activity	Section 1.3
A description of the receiving environment	Section 3
A description of the activity	Section 2
Details of the environmental impacts and risks	Section 6
The control measures for the activity	Section 6 (and Table 9)
The arrangements for ongoing monitoring of the titleholders environmental performance	Section 8.6
Response arrangements in the oil pollution emergency plan	Section 9.4
Consultation already undertaken and plans for ongoing consultation	Section 8.5 (and Appendix D)
Details of the titleholders nominated liaison person for the activity	Section 1.1

1. INTRODUCTION

1.1 Titleholder

For the purposes of this Offshore Environment Plan (EP), the titleholder is:

Lindsay Ward
Chief Executive Officer
Tasmanian Gas Pipeline Pty Ltd (TGPPL)
Level 27
140 William Street, Melbourne, VIC, 3000

Phone: 03 9044 1123
Email: enquiries@tasmaniangaspipeline.com.au

The titleholders nominated liaison person is:

Wacek Lipski
General Manager
Tasmanian Gas Pipeline Pty Ltd (TGPPL)
Level 27
140 William Street, Melbourne, VIC, 3000

Phone: 03 9044 1123
Email: enquiries@tasmaniangaspipeline.com.au

Details of the titleholder's nominated liaison person will be published on the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) website. NOPSEMA must be informed of a change in titleholder, a change in the titleholder's nominated liaison person or a change in the contact details for either.

1.2 Background

The Tasmanian Gas Pipeline (TGP) is a natural gas transmission pipeline system that extends from Longford in Victoria, across Bass Strait to Bell Bay in north-east Tasmania. Additional onshore pipelines extend from Bell Bay to Port Latta in north-west Tasmania and to Bridgewater in the south.

In July 2011, Palisade Investment Partners Ltd (Palisade) acquired Tasmanian Gas Pipeline Pty Ltd and its asset, the TGP. Palisade has kept the asset ownership and licence title "Tasmanian Gas Pipeline Pty Ltd" (TGPPL).

TGPPL is the Facility Operator of the offshore section with responsibility for the ongoing operation and integrity, safety and environmental management. TGPPL have an in-house operations team and utilise specialist consultants and contractors to provide expert advice and engineering assistance when required.

A Field Services Agreement (FSA) is in place between Zinfra Group (Zinfra) and TGPPL to perform maintenance activities on the TGP. Zinfra carry out certain onshore maintenance functions and provide emergency response for TGPPL if the subsea section requires isolation. Control room services are provided by TW Power Services (TWPS) through a direct contract with TGPPL. Services provided by TWPS primarily relate to the operation of the Supervisory Control and Data Acquisition (SCADA) system for the TGP in addition to assisting with the management of any emergency event arising on the TGP.

Refer to Section 8.2 for a summary of organisational relationships and roles between all TGP parties.

1.3 Scope

This Offshore Environment Plan (EP) focuses on the Bass Strait subsea section of the TGP from the low water mark at Ninety Mile Beach, about one kilometre (km) east of Seaspray, Victoria, to the low water mark at Five Mile Bluff on the coast of Tasmania, including a portion of the drilled crossings at the Victorian and Tasmanian landfalls.

The Longford Compressor Station (LCS) – owned by Jemena - is covered by a separate Environmental Improvement Plan (PO-510-PA-EV-001), as required by the Victorian Environment Protection Authority (EPA) licence for this facility (LA42297). Similarly, the onshore section of the pipeline in Victoria and Tasmania is covered by a separate Onshore Environment Management Plan (TGP-698-PA-HSE-001).

The following State and Commonwealth pipeline licences apply to the offshore section of the TGP:

Table 1: TGP Offshore Licences

Coverage	Route	Licence No.	Date Granted
State Offshore Victoria	The route of the pipeline starts at the high water mark on Ninety Mile Beach east of Seaspray at Lat. 38°22'10", Long. 147°14'15", and continues to the point of intersection with the 3 nautical mile (nm) limit at Lat. 38°24'50", Long. 147°14'15".	Vic/PL 30(V)	20/11/2001
State Offshore Tasmania	The pipeline commences from the low water mark near Five Mile Bluff, Tasmania Lat. 41°01'50", Long. 146°53'30", and proceeds from there to the Tasmanian 3 nm limit where the pipeline crosses Lat. -40°58'20", 146°53'40".	T/PL1-TAS	14/11/2001
Commonwealth Offshore Victoria	The pipeline route follows a straight line from the intersection point with the 3 nm limit at Lat. 38°22'10", Long. 147°14'15", to a point at Lat. 38°30'00", Long. 147°18'00". The pipeline route then follows a straight line between that point and the boundary of the adjacent area at Lat. 39°12'00", Long. 147°06'25".	Vic /PL 30	19/11/2001

Coverage	Route	Licence No.	Date Granted
Commonwealth Offshore Tasmania	The pipeline route follows a straight line from the intersection point with the 3 nm limit at Lat. 40°58'20", Long. 146°53'40", to a point at Lat. 39°30'00", Long. 147°02'00". The pipeline route then follows a straight line between that point and the boundary of the adjacent area at Lat. 39°12'00", Long. 147°06'25".	T/PL1-COMM	21/11/2001

The TGP operational areas described in Table 2 are located within Victorian, Tasmanian and Commonwealth waters. The regulatory framework for offshore petroleum activities in each of these jurisdictions is shown below. Activities excluded from the scope of this EP are vessels transiting to and from the operational area. The inspection and maintenance vessels are considered part of the TGP 'petroleum activity' while within the operational areas as defined below.

Table 2: Operational Areas

	Victorian waters	Tasmanian waters	Commonwealth waters
Operational area	Within 200 m of the pipeline from high water mark on Ninety Mile Beach east of Seaspray, Victoria to 3 NM limit.	Within 200 m of the pipeline, from low water mark at Five Mile Bluff, Tasmania to 3 NM limit.	Within the 200 m of the pipeline, between the Victorian and Tasmanian 3 NM limits.
Act and Regulations	*Offshore Petroleum and Greenhouse Gas Storage Act 2010* Offshore Petroleum and Greenhouse Gas Storage Regulations 2011	*Petroleum (Submerged Lands) Act 1982* Petroleum (Submerged Lands) (Management of Environment) Regulations 2012	*Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) and Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E) Regulations) *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)*
Regulator	Department of Jobs, Precincts and Regions (DJPR)	Mineral Resources Tasmania (MRT), a division of the Department of State Growth	National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA)

**The EPBC Act specifically governs the assessment of potential risks and impacts on matters of national environmental significance (MNES). The OPGGS Act and the EPBC Act are administered by NOPSEMA in relation to offshore petroleum activities.*

1.4 Objectives of the Offshore EP

The objectives of this Offshore EP are to:

1. Ensure implementation of TGPPL's and its contractor's environment policies and environmental management systems (EMS).
2. Meet regulatory requirements and maintain compliance with environmental obligations in accordance with the TGP pipeline licences, Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 and State offshore petroleum legislation.
3. Assist TGPPL employees and contractors to operate and maintain the Offshore TGP in a manner that minimises potential impacts to the marine environment and third parties, including but not limited to:

- benthic sedimentation and disturbance
- disturbance to protected marine fauna
- pollution of land, air and water
- disruption to other commercial activities
- disturbance to other legitimate marine users
- production, handling and disposal of waste
- disturbance to pipeline integrity
- disturbance to archaeological, anthropological and other heritage sites of significance; and
- the spread of introduced marine pests

4. Review and update the following activities that assist contractors and employees in conducting their inspections and maintenance activities:

- staff induction and training
- routine surveillance and monitoring of the pipeline
- maintenance procedures with respect to environmental aspects; and
- performance and compliance audits of the pipeline and facilities

The Offshore EP shall be reviewed and updated in accordance with TGP licence requirements and in consultation with the relevant regulatory authorities.

2. PIPELINE OVERVIEW

The TGP is a DN 350 (14 inch) pipeline with the key function of supplying sales quality natural gas from the LCS in Victoria, across the Bass Strait to Tasmania. The pipeline was commissioned in 2002 and has a capacity of 47 PJ per year.

2.1 Description of Operational Features

2.1.1 Subsea Pipeline Route

The TGP offshore section commences at the high water mark along Ninety Mile Beach, Seaspray and crosses Bass Strait to the low water mark at Five Mile Bluff, Tasmania where it continues onshore. The Offshore TGP is approximately 301 km in length, with maximum water depth along the route of approximately 77 metres (m). The TGP route is shown in Figure 1. The Offshore TGP route has been selected to minimise pipeline length and avoid adverse seafloor conditions and on bottom obstructions, as observed during the pre-construction survey.

There are two drilled crossings where the pipeline meets the Victorian and Tasmanian landfalls, which were constructed using horizontal directional drilling (HDD). The Victorian HDD section is 1080 m long, commencing at Kilometre Point (KP) – 0.265 and exiting the seabed at KP 0.815, at approximately 10 m water depth. The Victorian shore approach was trenched and backfilled naturally from KP 0.806 to KP 4.0 and the maximum depth of the trench is 0.6 m (Lowest Astronomical Tide (LAT)) to the top of the pipeline. The Tasmanian HDD section is some 859 m long, entering the seabed at KP 300.181 in 10.5 m (LAT) water depth.

The rest of the offshore component of the TGP sits on the Bass Strait seabed. The seabed along the Offshore TGP route across Bass Strait is mostly flat and featureless with the steepest slopes occurring between KP 289 and KP 290, where the seabed rises approximately 14 m over a distance of 90 m (slope angle 9°). Accordingly, this section of the pipeline design is not reliant on burial and the pipeline was not laid on the seabed. It is expected that some sections of the Offshore TGP will partially or fully self-bury with time.

2.1.2 Key Co-ordinates and Interfaces

The Offshore TGP route co-ordinates (grid and geographic) are provided in Table 3. The route length is defined by KP. The pipeline route curves are defined by length Intersection Points (IP) and associated Tangent Points (TP).

Table 3: TGP Offshore Route Co-ordinates (Grid and Geographic)

Feature	KP	WGS 84 (Zone 55)		AMG 66 (Zone 55)		Geographic WGS 84	
		Eastings (m)	Northings (m)	Eastings (m)	Northings (m)	Latitude	Longitude
Vic. End							
HDD Entry	21.647	517,842.2	5,753,741.4	517,730.0	5,753,558.0	-38.125157	147.121525
HDD Exit	22.735	518,167.2	5,752,703.4	518,055.0	5,752,520.0	-38.222522	147.122873
IP 1A		518,645.3	5,751,176.5	518,533.1	5,750,993.1	-39.231473	147.124858
IP 1B		520,368.0	5,749,364.1	520,255.8	5,749,180.7	-38.241339	147.135978
IP 1		526,271.2	5,738,832.4	526,159.0	5,738,649.0	-38.295452	147.180459
IP 2		502,979.2	5,631,602.4	502,867.0	5,631,419.0	-39.275455	147.020468
IP 3		491,100.2	5,462,000.4	490,988.0	5,461,817.0	-40.593526	146.533908
IP 3A		491,244.7	5,460,138.7	491,132.5	5,459,955.3	-41.003564	146.534517
HDD Exit	322.344	491,082.2	5,458,505.2	490,970.0	5,458,321.8	-41.012861	146.533813
HDD Entry	323.303	490,997.1	5,457,650.4	490,884.9	5,457,467.0	-41.015633	146.533444
Tas. End							

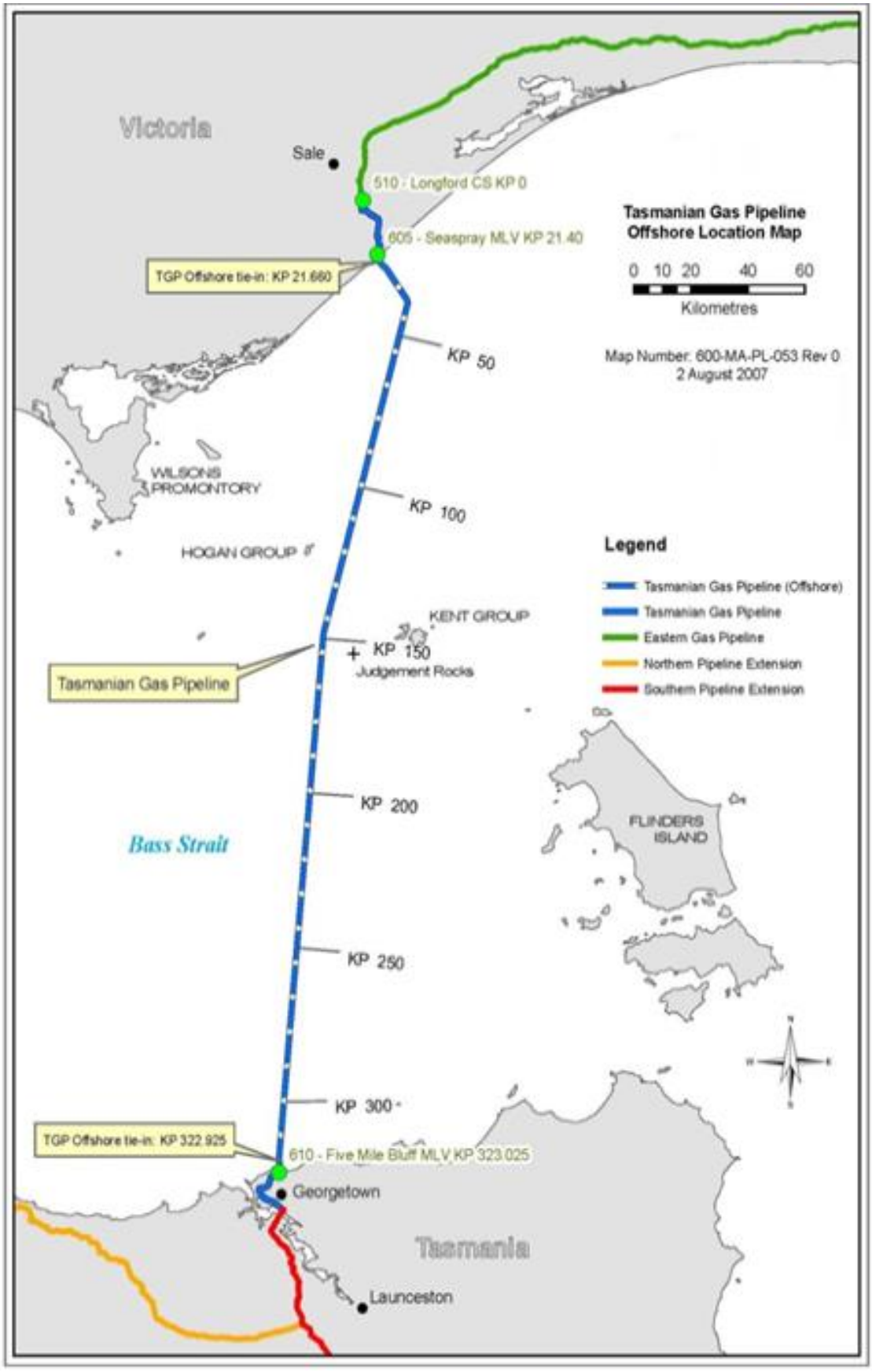


Figure 1: TGP Offshore Route Overview

2.1.3 Design and Operating Parameters

Made of carbon-manganese steel, the TGP has been designed and constructed in accordance with ASME B31.8: Gas Transmission and Distribution Piping Systems (1995 Edition) design code, applicable Australian Standards (e.g. AS 2885.2 Welding) and regulations of the Commonwealth, Victoria and Tasmania. Design parameters and operating conditions for the Offshore TGP are summarised in Table 4.

Table 4: TGP Design Parameters and Operating Conditions

Parameter	Unit	Value
Pipeline Length	km	301.6
Size	NB	350
Outside Diameter	mm	355.6
Pipe Wall Thickness	mm	11.1
Wall Thickness (shore crossing)[1]	mm	12.7
Grade		X65
Maximum Allowable Operating Pressure	MPa(g)	15.3
Offshore Pipeline Average Design Temperature	°C	13

Notes:

1. *12.7 mm wall thickness used for section of pipeline through the shore crossing and along the shore approach lengths to provide additional strength, wall thickness and stability.*

The Offshore TGP has been designed in accordance with a pipeline integrity study to ensure it can withstand conditions expected in Bass Strait, including currents, temperature, sedimentation, marine growth and seabed conditions. This is outlined in the TGP *Design Basis Manual – Offshore Pipeline (TGP-698-DG-DN-003)* and further details are also provided in the TGP *Offshore Safety Case (TGP-698-SC-HSE-004).*

The Offshore TGP has fully welded joints along its entire length and has no tees. As a result there are no flanges, with the exception of the HDD tie-in flanges offshore at the Victorian and Tasmanian ends.

The Offshore TGP is protected externally by a 0.4 mm fusion bonded epoxy anti-corrosion coating. In addition, the subsea section is further protected by a nominal 38 mm concrete weighted coating, which also serves to stabilise the pipe and act as an effective barrier between any third party impacts and the pipe wall. The Offshore TGP also has a cathodic protection (CP) system comprising sacrificial aluminium anodes attached at approximately every 12 to 15 field joints (approximately every 180 m).

The Victorian and Tasmanian HDD sections are protected by 38 mm thick sacrificial anodes installed on every pipe joint through the bore hole. A galvanic anode CP system and onshore anode ground bed was installed on the Victorian HDD section during construction but was subsequently disconnected following commissioning of the pipeline.

2.1.4 Pipeline Facilities and Features

The TGP route is shown in Figure 1. There are no permanent offshore facilities (platforms, mooring buoys, etc.) or equipment, machinery or instrumentation associated with the Offshore TGP. Ancillary facilities occur at the Victorian and Tasmanian ends beyond the offshore section of the TGP:

- Seaspray Main Line Valve (MLV) (Facility No 605) KP 21.40
- Five Mile Bluff MLV (Facility No 610) KP 323.025.

A section of the Offshore TGP was trenched during the installation stage from the Victorian HDD exit point at KP 22.78 to approximately 11 m water depth at KP 25.988. The Tasmanian HDD exit point at KP 322.344 was not trenched due to hard rock. The trench on the Victorian side was not mechanically backfilled but left open to backfill naturally. To date, this is the only section of the Offshore TGP that is fully buried.

Since the pipeline was constructed no additional property has been brought onto or left on the title areas covered by this EP.

No end-of-life or decommissioning activities are planned during the life of this EP. The offshore pipeline has a nominal 40-year design life, which may be extended subject to confirming the integrity of the pipeline. When decommissioning activities are being considered a review will be conducted and a plan developed including environmental considerations such as rehabilitation and monitoring. It is currently considered that:

- The net environmental risk and impact is significantly higher for decommissioning strategies involving pipeline recovery compared to leaving the pipe in-situ.
- The risk to others using the marine environment around the region of the abandoned pipeline for the remainder of its corrosion life is sufficiently low to be negligible.
- The long-term environmental impact in the region of the abandoned pipeline for the remainder of its corrosion life is sufficiently low to be negligible.

Based on the above the current decommissioning philosophy assumes that the pipeline will remain in-situ. This approach will be reviewed at the time of decommissioning, taking into consideration the acts, regulations and guidance of the day as well as any relevant technological advancements.

2.1.5 Gas Composition

The TGP transports sales quality Natural Gas from Longford in Victoria to Tasmania. TGP Natural Gas comprises largely methane (91.14%) and ethane (5.21%) and is dry and free from significant impurities under normal operating conditions. Other components include carbon dioxide (2.26%), nitrogen (0.74%), propane (0.5%) and minor quantities of oxygen, butane, pentane and hexane (in quantities less than 0.1%).

The sales gas complies with *AS 4564: 2011 – Specification for General Purpose Natural Gas,* which sets out the limits for Wobbe Index, oxygen, hydrogen sulphide, total sulphur, water content, hydrocarbon dew point and total inert gases.

Gas quality is continuously monitored by SCADA using gas chromatographs and moisture analysers to check that gas conforms to specifications set out in contracts with gas suppliers and shippers. Gas chromatographs and moisture analysers are validated continually using certified calibration gas. The gas measurement instruments are validated at regular intervals as determined by the pipeline engineers.

2.1.6 Third Party Infrastructure

The Offshore TGP route is adjacent and to the west of the EAPL/BHP Perch and Dolphin pipeline easement. The TGP design provides a minimum separation of 230 m between the Offshore TGP and the EAPL/BHP Perch and Dolphin pipelines (refer drawing no.TGP-600-PL-IN-002).

The Offshore TGP route is adjacent and to the east of the Basslink subsea 400 kV DC electricity Interconnector. The TGP design provides minimum offshore separation between the Offshore TGP and the Basslink Interconnector of 3.262 km (refer drawing no.TGP-600-PL-IN-003).

There is one foreign crossing of the Offshore TGP. The Indigo submarine cable is a fibre optic communication link between Sydney and Singapore via Perth and Jakarta and was laid in 2018. It

crosses the TGP in a uraduct at S39 17.58661 E147 04.9635. Details are contained within *Indigo Cable/TGP Final crossing report (TGP-600-RP-SU-011)*

2.2 Key Offshore TGP Activities

The TGP is an operating pipeline transporting natural gas from Victoria to Tasmania and, therefore, there are no daily activities on the pipeline itself apart from continuous monitoring of pipeline flows and pressures by the Control Room.

Surveys of the pipeline, to assess pipeline integrity and any maintenance requirements, are undertaken on a periodic basis and occur approximately every 5 years. Consequently, temporary facilities are only on location during subsea survey and emergency repair works if, and when, they arise.

The following sub-sections describe all potential activities associated with the Offshore TGP.

2.2.1 Operation of the Pipeline

The Control Room in Melbourne CBD, Victoria operates the pipeline 24 hours per day, 7 days per week, 365 days a year via the SCADA system.

The SCADA system monitors flow in the pipeline and provides information on, and remote management of, the CP system, pressures, temperatures, valve status, metering selections, alarms, gas quality, flow rates, condition monitoring and site entry monitoring. The status of the entire TGP system can be determined and operators can respond to changing conditions, faults and emergencies.

The SCADA system ensures that all relevant alarms and protective systems are in place so that pipeline integrity, and safety of personnel and the public, is not compromised and that security of supply is maintained. Remote shutdown, opening and closing of MLVs and other ancillary functions are all conducted from the Control Room using SCADA. The SCADA system consists of redundant servers running a Honeywell Experion system, and the system is connected to stations and facilities along the TGP via the data communication network.

Gas pressure in the TGP is monitored continuously from the Control Room. In the event of detection in pressure drop, the affected pipeline section will be immediately isolated by closure of the appropriate MLVs at Seaspray, Victoria and Five Mile Bluff in Tasmania.

Smoke, flame, and/or gas detection systems have been installed in onshore pipeline facility control huts and are also monitored by the Control Room via SCADA. There are no offshore facilities and accordingly no smoke, flame and/or gas detection systems are installed on the Offshore TGP. The SCADA system provides real time flow and pressure data which is modelled to enable abnormal operating conditions, pipeline leak, to be alarmed.

2.2.2 Field Surveys and Maintenance Activities

Field inspections and maintenance activities for the Offshore TGP are performed in accordance with the TGP *Offshore Operations and Maintenance Management Plan (TGP-600-OM-MO-002* and the schedule of activities is outlined in the TGP *Offshore Pipeline Operations and Maintenance Schedule (TGP-600-SH-MO-001)*. These activities include:

- Periodic subsea surveys using remotely-operated vehicles (ROV) / autonomous underwater vehicle (AUV), Side Scan Sonar (SSS) and Diver Inspections to detect existing or potential pipeline damage, and for the determination of maintenance and operational requirements
- An intelligent pipeline pigging activity, whereby an electronically-equipped device (pig) is inserted into the pipeline to detect metal loss in the pipeline wall; and
- Maintenance activities conducted on an as-needs basis following surveys or identified issues

The TGP *Offshore Pipeline Operations and Maintenance Schedule* (TGP-600-SH-MO-001) provides for a five-year rolling planned works program which is reviewed annually subject to risk assessment and evaluation of any integrity surveys conducted in the preceding year. This

approach is further defined in the Offshore Pipeline Integrity Management Plan (TGP-698-PA-IP-002).

Major event driven surveys may be conducted in a similar fashion to the regular surveys to determine damage from physical impact or adverse weather, and will be undertaken as required (refer to Section 2.2.2.7).

Inspections and maintenance activities are performed by specialist contractors contracted in accordance with TGPPL's contractor engagement process (refer to Section 8.2.2). Any inspection and maintenance work must be carried out in a manner that matches the performance outcomes and standards set down in this Offshore EP.

Offshore pipeline activities are discussed in detail in subsequent sections. Where the Offshore TGP joins the terrestrial component of the pipeline, operations and maintenance activities undertaken in the coastal areas are discussed in more detail in the TGP *Onshore Environment Management Plan (TGP-698-PA-HSE-001).*

2.2.2.1 Support vessels

Maintenance and inspection of the Offshore TGP is undertaken with the aid of support vessels. Vessels are contracted from international or national suppliers, when required, and will vary depending on the proposed activity and vessel availability. Vessels supporting the TGP operations will be specified and operated in accordance with international and Australian regulatory requirements. The vessels will be subject to a marine assurance program and will be certified as being in compliance with international maritime legislative requirements by a Classification Society registered with the International Association of Classification Societies (IACS).

Vessels range in weight (300 – 1500 tonnes (t) - gross tonnage) and fuel capacity (48 - 530 cubic metres (m^3)). An example vessel, used in March 2013 for an Offshore TGP survey, is the 'Silver Star' (refer to Figure 2). The 'Silver Star' has a gross tonnage of 300 t and a fuel capacity of 48 m^3 (approx. 48,000 L) spread between numerous tanks.

Depending on inspection and maintenance activities required, vessels are at sea for 1 to 4 weeks. Given their greater fuel capacity, large vessels can remain at sea for these time periods, however, smaller vessels such as the 'Silver Star' may require port visit to refuel or for maintenance. No vessel refuelling is undertaken at sea.

Vessels use global positioning system (GPS) coordinates to remain within the Offshore TGP route.

Figure 2: The 'Silver Star', typical of the vessels used for pipeline surveys

2.2.2.2 Pipeline Inspections

As per the TGP *Offshore Pipeline Operations and Maintenance Schedule (TGP-600-SH-MO-001)*, maintenance activities include periodic inspections to provide assurance of the pipeline integrity. Specialised geophysical surveys are used to inspect the condition of the offshore component of

the pipeline. Pipeline anomalies or span inconsistencies from as-laid data are identified in these operations, along with pipeline orientation and the condition of coatings, field joints and anodes.

Each survey will use offshore support vessels. Equipment used in the surveys includes ROV / AUV mounted cameras, single and multi-beam echo sounders and SSS (refer to Section 2.2.2.3 below). The vessel will also be equipped with deck handling facilities and survey positioning equipment.

Offshore vessels involved with Offshore TGP inspections have their own communications system for use between the vessel, land base and emergency services should they be required. The communication system is made available to visiting TGPPL personnel, visitors, representatives, consultants, etc. at all times during the surveys and in emergency situations.

Inspection of the Offshore TGP is normally scheduled once every 2 years (unless a risk assessment or unplanned event triggers a survey). TGPPL are working towards a risk-based inspection (RBI) approach to future surveys, with a view to extending the inspection intervals out to possibly every 7 years. The last full length inspection of the Offshore TGP was completed in March/April 2019. The next full pipeline inspection is targeted in 2024. The survey may involve the use of SSS or ROV / AUV. The duration of each survey ranges between 1 to 4 weeks. Surveys are not expected to exceed 4 weeks.

2.2.2.3 Side Scan Sonar (SSS)

SSS is a hydro-acoustic technique that involves towing a torpedo shaped 'towfish' behind the survey vessel. The tows are typically conducted at 3 to 5 knots with a maximum swath width of 150 m per side depending on resolution and water depth. The towfish is normally located about 10-15 m above the seabed and at a distance of about 150-200 m behind the vessel. There are no fluids contained within the towfish.

These surveys do not use air-guns and are considered less intrusive than surveys for oil exploration where air gun penetration is expected to be in the range of 3 to 4 km. Systems used in the geophysical surveys of the Offshore TGP typically penetrate the seabed only to 10 m and the source noise level of sub-bottom profile equipment is approximately 60-70 dB re 1µPa@1 m.

The SSS survey is conducted over the majority of the Offshore TGP length (excluding inshore portions) and is used to: determine if the pipeline has moved; identify any objects that may have impacted the pipeline; and identify any spans that exceed the maximum allowable length. Information gathered during the SSS survey is used to plan and determine the visual inspection requirements of the subsequent ROV / AUV survey.

2.2.2.4 Remotely Operated Vehicle (ROV) / Autonomous Underwater Vehicle (AUV) Survey

Visual inspections of sections of the Offshore TGP identified during the SSS surveys are undertaken using a ROV or AUV. This allows confirmation of the pipe stability and weight coating integrity, confirmation of any locations where the approved free span lengths are exceeded, and checks for external damage, debris and marine growth.

ROVs / AUVs are also used to inspect the CP system and may use probes to determine electrical potential differences at fixed points. Sacrificial anodes, placed about every 180 m along the Offshore TGP, are also inspected as are field joint coatings applied in the gaps of concrete between individual pipe joints. These surveys will include the inspection of as many anodes as possible, with estimates of the amount of anode depletion and the collection of potential readings, to identify any areas of the Offshore TGP that may be susceptible to external corrosion.

ROV surveys are undertaken in line with the IMCA R004 Rev. 3, 2009 - Code of practice for the safe and efficient operation of remotely operated vehicles. ROVs are generally mounted with a camera in pressure proof housing and may have robotic arms to allow completion of small tasks. Small amounts of hydraulic oil may therefore be present. A cable connects the ROV / AUV to the surface and the image of the seabed can be viewed and recorded on the vessel. Coordinates are recorded via GPS in order to have an automated permanent record of the location of the camera drop or tow. Where spans are confirmed to be beyond the maximum allowable limit, maintenance works will be undertaken on the same voyage to correct the deficiency (refer to Section 2.2.2.7).

The Victorian and Tasmanian HDD exit points are inspected for scouring and/or free span development in accordance with the TGP *Offshore Pipeline Operation and Maintenance Schedule (TGP-600-SH-MO-001)* through ROV / AUV or diver survey, and complemented by hydrographic surveys as required to cover possible backfilled trench areas. Should excessive free spanning at the HDD exits be detected, the severity of the span shall be assessed. The method and timing of any span rectification work deemed necessary shall be determined based on an engineering and risk assessment of the survey results.

2.2.2.5 Diver Inspections

The tie-in flanges at the HDD sections of the Offshore TGP lie in relatively shallow water and it was anticipated that the flanges would be inspected manually using divers. However, during the 2013 ROV survey, the ROV unit was able to inspect the tie-in flanges to such an extent that the need for diving operations is no longer required for this inspection work.

Diver inspections are not normally carried out during the major surveys. However, in the event of extreme damage, if metrology is required, or for repair / maintenance work, divers may be employed to both inspect and accurately map the pipeline in the relevant area.

For further details of diving operations, refer to Section 2.11.4 of the *TGP Offshore Safety Case (TGP-698-RP-AU-003)*.

2.2.2.6 Internal Inspection (Pigging)

Pigs are devices inserted into the pipeline using 'pig traps' (launchers) that are fitted with doors (closures). Pigs enter the pipeline via a launcher and exit via a receiver, both of which are onshore devices. When inserted, pigs travel throughout the length of a pipeline driven by the gas flow.

There are two types of pigs which perform different maintenance functions:

- Utility pigs - are used to perform functions such as cleaning or sealing a pipeline; and
- Intelligent ('smart') pigs - provide information on the internal condition of the pipeline, as well as locating problem areas

The frequency of pipeline pigging using utility pigs is determined based on operational history and the annual integrity risk assessment and review. Cleaning pig runs are scheduled in accordance with the annual *Onshore Asset Management Plan.* The timing of subsequent cleaning pig runs will be determined subject to pig retrieval and inspection of the nature and amount of debris collected.

Intelligent pigging is also included as part of the TGP inspection and maintenance programme. A planned intelligent pigging run has been included in the *Offshore Pipeline Operations and Maintenance Schedule (TGP-600-SH-MO-001)* every 10 years, following the successful run performed in 2010. The frequency is reviewed every year in the annual integrity risk assessment and review. This review will analyse all the integrity data collected since the annual review and scheduling of the next intelligent pigging run will then be based on risk assessment. If the continual collection and evaluation of integrity management data indicates a deficiency trend, then the timing of the formal integrity review study will be brought forward. Currently, the next routine intelligent pigging run is scheduled for 2020, however, the requirement for an intelligent pigging inspection outside the nominal 10 yearly schedule may be triggered by the following events:

- Integrity monitoring data indicates that there is a concern with respect to the long-term integrity of the pipeline; or
- A direct event occurs that may have compromised the integrity of the pipeline

2.2.2.7 Maintenance Activities

Maintenance work to repair potential or existing damage consists of specific tasks required to rectify deficiencies found during Offshore TGP inspections, and their frequency will therefore depend on the results of the inspection surveys. It is anticipated that maintenance activities could comprise the following:

- Rectification of unsupported pipeline spans that are greater than the maximum allowable span, in order to ensure compliance with the allowable design length and reduce the likelihood of vortex induced vibrations (VIV). Span correction generally involves the installation of supports, in the form of grout-filled bags, underneath the centre of the span (jetting to remove high points is considered unlikely once the pipeline has been laid). Each bag, with dimensions of about 1800 mm × 1200 mm, is placed under the subsea pipeline using a ROV and inflated with grout (concrete) via a hose connection to the support vessel. Each operation is monitored by the ROV to ensure smooth operation
- Removal of dropped objects (such as containers) from passing vessels (including survey vessels) that may settle on or near the Offshore TGP is a conceivable requirement and, depending on the object, is likely to be achieved with the assistance of a ROV (objects of up to 300 kg in weight can be removed by ROV)
- Repair of concrete coating which, depending on the severity, may simply involve placing a concrete mattress over the damaged area to prevent possible damage to the subsea pipeline from further impacts. Concrete itself is considered environmentally benign and the mattress installation is undertaken in accordance with IMCA D042, R016 2011 - Diver and ROV Based Concrete Mattress Handling, Deployment, Installation, Repositioning and Decommissioning. Concrete mattresses, of dimensions 150 mm x 2.2 m x 5 m, will be lowered onto the subsea pipeline via a specialised crane on-board support vessels (maximum on-board weight of 3.5 t). Final placement is assisted by the use of ROVs and/or divers
- Replacement of sacrificial anodes (possibly expected during the design life). This will be undertaken using a ROV, which will remove and replace the anode (attached via a bracket)

Removal of marine growth from the subsea pipeline is not expected to be required at this stage. Similarly, while it is expected that the subsea pipeline will self-bury over time as sediment shifts, removal of excessive sedimentation is not an expected requirement. This is monitored as part of Offshore TGP inspections

2.3 Unplanned Events

Unplanned events or emergencies identified for the Offshore TGP are:

- Leaks from / ruptures of the pipeline leading to loss of containment (LOC)
- Incidents on board the offshore inspection/maintenance support vessel(s) resulting in a spill of fuel, chemicals or other contaminants

2.3.1 Gas Escape

LOC from the Offshore TGP would result in a significant pressure drop, which would be identified via the SCADA system. Major surveys may result when significant pressure drops are identified in the pipeline via the SCADA system.

In the event of detection of pressure drop, the Offshore TGP will be immediately isolated by closure of the onshore MLVs at Seaspray and Five Mile Bluff. This will automatically limit the volume of gas released. The maximum volume of gas released from any point in the pipeline can be up to 20 TJ. Following isolation of the Offshore TGP inventory, the TGP Offshore emergency procedures would be implemented and the inventory of gas blowdown in a controlled manner through the onshore MLVs. TGPPL would then implement procedures to repair the damaged section of subsea pipeline as soon as possible.

Due to the depth of the subsea pipeline, any gas release is most likely to be gradual and evidenced by bubbles rising to the surface. Any explosive rupture would be buffered by the density of the water and would only affect the immediate vicinity of the pipeline. Impacts would therefore depend on the depth at which the failure occurred. The pipeline however has been specifically designed (material, wall thickness and concrete coating) to resist all perceived risks such as penetration from anchors, dropped cargo or sunken vessels.

Maintenance of pipeline integrity is specifically addressed in the TGP *Pipeline Integrity Management Plan (TGP-698-PA-IP-002)* and risks associated with a breach in Offshore TGP integrity are covered within Section 3 of the *TGP Offshore Safety Case (TGP-698-RP-AU-003)*.

Modelling of a potential leak of gas as a result of a breach of the Offshore TGP was undertaken to determine the area that may be impacted. The potential gas leak scenarios modelled ranged from a hole of 5 mm to a full bore rupture (Cardno, 2013).

Due to its low molecular weight, any gas escape from the Offshore TGP is expected to rise rapidly through the water column to the sea surface where it will dissipate to atmosphere. For the purposes of the model, it was assumed that gas will rise from the seabed as bubbles and reach the sea surface in an area represented by a circle with a radius dependent on the water depth and the rate of leakage. With this initial source on the surface, standard atmospheric dispersion was used to compute the gas concentration in the atmosphere as a function of the distance downwind (Cardno, 2013).

Results of the modelling indicated that:

- Concentration of gas in the plume above the sea surface will drop rapidly to below the Lower Explosive Limit (LEL) within 5 km of the source
- Sea level gas concentrations are very much lower and, due to the plume rise, are well below the required limit beyond about 100 m from the source

The environmental impacts of a gas leak would largely be due to its physical presence as it passes through the water column and into the atmosphere. Some of this gas may dissolve in the water column but is not generally considered toxic to marine biota. The main potential impacts are only likely to occur from the extreme cases of explosion, flammability or asphyxiation where it may accumulate in sufficient quantities. The open environment of the Offshore TGP is extremely unlikely to lead to this condition.

Potential exposure of marine fauna to gas hydrocarbons from a subsea pipeline rupture would require the coincident occurrence of fauna, such as marine mammals or birds, within the area of a recent leak.

In the open water offshore environment, the nearest land mass is located 10 km from the Offshore TGP and is unlikely to be impacted by gas escape from a subsea pipeline rupture.

For a gas leak in a nearshore environment, adverse effects could involve potential hazards associated with concentration of gas in air near the LEL, however atmospheric conditions prevailing at the time, and presence of ignition sources, will determine if there is any impact to the environment.

2.3.2 Hydrocarbon Spill

The TGP is licensed to carry dry natural gas only (i.e. it contains no liquid hydrocarbons or contaminating compounds) and, therefore, a leak from the Offshore TGP, regardless of size, is not considered a credible source of liquid hydrocarbon spills. As such, maintenance and inspection activities undertaken by third party vessels as part of Offshore TGP operations are deemed the only credible source of liquid hydrocarbon spills.

The types of hydrocarbons used during inspection and maintenance activities include:

- Hydraulic fluids used within inspection equipment (ROVs / AUVs)
- Fuel used to power inspection and maintenance vessels

Spills contained within the confines of the vessel are dealt with under the vessel Shipboard Oil Pollution Emergency Plan (SOPEP) and so are not discussed further within this document.

As no operational chemicals are required on the vessels and no refuelling shall occur at sea, the most credible sources of a hydrocarbon spill were identified as:

- Spills or leaks of hydraulic oil from the ROV / AUV

- Breach of a fuel tank on the survey vessel either as a result of collision or grounding during extreme weather events

2.3.2.1 Hydraulic Oil Spill

Due to the size of the equipment used, the maximum volume of any potential spill of hydraulic oil from ROVs / AUVs will be 100 L.

Hydraulic oils utilised in the ROVs / AUVs are environmentally friendly, low ecotoxicity oils, which will breakdown rapidly and pose minimal risk to the marine environment. In addition, ROVs / AUVs are generally only utilized in open sea environments where a spill of this magnitude is likely to quickly disperse.

2.3.2.2 Fuel Spill

Marine Diesel Oil (MDO), or Marine Gas Oil (MGO), fuel will be used to power survey vessels. This may be procured from a range of suppliers.

Diesel oils are generally considered to be low viscosity, non-persistent oils, which are readily degraded by naturally occurring microbes. Diesel oils are considered to have a higher aquatic toxicity in comparison to many other crude oils due to the types of hydrocarbon present and their bioavailability. They also have a high potential to bio-accumulate in organisms.

MDO is a medium-grade oil (classified as a Group II oil) used in the maritime industry. It has a low density, a low pour point and a low dynamic viscosity (Table 5), indicating that this oil will spread quickly when spilled at sea and thin out to low thicknesses, increasing the rate of evaporation.

Due to its chemical composition, approximately 40% will generally evaporate within the first day, with the remaining volatiles evaporating over 3-4 days depending upon the prevailing conditions. Diesel shows a strong tendency to entrain into the upper water column in the presence of moderate winds and breaking waves (>12 knots) but floats to the surface when conditions are calm, which delays the evaporation process. Table 6 shows the boiling point ranges for the diesel used in the ADIOS II spill modelling.

Table 5: Physical characteristics of MDO

Parameter	Characteristic
Density (kg/m^3)	829 @ 15°C
API	37.6
Dynamic viscosity (cP)	4.0 @ 25°C
Pour point (°C)	-14
Oil category	Group II
Oil persistence classification	Light-persistent oil

Table 6: Boiling point ranges of MDO

Characteristic	Volatiles (%)	Semi-volatiles (%)	Low volatiles (%)	Residual (%)
Boiling Point (°C)	<180	180 - 265	265 - 380	>380
MDO	6.0	34.6	54.4	5
	Non-persistent			Persistent

The environmental impact associated with an MDO spill is likely to be less severe than that of Marine Fuel Oil (and MGO less again) because of the lower molecular weight of the hydrocarbon fractions and lower viscosity (NOAA, 2006).

The environmental impacts of a hydrocarbon spill are largely due to the toxicity of the fuel (generally due to the aromatic components) and its physical persistence as layer or emulsion. For a fuel spill in an offshore environment, adverse effects would primarily involve acute toxicity related to aromatic hydrocarbon exposure in "fresh" fuel. Potential exposure of marine fauna to spilled hydrocarbons would require the coincident occurrence of fauna, such as marine mammals or birds, within the area of a recent spill. As such, the potential for damage would be limited to the few hours immediately following a spill before the aromatic components evaporate. In the high energy environment of Bass Strait, aromatic compounds will evaporate and disperse quickly.

For a fuel spill in a nearshore environment, adverse effects could involve acute toxicity related to aromatic hydrocarbon exposure in "fresh" fuel as well as the potential physical effects associated with "oiling" of habitat or organisms (a detailed evaluation of potential impacts is provided in Section 6.9.2).

2.3.2.3 Fuel Spill Modelling Results

The maximum credible fuel spill volume associated with Offshore TGP inspection and maintenance activities is 40,000 L, being the maximum capacity of one fuel tank of the largest expected vessel (AMSA, 2012). Oil spill trajectory modelling with a spill volume of 40,000 L of fuel oil was undertaken to determine the areas that could potentially be impacted by a spill of fuel oil.

The key assumptions and methodologies of the oil spill modelling for the TGP Offshore OPEP are summarised as follows:

- It was assumed that spilled material will move downwind at a rate of 3% of the wind speed (Det Norske Veritas (DNV), 2011) in addition to movement by tidal currents. This provided the movement of the centroid of a spill
- It was assumed that the source of the spill will be a vessel that could be working at any point along the length of the Offshore TGP with equal likelihood
- A Monte Carlo simulation was run for 100,000 events to plot contours of frequency of occurrence of spilled material at intervals of 12, 24, 36 and 48 hours after the spill event
- Wind data was derived from the Bureau of Meteorology operational model system, and tidal currents extracted at ten locations equally spaced along the pipeline from a calibrated numerical model of the tidal currents in Bass Strait
- Does not take into account the weathering and fate of the spilled oil

Figure 3 shows the distribution of the centroids for all runs.

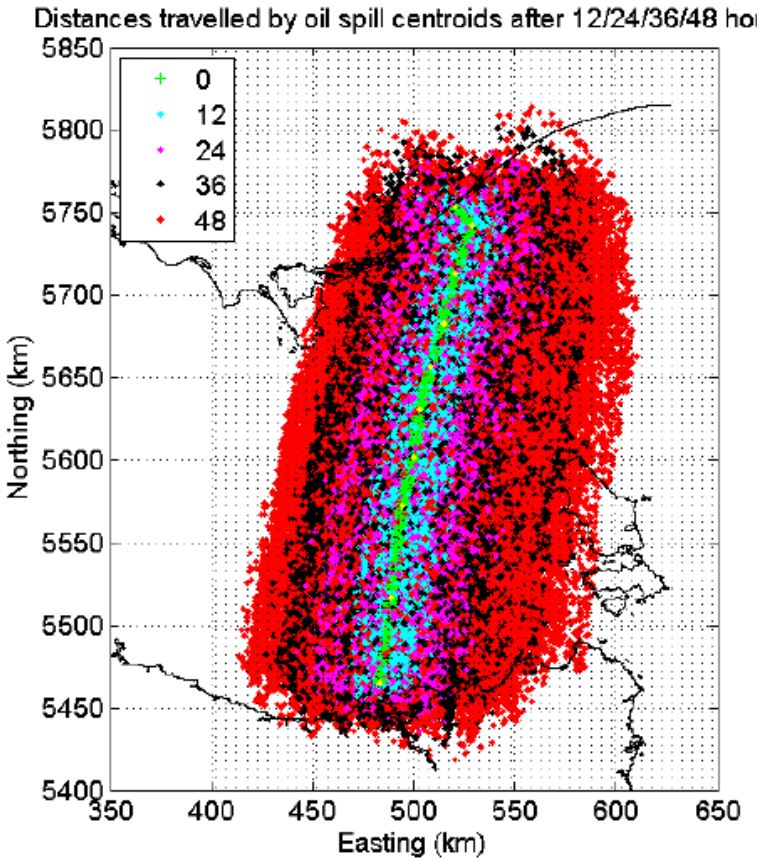


Figure 3: Results of 100, 000 Fuel Oil Spill Simulations

Figure 4 to Figure 7 show the percentage probability of the centroid occurring in a 5 km grid on the assumption that a hydrocarbon spill occurs.

Fuel tank breach through accidents as a result of extreme weather events or collision between vessels is considered unlikely due to the control measures in place (section 6.9.3). Furthermore, with respect to accidents during extreme weather events, the maximum distance that a vessel working near the Offshore TGP could be from a safe mainland harbour is only 160 km. Consequently, if weather conditions are predicted to deteriorate, vessels will terminate activities and seek refuge.

Since the likelihood of a spill is very low and field maintenance and subsea inspection activities only occur every 2 years, multiplying this by the low occurrence probability results in an extremely low likelihood of a spill occurring at any given location (Cardno 2013). The modelling report concluded "Since the likelihood of a spill is very low, multiplying this by the low occurrence probability gives an extremely low likelihood of a spill impacting at any given location. Due to the extremely low likelihood, it is not considered warranted to undertake more detailed fate modelling" (Cardno, 2013).

Based on the trajectory modelling results, the zone of potential impact (ZPI) has been conservatively defined as the area within the 0.000 contour (representing a probability of less than 0.0005%) after 48 hours, refer Figure 7.

The spill of 40 m^3 was also modelled using ADIOS II (Automated Data Inquiry for Oil Spills) to predict how the diesel oil would weather (undergo physical and chemical changes) in the marine environment (Table 7) to confirm the definition of the ZPI. It was predicted that the surface life for an instantaneous diesel spill of 40 m^3 from a worst-case vessel collision incident is estimated at 12 hours (Figure 4).

Table 7: Average characteristics for Bass Strait (winter)

	Current	Wind	Water Temperature	Salinity
Details	0.3 m/s	8 m/s	12°C	35 ppt
Direction	East	West	-	-

Due to rapid and high levels of evaporation when spilt at sea, the environmental effects of diesel spills are generally short-term. When spilled at sea, diesel will spread and thin out quickly, with up to 37 m^3 (over 90%) predicted to be lost by evaporation and dispersion within just 6 hours, depending upon sea temperature and winds (Figure 4). Diesel oils also have low viscosities and can result in hydrocarbons becoming physically dispersed as fine droplets into the water column when winds exceed 10 knots. Droplets of diesel oil that are naturally dispersed will be sub-surface (3 – 10m depending on the conditions) and will move solely with the currents while dispersed in the water, while on the surface are affected by both wind and currents.

The definition of the ZPI as shown in Figure 9 is considered to be conservative given that the ADIOS modelling indicates that the surface life for a 40 m^3 diesel spill is approximately 12 hours. The area potentially exposed to surface oil within the 0.000 contour after 12 hours is considerably smaller with minimal shoreline contact. The ADIOS modelling confirms that the trajectory modelling provides a relevant and conservative basis for the definition of the ZPI and identification of receptors in the environment (see Section 6.9.2).

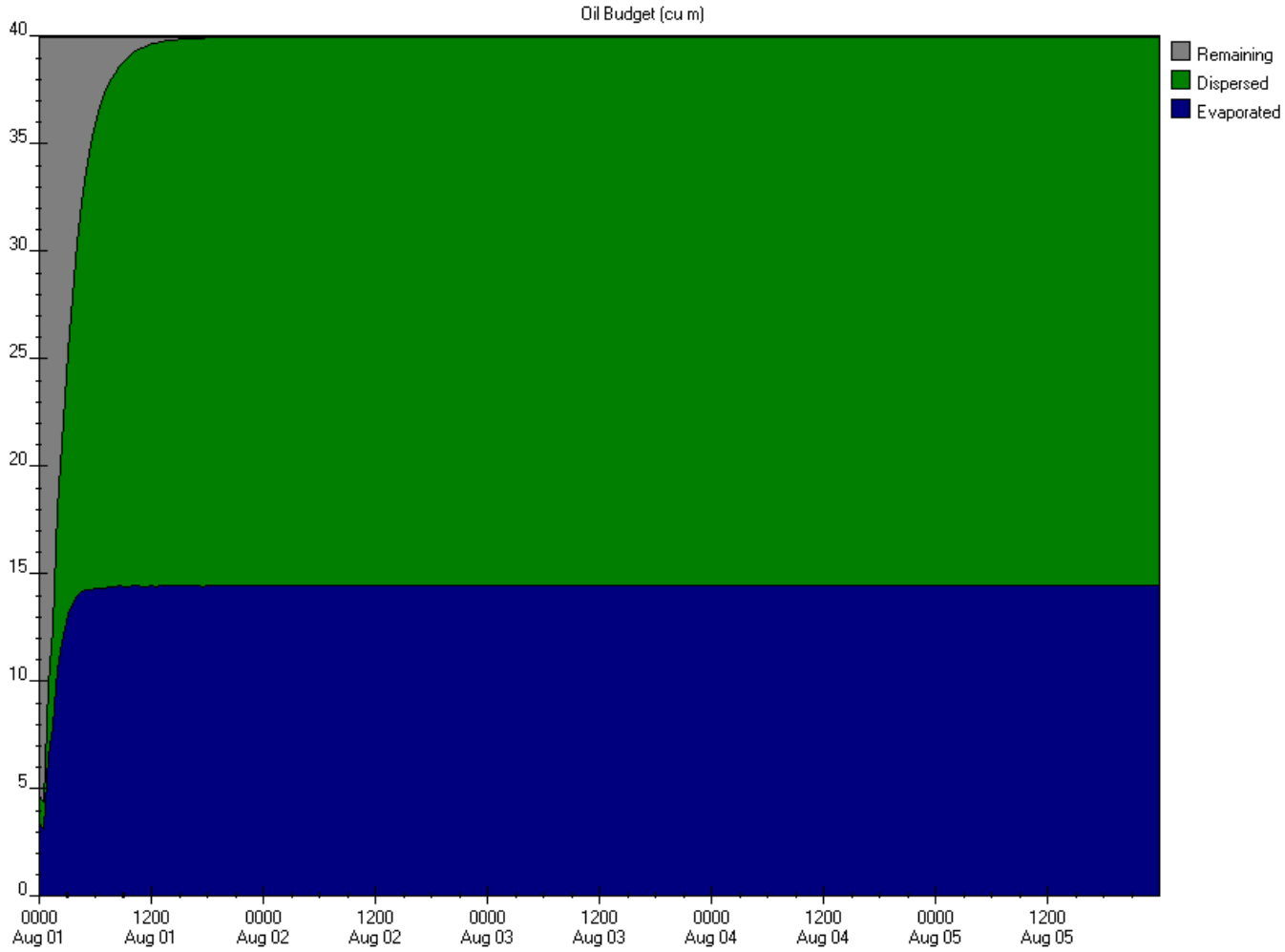


Figure 4: Percentage of oil remaining from a 40 m^3 diesel spill

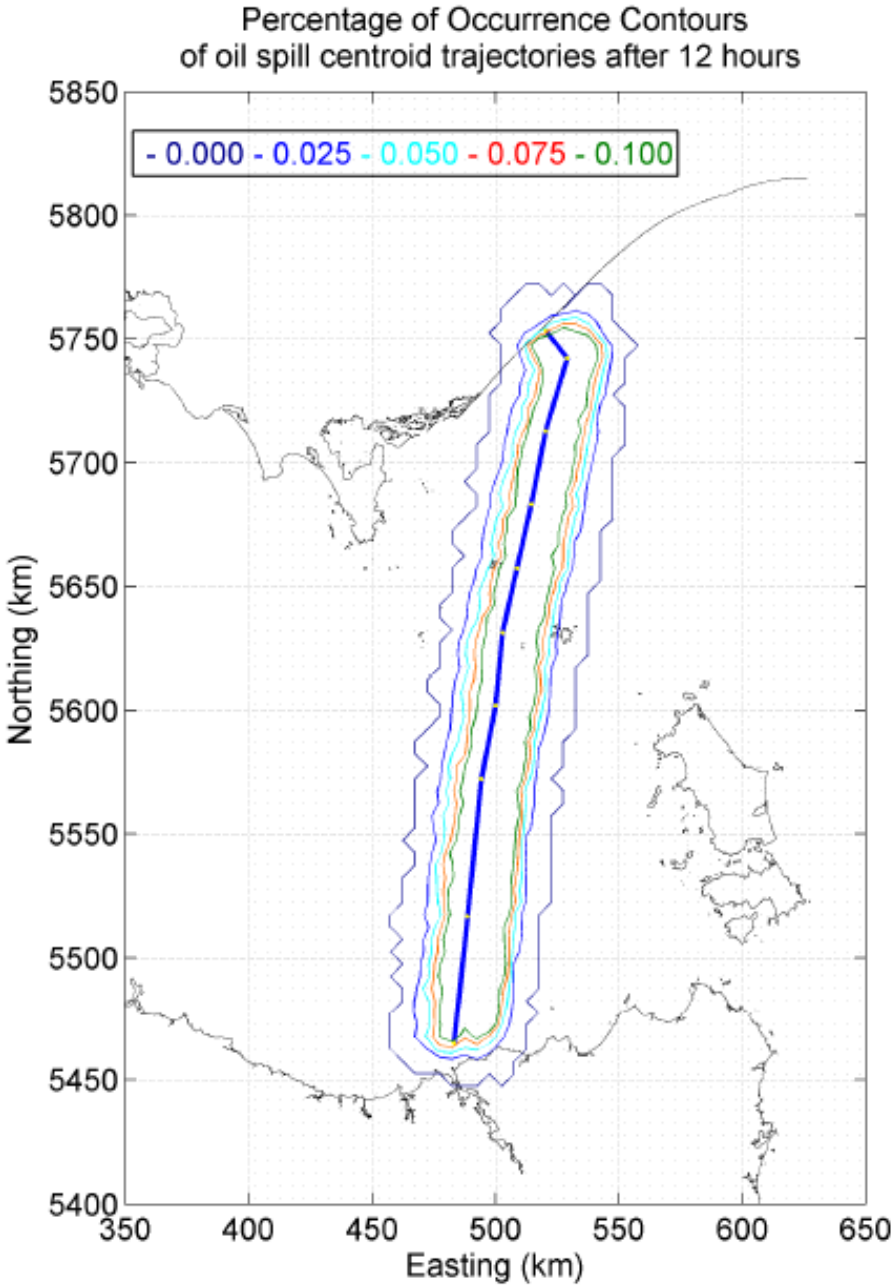


Figure 5: Percentage of Occurrence Contours of Spill Centroid Trajectories after 12 hours

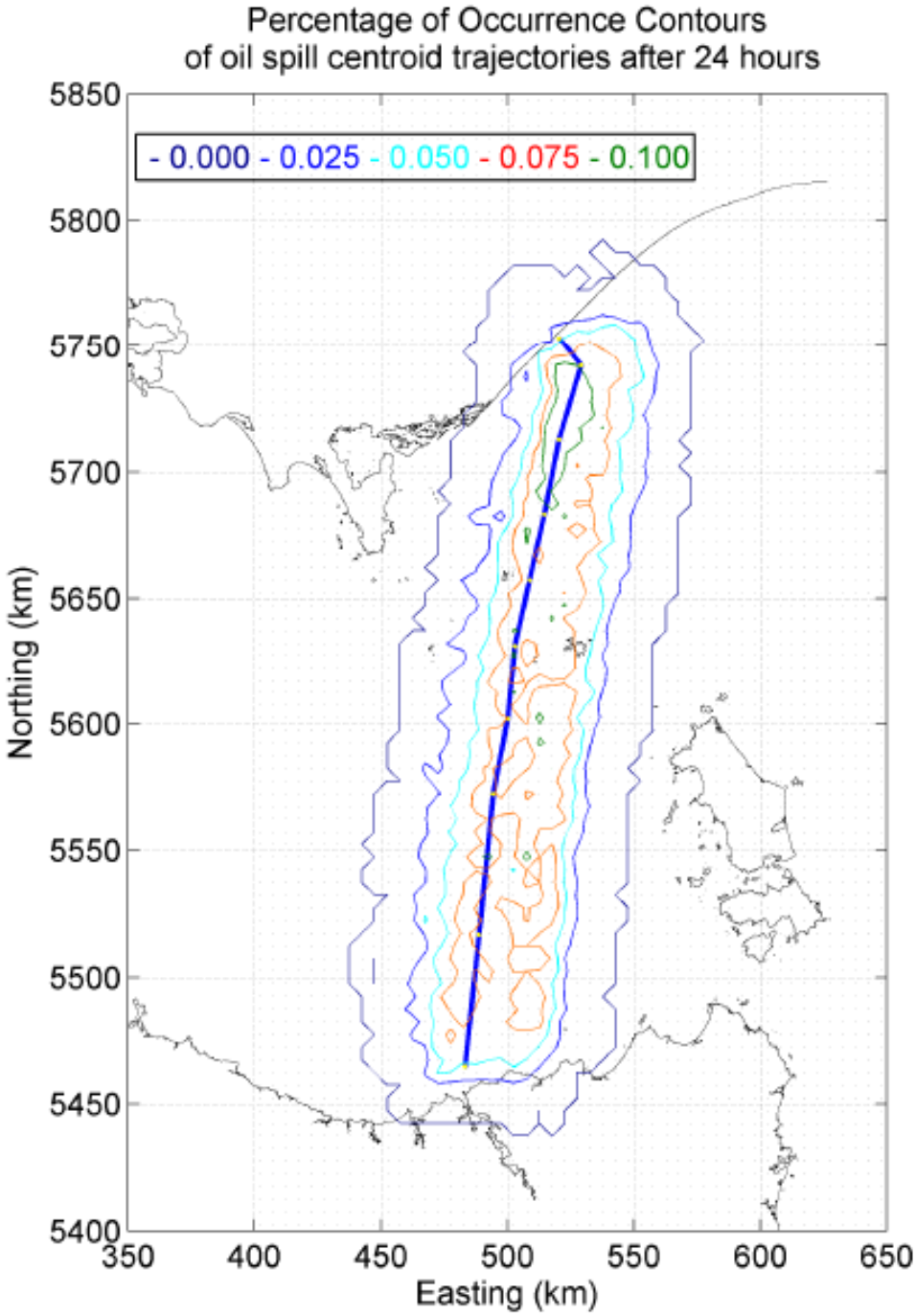


Figure 6: Percentage of Occurrence Contours of Spill Centroid Trajectories after 24 hours

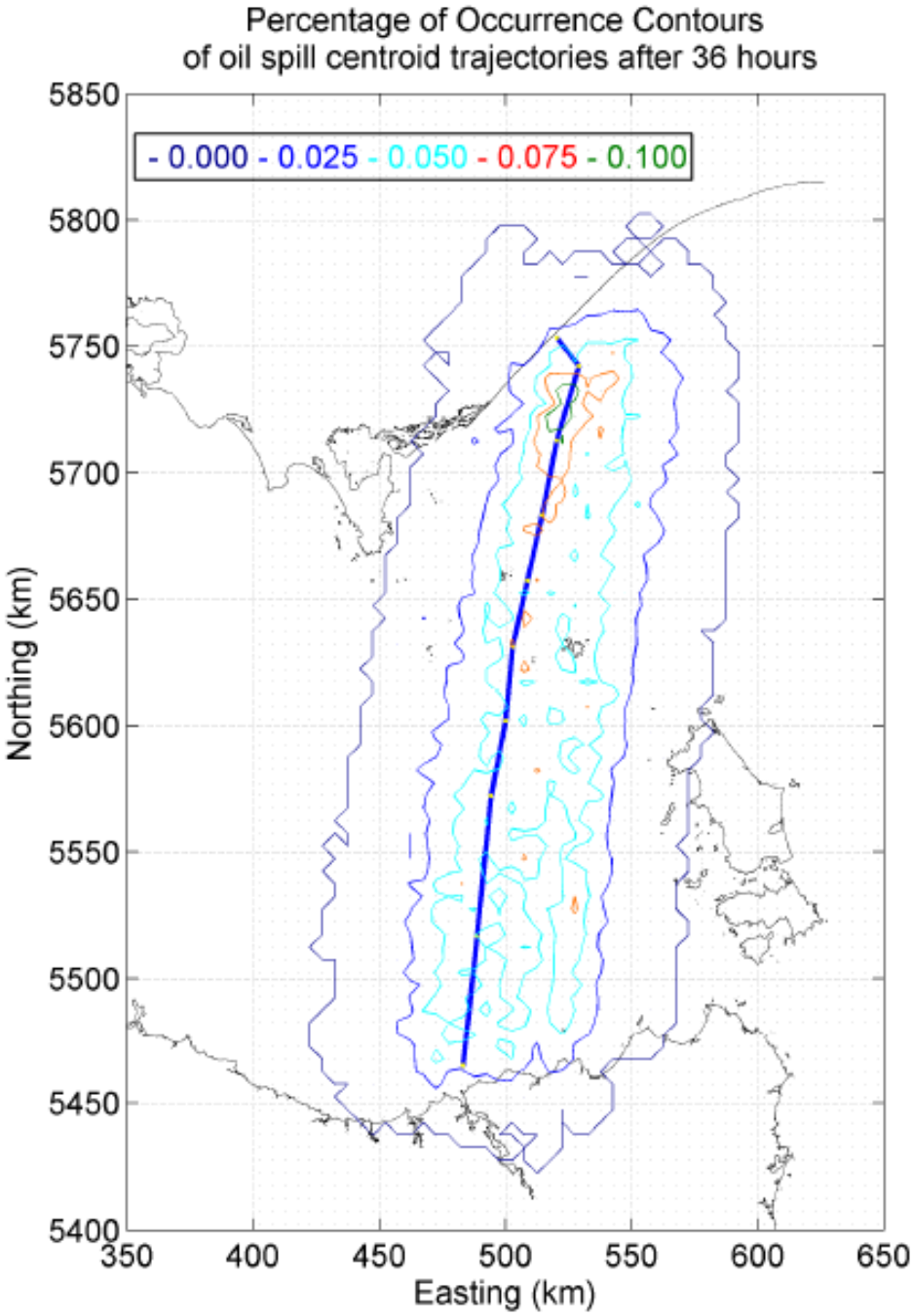


Figure 7: Percentage of Occurrence Contours of Spill Centroid Trajectories after 36 hours

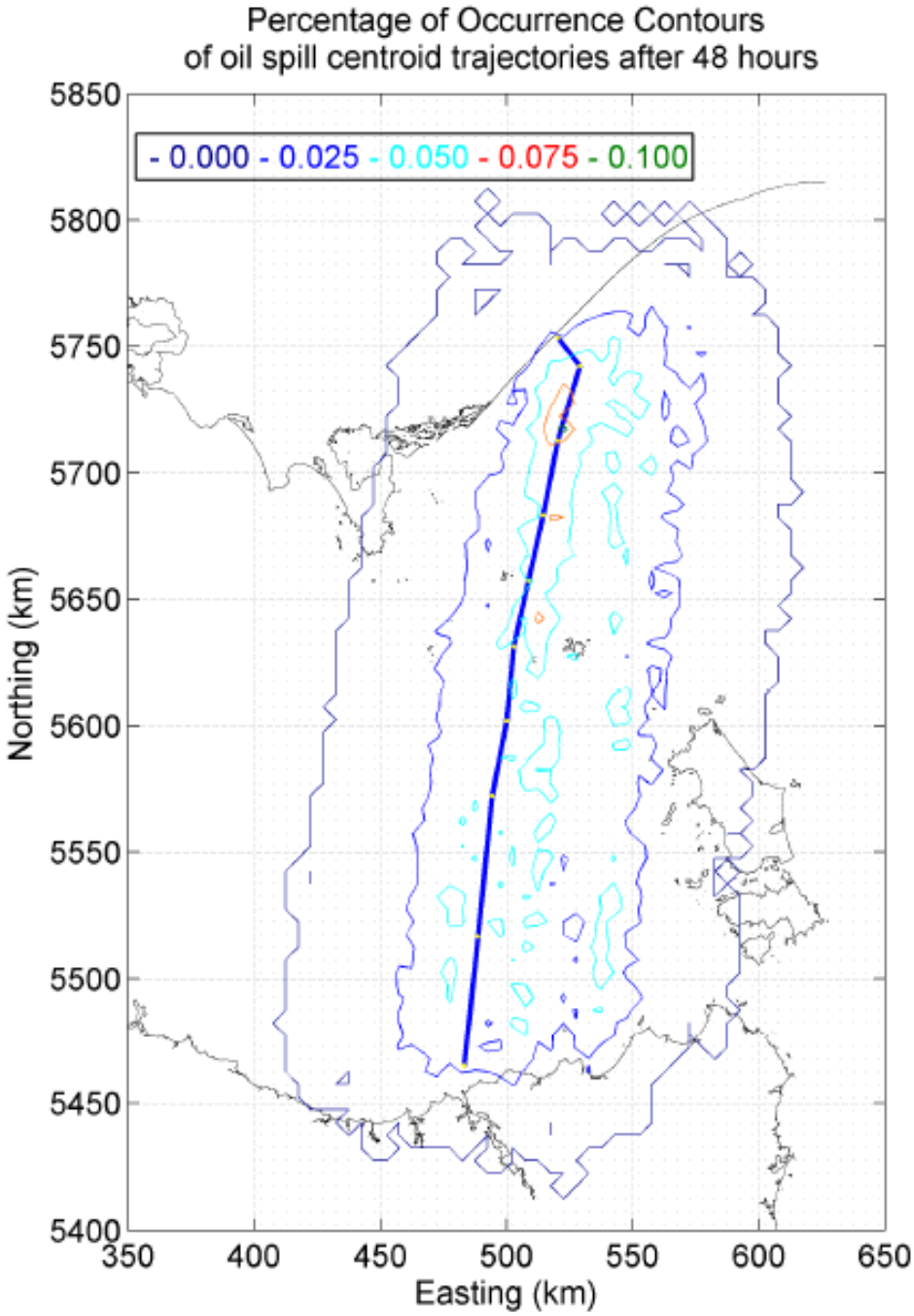


Figure 8: Percentage of Occurrence Contours of Spill Centroid Trajectories after 48 hours

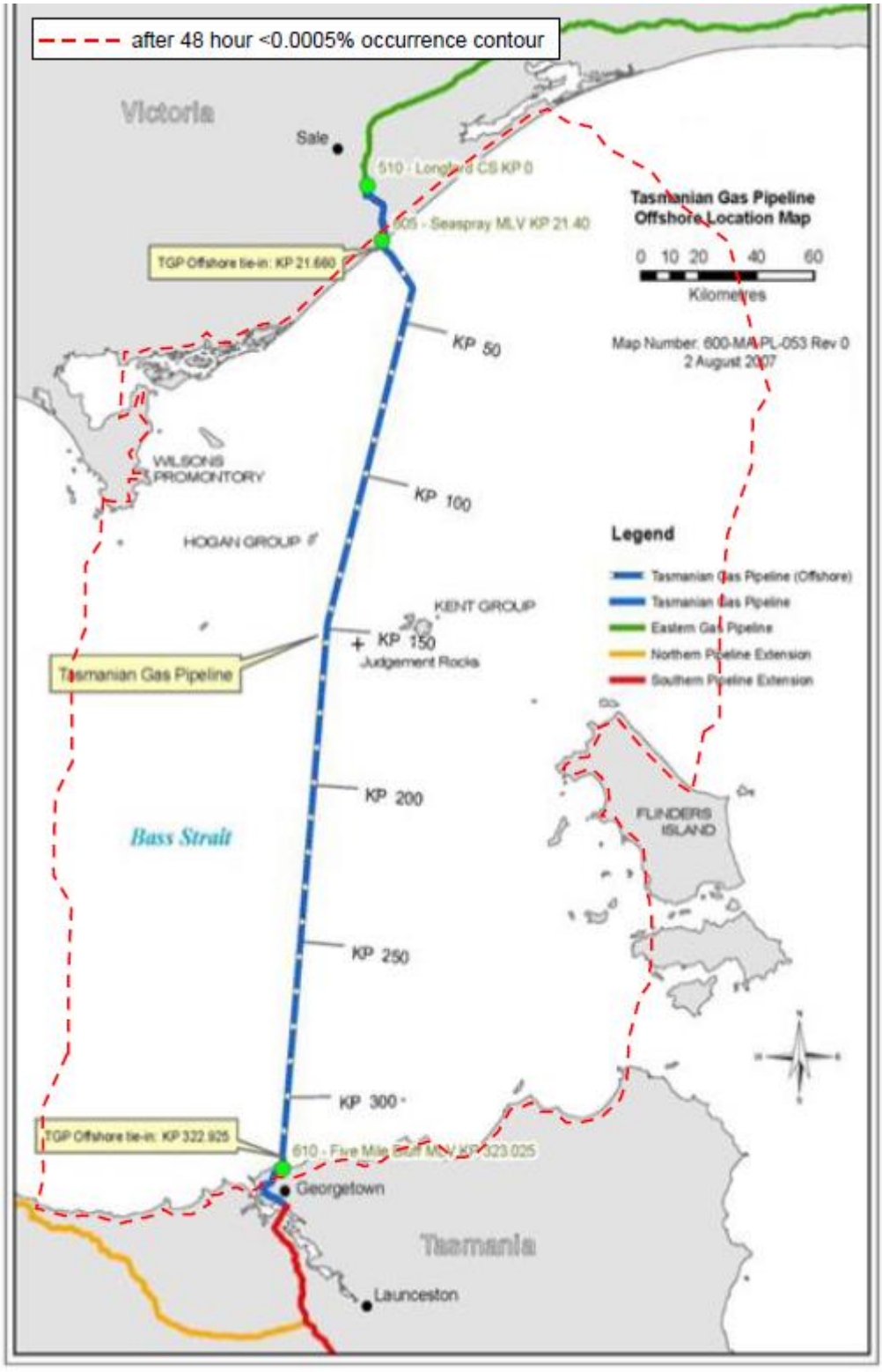


Figure 9: Zone of Potential Impact (ZPI) defined by 0000 contour after 48 hours

3. ENVIRONMENTAL FEATURES

Environmental features of the pipeline route are comprehensively described in reports prepared prior to the construction of the pipeline for Duke Energy International (DEI). These reports were prepared to examine the potential environmental effects of the construction and operation of the pipeline, as well as proposed management measures, and were used to assist in determining the final pipeline route so that environmental impacts would be minimised. They include:

- DEI Tasmania Holdings Pty Ltd. 2001. Tasmania Natural Gas Project – Stage 1 Longford, Victoria to Bell Bay Power Station, Tasmania - Public Environment Report. Prepared by Hydro Tasmania. Volumes 1 to 10
- DEI Tasmania Holdings Pty Ltd. 2001. Tasmania Natural Gas Project – Stage 2 Bell Bay Power Station to Port Latta – Development Proposal and Environmental Management Plan. Prepared by Hydro Tasmania. Volumes 1 to 3
- DEI Tasmania Holdings Pty Ltd. Tasmania Natural Gas Project – Stage 3 Springfield to Boyer and Claremont. Volumes 1 to 3

The original pipeline reports concluded that operational activities are likely to have only minimal impact on the environment due to the location of the pipeline on the seabed and the unobtrusive nature and low frequency of inspection and maintenance activities (refer to Section 2.2). Further details on the environmental impacts identified are provided in Section 6 and **Error! Reference source not found.**.

The main features of the environment traversed by the pipeline, including the ZPI in the unlikely event of a fuel spill from an inspection and maintenance vessel (defined in Section 2.3.2.2), are described below. Appendix E contains the EPBC Act Protected Matters Report for the ZPI which informed this description of environment.

3.1 Physical Environment

Bass Strait was formed approximately 12,000 to 15,000 years ago by the inundation of a land bridge that had once connected Tasmania and Victoria. It is a comparatively shallow sea (depths of up to 80 m) with the western and eastern entrances defined by the continental shelf that extends between King Island and Cape Otway in the west and between Flinders Island and Wilsons Promontory in the east. Beyond the continental shelf the seabed declines sharply to depths over 3,000 m.

The seabed along the direct route between Seaspray and Five Mile Bluff is reasonably featureless (refer to Figure 10). In the vicinity of the pipeline the seabed consists primarily of fine and medium grained quartzose sands with a mean grain size of 0.12 to 0.25 mm (refer to Figure 11 for a sea floor image). Coarse sands and gravels are present to a lesser extent in the proximity of the Victorian shore crossing (Hydro Tasmania, 2001). Seabed current manipulations have formed some sand waves.

Circulation, or mixing of water, in Bass Strait is mainly dependent on tidal currents, but wind-driven currents, coastal trapped waves, barometric pressure-induced currents, density-driven flows and ocean-scale circulation patterns also contribute. The current speeds ultimately depend on the proximity to the eastern entrance of Bass Strait, with lower current speeds expected to the west. Current speeds between 0.30 m/s and 0.79 m/s occur during 5 year return period storms, while current speeds of 0.41 m/s to 1.03 m/s occur during 100 year return period storms (Hydro Tasmania, 2001).

The average annual rainfall is 718.8 mm (recorded at Deal Island in the Kent Group), with the highest rainfall and most rainy days occurring from May through to August. Winds are typically strongest during spring and weakest during the winter: 50-60% of winds are under 10 knots, with 30-37% of winds occurring between 10 and 20 knots. Strongest winds (greater than 20 knots) mainly originate from the west. Average temperatures range from 8.5°C in winter to 20.5°C in summer (BOM, 2012).

Protection of the region from westerly and south-westerly swells is provided by Wilsons Promontory, Tasmania and King Island. However, during 5 and 100 year storm events, wave heights may range from 4.5 m to 5.5 m and 6.8 m to 7.5 m, respectively. Although the Offshore

TGP was originally laid on the surface of the seabed, strong current and wave activity may result in shifting sands and periodical burial of pipeline sections. Seismic activity along the pipeline route was considered during the design phase of the pipeline and was confirmed to be of minimal risk.

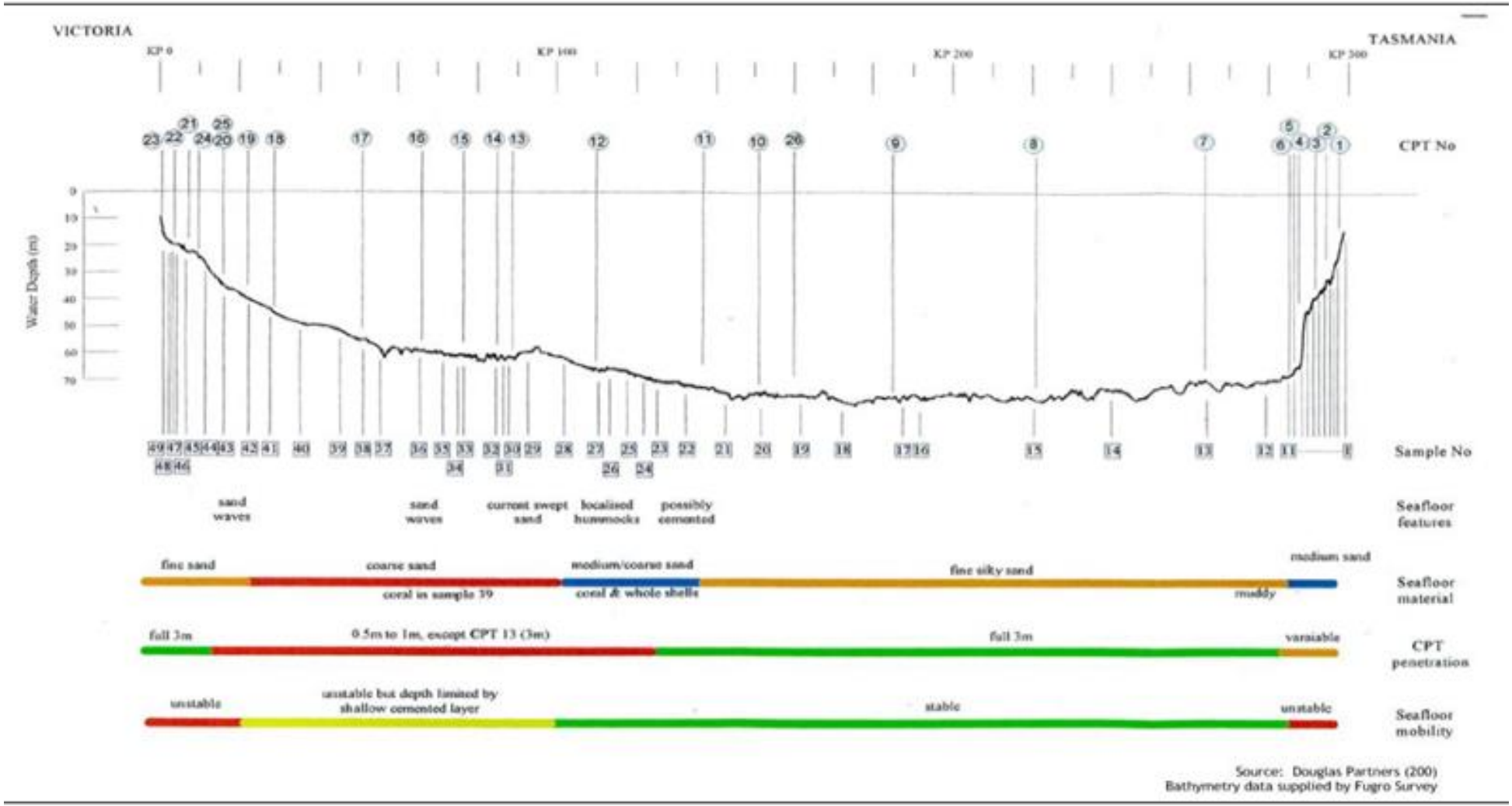


Figure 10: Bass Strait sea floor features

The Offshore TGP route does not lie within any significant terrestrial features, with the closest landform 9 km away, but does pass within the vicinity of a number of small islands or island groups (as shown in Figure 1). These include (in order from north to south):

- **The Hogan Island Group** - straddles the border between Victoria and Tasmania and is located about 10 km to the west of the Offshore TGP and about 45 km east of Wilsons Promontory, Victoria. It is made up of one main island; Hogan Island and several islets including Boundary Islet, East Islet, Long Islet, Twin Islet, Round Islet and Seal Rock. Boundary Islet is the land boundary between Victoria and Tasmania
- **The Curtis Island Group** - lying about 25 km west of the pipeline and made up of Curtis Island, Cone Island, Sugarloaf Rock and Devils Tower
- **The Kent Group** - an archipelago of six islands and offshore rocks situated approximately half way between Wilsons Promontory and the northern end of Flinders Island. The main groups of islands (incorporating Deal, Dover and Erith Islands) lie about 23 km east of the Offshore TGP. Two minor islets, North East and South West are within the vicinity of this group, however, Judgement Rocks, a small granite island with an area of 0.39 hectares (ha) lies to the south-west of the main islands of the Kent Group and about 10 km east of the pipeline
- **The Bass Pyramid Group** - made up of Craggy Island, Wright Rock and Bass Pyramid and lying between Flinders Island and the Kent Group. Bass Pyramid is a small, steep-sided granite island with an area of <1 ha and lies about 20 km east of the pipeline
- **Tenth Island** - part of the Waterhouse Island Group off the northern coast of Tasmania, lies approximately 9 km east of the pipeline

All islands, apart from Boundary Islet within the Hogan Island Group, are under the jurisdiction of Tasmania and are located at least 8 km from the Offshore TGP.

Figure 11: TGP subsea pipe and seabed

3.2 Biological Environment

Bass Strait is an area of relative high faunal diversity and supports a number of species of high conservation and commercial value. This is partly due to its unique biogeographical location at the

convergence of three marine biogeographical regions: the Peronian (New South Wales), Maugean (Tasmania) and Flindersian (southern Australia).

There are many different temperate ocean habitat types represented in Bass Strait, from open beaches and rocky reefs (both exposed and sheltered) to offshore islands, soft bottom habitats (sand, mud and seagrass) and open sea. The main marine species and communities present within, and immediately surrounding, the Offshore TGP route primarily comprises:

- **Plankton** - There have been few studies of plankton populations in the Bass Strait region, however a key study by Watson and Chaloupka (1982) recorded over 170 species of zooplankton during sampling of eastern Bass Strait waters, half of which were marine copepods. These are a key biomass component of the ocean food chain
- **Macroalgae** - A detailed survey of the north-eastern Bass Strait Islands identified up to 40 species of macroalgae surrounding the Kent and Hogan Groups, an indicator of the nutrient rich waters and diversity of habitats available (Edgar, 1984)
- **Benthic infauna and epifauna** (fauna living within and on the seabed) - Include brittlestars, urchins, sponges, lamp shells, crabs, sea squirts, polychaete worms, bivalves and molluscs. Bass Strait as a whole has a relatively heterogeneous benthic habitat and has one of the highest biodiversities of benthic fauna in the world. The substrate along the pipeline route itself, however, represents a largely homogenous habitat type and is not significantly diverse from other regions within Bass Strait (Hydro Tasmania 2001). While a number of species that occur in south-east Australian waters are endemic to the area, most of these species are widely distributed throughout the region (Phillips et al, 1984). Any impacts will be localised and unique faunal elements are unlikely to be disturbed
- **Pelagic and demersal species** (ocean dwelling species and those species that live close to the seafloor) - A number of important commercial fish and invertebrate species, with a relatively high diversity in fish species, have been recorded around the Kent Group (Parks and Wildlife Service, 2000). It is estimated that over 500 species of fish, including approximately 50 species of elasmobranches (sharks and rays), are found in Bass Strait (LCC, 1993). There are no endemic species to the area, with the majority of species being widely dispersed throughout the region
- **Two migratory species** which may be found in Bass Strait are listed as vulnerable under the EPBC Act (Appendix E): the Great White Shark (*Carcharodon carcharias*) and the Whale Shark (*Rhincodon typus*). Ninety Mile Beach provides important feeding grounds for juvenile Great White Sharks, effectively representing nursery habitat. A Biologically Important Area (BIA) for breeding (nursery ground) has been established in the coastal region extending east from Wilsons Promontory. The Great White Shark moves seasonally along the Australian coast moving north in Autumn and Winter along the east coast and returning to southern Australian waters by early Summer. Sharks are known to congregate around seal colonies within the Kent and Hogan Group looking for food and these waters have been established as a foraging BIA for the Great White Shark. Whale Sharks generally occur in warmer oceanic waters off northern Australia and are not likely to be found in Bass Strait
- **One fish species** potentially occurring within the ZPI was listed as vulnerable under the EPBC Act (Appendix E): the Australian Grayling (*Prototroctes maraena*). The Australian Grayling is a migratory species that inhabits estuarine waters and coastal seas as larvae/juveniles, but spends most of its life in rivers and streams as an adult (DSE, 2008)
- **Pinnipeds** - Pinnipeds, principally the Australian Fur Seal (*Arctocephalus pusillus*), frequent Bass Strait (Appendix E). Many of the islands in Bass Strait are important breeding or haul-out sites for the Australian Fur Seal, including large breeding colonies at Judgement Rocks and Tenth Island. Australian Fur Seals generally breed around November to December with the majority of pups suckled for about 8 months
- **Cetaceans** - About 15 species of whales and dolphins have been observed in Bass Strait, although only a minority are resident or have been observed frequently. The most freely seen are the Common (*Delphinus delphis*) and Bottle-nosed (*Tursiops truncatus*) dolphins, but a number of whales also visit the region during annual migrations to and from their breeding grounds (mostly during the winter months). These include the Blue Whale (*Balaenoptera*

musculus) and Southern-right Whale (*Eubalaena australis*), which are listed as Endangered under the EPBC Act, and the Humpback Whale (*Megaptera novaeangliae*) and Fin Whale (*Balaenoptera physalus*) which are listed as Vulnerable (Appendix E). All cetaceans are susceptible to direct disturbance from shipping operations, including seismic or acoustic surveys, collision with large vessels, and pollution from plastics, oil spills and dumping of industrial wastes which can lead to bio-accumulation of toxins in cetacean body tissues.

Sightings of Blue Whales in Bass Strait a reasonably rare (Bannister *et al*., 1996) however a BIA for the Pygmy Blue Whale for distribution and possible foraging (DoEE, 2015c) has been identified in Bass Strait extending west to South Australia waters to the Bonney Upwelling, a known Pygmy Blue Whale feeding aggregation area.

Southern-right Whales migrate west along the southern Australian coastline to calving aggregation areas in western Victoria waters. BIAs for migration and distribution have been identified in Victorian coastal waters and in Bass Strait respectively.

The main migration route of the Humpback Whale is along the east coast of Australia however some whales may migrate through Bass Strait.

The distribution of Fin Whales in Australian waters is uncertain but they have been recorded in Commonwealth waters off most States (the species is rarely found in inshore waters) (DoEE, 2017).

- **Birds** - Include resident seabirds and migratory species crossing Bass Strait. Large breeding seabird colonies exist around the Kent Group, particularly on Deal and Erith Islands and two small islets known as North East and South West Islands. Species include Common Diving Petrels, Short-tailed Shearwaters, Little Penguins, Pacific Gulls, Sooty Oystercatchers and cormorants (Kent Management Plan, 2005). Species listed under the EPBC Act also breed within islands of the Kent Group, including the Vulnerable Fairy Prion (*Pachyptila turtur subantarctica*) and Cape Barren Goose (*Cereopsis novaehollandiae grisea*).

  A foraging BIA has been identified for a number of albatross, petrel and shearwater species: Antipodean, Buller's, Shy, Black-browed, Campbell, Wandering and Indian Yellow-nosed Albatross, Common Diving and White-faced Storm Petrels and Short-tailed Shearwater, in Bass Strait and along the edge of the continental shelf (DoEE 2015a). The Australian populations of both the Common Diving and White-faced Storm Petrels account for a significant proportion of the global populations and breeding BIAs have been identified around the Kent Group and Furneaux Group respectively. Bass Strait has the largest proportion of Little Penguin breeding colonies in Australia at approximately 60%, and foraging and breeding BIAs have been identified for the Little Penguin around both the Kent and Furneaux Island groups (DoEE 2015a).

  Up to 40 threatened species listed under the EPBC Act may occur, or are likely to occur, within the ZPI throughout the year (Appendix E). Many of these species are protected under international agreements (e.g. CAMBA, JAMBA and ROKAMBA – refer to Section 4.1) and may be observed passing through Bass Strait on their way to or from mainland Victoria and Tasmania. This includes land based species such as the endangered Swift Parrot (*Lathamus discolour*), which migrates from southern Tasmania to Victoria every winter.

- **Reptiles** - **There** are several reptile species that are occasional vagrants to the eastern part of Bass Strait, including three species of marine turtle: the Loggerhead (*Caretta caretta*) and the Leatherback (*Dermochelys coriacea*), both of which are listed as Endangered and the Green Turtle which is listed as Vulnerable under the EPBC Act (Appendix E).

- **Introduced Pests** - At least 130 introduced and cryptogenic (species of unknown origin) marine pest species are found in and around Tasmanian coastal waters (Tasmanian Planning Commission, 2009) and more than 100 species in Victorian waters (DSE, 2012). It is likely that many of these species have been introduced by ballast water discharged from international shipping or attached to the many private and commercial vessels traversing Bass Strait. Key marine pests observed in northern Tasmania, Bass Strait and southern Victorian waters include the northern Pacific Seastar (*Asterias amurensi*), European Green Crab (*Carcinus maenas*), Asian Date Mussel (*Musculista senhousia*), European Clam (*Corbula gibba*), European Fan Worm (*Sabella spallanzanii*), New Zealand Screw Shell (*Maoricolpus roseus*), Japanese Kelp

(*Undaria pinnatifida*) and Long-spined Sea Urchin (*Centrostephanus rodgersii*). All marine pests are considered a threat to the marine environment as they compete directly with native species for habitat and food.

Table 8: Key threats for threatened species or species habitat that may occur within the ZPI

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)	BIA	
			OA	ZPI
Sharks				
Great White Shark	Recovery Plan for the White Shark	None identified	f, b	f, b
Whale Shark	Approved Conservation Advice for Whale Shark	Vessel strike Habitat destruction from mineral exploration, production and transportation Marine debris	-	-
Cetaceans				
Pygmy Blue Whale	Conservation Management Plan for the Blue Whale, 2015-2025	Noise interference Habitat modification from marine debris or chemical discharge Vessel strike	d, f	d, f
Southern-right Whale	Conservation Management Plan for the Southern-right Whale, 2011-2021	Noise interference Pollution Vessel strike	m	d, m
Humpback Whale	Approved Conservation Advice for Humpback Whale	Noise interference Habitat modification Vessel strike Entanglement	-	-
Fin Whale	Approved Conservation Advice for Fin Whale	Noise interference Habitat modification Vessel strike Entanglement	-	-
Birds				
Antipodean Albatross	National Recovery Plan for Threatened Albatrosses and Giant Petrels, 2011-2016	Marine pollution, including marine debris	-	-
Southern Royal Albatross			-	-
Wandering Albatross			f	f
Gibson's Albatross			-	-
Northern Royal Albatross			-	-
Sooty Albatross			-	-
Buller's Albatross			f	f
Shy Albatross			f	f
Chatham Albatross			-	-

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)	BIA	
Campbell Albatross			f	f
Black-browed Albatross			f	f
Salvin's Albatross			-	-
White-capped Albatross			-	-
Grey-headed Albatross	National Recovery Plan for Threatened Albatrosses and Giant Petrels, 2011-2016 Approved Conservation Advice for *Thalassarche chrysostoma* (Grey-headed Albatross)	Marine pollution, including marine debris	-	-
Common Diving Petrel	-	-	f, b	f, b
White-faced Storm Petrel	-	-	f, b	f, b
Blue Petrel	Approved Conservation Advice for *Halobaena caerulea* (Blue Petrel)	None identified	-	-
Southern Giant Petrel	National Recovery Plan for Threatened Albatrosses and Giant Petrels, 2011-2016	Marine pollution, including marine debris	-	-
Northern Giant Petrel			-	-
Gould's Petrel	Gould's Petrel (*Pterodroma leucoptera leucoptera*) Recovery Plan	Oil spills	-	-
Greater Sand Plover	Approved Conservation Advice for *Charadrius leschenaultia* (Greater Sand Plover)	Habitat loss and degradation from pollution	-	-
Lesser Sand Plover	Approved Conservation Advice for *Charadrius mongolus* (Lesser Sand Plover)	Habitat loss and degradation from pollution	-	-
Hooded Plover (eastern)	Approved Conservation Advice for *Thinornis rubricollis* (Hooded Plover, Eastern)	Oil spills Entanglements and ingestion of marine debris	-	-
Curlew Sandpiper	Approved Conservation Advice for *Calidris ferruginea* (Curlew Sandpiper)	Habitat loss and degradation from pollution Environmental pollution	-	-
Short-tailed Shearwater	-	-	f	f
Little penguin	-	-	-	f, b
Australian Fairy Tern	Approved Conservation Advice for *Sternula nereis nereis* (Fairy Tern)	Oil spills, particularly in Victoria, where the close proximity of oil facilities poses a risk of oil spills that may affect the species'	-	-

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)	BIA	
		breeding habitat		
Tasmanian Wedge-tailed Eagle	Threatened Tasmanian Eagles Recover Plan, 2006-2010 (DPIW, 2006)	Oiling, entanglement, pollution	-	-
Australasian Bittern	Approved Conservation Advice for *Botaurus poiciloptilus* (Australasian Bittern)	Reduced water quality as a result of increasing salinity, siltation and pollution	-	-
Red Knot	Approved Conservation Advice for *Calidris canutus* (Red Knot)	Habitat loss and degradation from environmental Pollution Pollution or contamination impacts	-	-
Great Knot	Approved Conservation Advice for *Calidris tenuirostris* (Great Knot)	Habitat loss and degradation from environmental Pollution Pollution or contamination impacts	-	-
Red Knot, Great Knot, Bar-tailed Godwit, Greater Sand Plover	Wildlife conservation plan for migratory shorebirds	Habitat loss and degradation from environmental Pollution Pollution or contamination impacts	-	-
Eastern Bristlebird	National Recovery Plan for Eastern Bristlebird (*Dasyornis brachypterus*)	None identified	-	-
Swift Parrot	Approved Conservation Advice for *Lathamus discolour* (Swift Parrot)	None identified	-	-
Bar-tailed Godwit	Approved Conservation Advice for *Limosa lapponica bauera* (Bar-tailed Godwit)	Habitat loss and degradation from pollution Pollution/contamination	-	-
Tasmanian Masked Owl	Approved Conservation Advice for *Tyto novaehollandiae castanops* (Tasmanian Masked Owl)(DEWHA, 2010)	None identified	-	-
Northern Siberian Bar-tailed Godwit	Approved Conservation Advice for *Limosa lapponica menzbieri* (Northern Siberian Bar-tailed Godwit)	Habitat loss and degradation from pollution Pollution/contamination	-	-
Orange-bellied Parrot	National Recovery Plan for the Orange-bellied Parrot (*Neophema chrysogaster*)	None identified	-	-
Eastern Curlew	Approved Conservation Advice for *Numenius madagascariensis* (Eastern Curlew)	Habitat loss and degradation from pollution Environmental pollution	-	-

Common Name	Conservation Advice or Recovery Plan	Key Threats (relevant to petroleum activities)	BIA	
Fairy Prion (southern)	Approved Conservation Advice for *Pachyptila turtur subantartica* (Fairy Prion Southern)	None identified	-	-
Australian Painted Snipe	Approved Conservation Advice for *Rostratula australis* (Australian Painted Snipe)	None identified	-	-
Forty-spotted Pardalote	Conservation Advice Pardalotus quadraginatus forty-spotted pardalote (TSSC, 2016c)	None Identified	-	-
Regent Honeyeater	Conservation Advice Anthochaera phrygia regent honeyeater. Canberra: Department of the Environment (DOEE, 2015 f)	None Identified	-	-
Tasmanian Azure Kingfisher	Approved Conservation Advice for *Ceyx azureus diemenensis* (Tasmanian Azure Kingfisher) (DEWHA, 2010c)	None Identified	-	-
Painted Honeyeater	Conservation Advice Grantiella picta painted honeyeater. Canberra: Department of the Environment (DoEE, 2015 g).	None Identified	-	-
Marine Reptiles				
Loggerhead Turtle	Recovery Plan for Marine Turtles in Australia, 2017-2027	Marine debris Chemical discharge Light pollution Habitat modification Vessel disturbance Noise interference	-	-
Green Turtle			-	-
Leatherback Turtle	Recovery Plan for Marine Turtles in Australia, 2017-2027 Approved Conservation Advice for *Dermochelys coriacea* (Leatherback Turtle)	As above	-	-

Key:

	BIA
d	distribution

	BIA
f	foraging
m	migration
b	breeding

Threatened species and communities listed under the EPBC Act are protected by legislation and include species listed as endangered or vulnerable, migratory species including birds and mammals, and cetaceans including whales and dolphins. In addition, State legislation protects threatened species, communities and whales in coastal waters. Under State and Commonwealth legislation it is an offence to kill, injure, take or interfere with threatened species, migratory species and cetaceans.

It should be noted that some species occurring in the region may not be classified as threatened under the EPBC Act, but are classified under the relevant State legislation, e.g. *Sterna albifrons sinensis* (Little Tern (western Pacific)) is classified as Endangered under the Tasmanian *Threatened Species Protection Act 1995*.

Species listed under State and Commonwealth legislation may migrate or move through the Offshore TGP route at any given time, however none of the species are dependent upon the area for food or reproduction. Furthermore, as the Offshore TGP is operational and lies on the seabed 80 m below sea level, operation, inspection and maintenance activities are expected to have a minimal impact on the biological environment. Further impacts on the environment are discussed in Section 6 and identified through the TGP Offshore Environmental Risk Assessment (ERA) provided in **Error! Reference source not found.**.

3.3 Cultural Environment

A number of studies were undertaken prior to construction of the Offshore TGP to identify:

- The potential for the presence of submerged terrestrial sites dating from the period prior to the creation of Bass Strait (prehistoric)
- Potential and actual submerged archaeological remains associated with European period sites situated close to or on the coast near the proposed landfalls
- Known and potential shipwrecks within 5 nautical miles (nm) of the Offshore TGP route

The potential for impact of the Offshore TGP on submerged terrestrial sites is considered low, partly due to the effect of physical factors on surface deposits as sea levels rose, but also due to the subsequent sedimentation and burial of submerged terrestrial sites that would have occurred following inundation. No submerged terrestrial sites were identified during construction of the Offshore TGP.

The coastal zone of both Tasmania and Victoria potentially contains numerous heritage sites, predominantly of recent formation (last 1,000 years). However, archaeological surveys conducted prior to construction found little evidence within the pipeline route of sites of either Aboriginal or non-Aboriginal origin (Hydro Tasmania 2001). All potential sites within the foreshore landform of the alignment were nonetheless avoided via use of directional drilling under the coastal zone.

Data on shipwrecks in the region indicates a significant number are present throughout Bass Strait and coastal Victoria and Tasmania. However, exact resting places for most of these wrecks are unknown. The estimated locations of shipwrecks in the Bass Strait and State coastal regions in relation to the Offshore TGP are shown in Figure 12 and include the following:

- The wreck Glenelg - reported to be situated in close proximity to the pipeline, although estimates of its location vary from close to Lakes Entrance to being 40 nm west of Lakes Entrance
- The Norfolk, which also has conflicting locations (one report has it situated 30 nm from Lakes Entrance, while another records a location between Seaspray and Woodside). Several wrecks have been listed as ‘lost Ninety Mile Beach
- The wrecks Fear Not and Oberlin situated close to the shore at Hogan Island
- The wreck of Bulli lies almost intact in West Cove, Erith Island within the Kent Group
- A number of wreck locations in the Five Mile Bluff region, including an unidentified coaster (1843) and the Royal Oak

While it is important to be aware of the possibility of cultural artefacts within the vicinity of the pipeline, no sites of Aboriginal or non-Aboriginal significance (including shipwrecks) were evident along the pipeline route during pre-construction surveys conducted in September 2000 (Hydro Tasmania 2001). The Offshore TGP and its operation is therefore considered unlikely to have any impact upon values of heritage significance (Hydro Tasmania 2001).

The Gunai-Kurnai native title determination area in Victoria covers approximately 45,000 hectares and extends from west Gippsland near Warragul, east to the Snowy River and north to the Great Dividing Range. The area includes 10 parks and reserves that are jointly managed by the State government and the Gunai-Kurnai people (NNTT 2010). Areas within and adjacent to the Ninety Mile Beach Marine National Park (refer to Section 3.5.6) are considered culturally and spiritually significant to the relevant indigenous communities. Although this Offshore EP applies to the offshore component of the TGP pipeline, the native title determination area is relevant given that the boundary extends to 200 m offshore between Lakes Entrance and Marlo. At the time of writing a Native Title Claimant Application was registered by the Gunai-Kurnai people for an area covering Wilsons Promontory (NNTT 2019).

There are no native title determination areas in Tasmania however there are five Indigenous Protected Areas on the islands of the Ferneaux Group in Bass Strait (DPMC 2019).

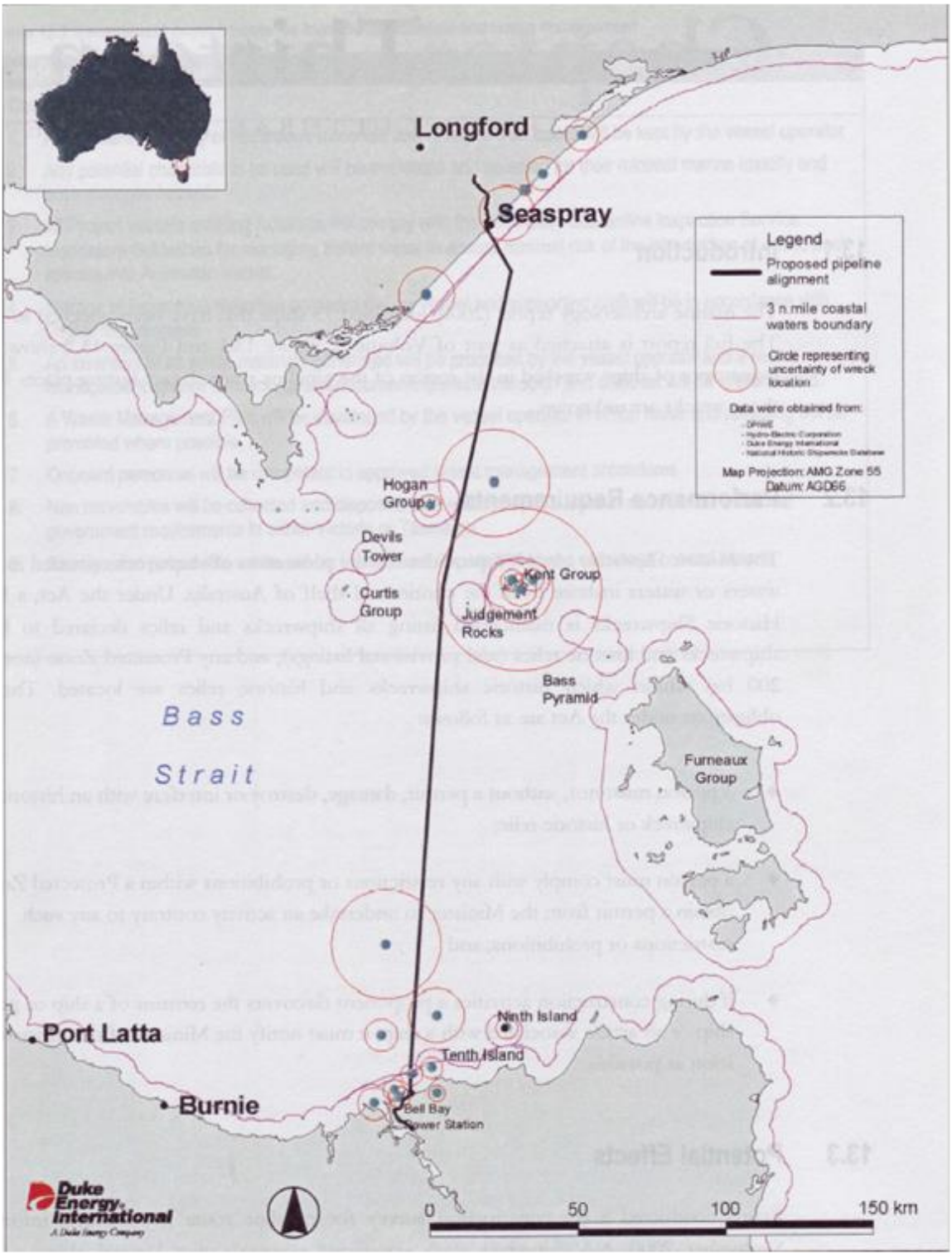


Figure 12: Estimated locations of vessels lost in Bass Strait

3.4 Socio-Economic Environment

A wide range of human activities occur in the waters of Bass Strait, including commercial oil and gas fields, shipping, commercial and recreational fishing, and other recreational activities.

- **Commercial Fisheries** - Several commercial fisheries operate in the general vicinity of the Offshore TGP depending on the season, including the: Southern Bluefin Tuna Fishery, Eastern Tuna and Billfish Fishery, Eastern Skipjack Tuna Fishery, Small Pelagic Fishery, the Bass Strait Scallop Fishery (Central Zone) and the Southern Squid Jig Fishery. School whiting (*Sillago bassensis* and *S. flindersi*) and flathead (*Platycephalus* and *Neoplatycephalus spp*.) are the most significant commercial species. Other commercially significant species include Pilchards (*Sardinops neopilchardus*), Anchovies (*Engraulis australis*), Australian Salmon (*Arripis trutta*), Blue Sprat (*Spratelloides robustas*), and Southern Calamari (*Sepioteuthis australis*). Of less commercial value are the Gummy Shark (*Mustelus antarcticus*), School Shark (*Galeorhinus galeus*), Jackass Morwong (*Nemadactylus macropterus*), Jack Mackerel (*Trachurus declivis*) and Snapper (*Chrysophrys auratus*) (Parry et al., 1990).
- **Commercial shipping** - Bass Strait is one of Australia's busiest shipping areas, with passengers and freight being transported between the mainland and Tasmania as well as New Zealand. The highest volumes of shipping traffic travel in an east-west direction, with connections to Melbourne and Geelong. Substantial volumes of shipping traffic also occur between Melbourne/Geelong and Tasmania moving in a north-south direction
- **Recreational activities** - Most recreational activities occur in nearshore environments, including fishing, boating and diving, and are often controlled by conditions within the open waters of the Strait. Several of the islands in the region are also available for visiting, although access may be controlled by permit systems managed by the Tasmanian Parks and Wildlife Service. Popular recreational activities offered by the Bass Strait islands include bird-watching, fishing and diving around reefs and shipwrecks
- **Oil and Gas Infrastructure** - The Gippsland Basin has been producing significant oil and gas resources since the 1960s and includes a number of operating fields. Petroleum permits have been issued for exploration and production within the central Bass Strait region, with the closest operating field located at least 3 km to the east of the Offshore TGP
- **Other infrastructure** - The Victorian shore crossing of the Offshore TGP is adjacent to existing pipeline easements or infrastructure, including EAPL/BHP pipeline, BASSLINK Interconnector and Indigo Cable. These have been outlined in Section 2.1.6

Due to the depth and location of the Offshore TGP, and periodic nature of inspection and maintenance activities, Offshore TGP activities should pose minimal hindrance to socio-economic activities in Bass Strait.

3.5 Environmentally Significant Areas

3.5.1 Wetlands of International Importance

3.5.1.1 Gippsland Lakes Ramsar Site

The Gippsland Lakes Ramsar Site is located in Victoria, south of the Eastern Highlands and to the east of the La Trobe Valley. Covering a vast area, the lakes are a series of large, shallow, coastal lagoons approximately 70 km in length and 10 km wide, separated from the sea by sand dunes. The surface area of the lakes is approximately 364 km^2 and the three main water bodies are Lakes Wellington, Victoria and King.

The Gippsland Lakes Ramsar Site meets six of the Ramsar criteria:1, 2, 4, 5, 6 & 8 (as described in DoEE 2019).

The Gippsland Lakes is a particularly good representative example of a natural or near-natural wetland, characteristic of the biogeographical region. It forms one of the largest coastal lagoon systems in the Drainage Division and contains a distinctive landscape of wetlands and flat coastal plains. The site supports a broad range of wetland types in close proximity to each other, including periodically inundated palustrine marshes, permanently inundated palustrine marshes, shallow lacustrine (lake) features, deep lacustrine features, lagoons with narrow inlets, and broad embayments. The site supports several nationally threatened wetland fauna species at various stages of their life-cycle including two nationally threatened frog species, the vulnerable Australian Painted Snipe, a vulnerable fish species (the Australian Grayling) and three nationally vulnerable and endangered wetland-associated flora species.

The site supports habitat and conditions that are important for critical life cycle stages of a variety of wetland-dependent fauna species. The permanence of the main lakes and the relatively regular flooding of the adjacent wetlands mean that this wetland is an important drought refuge for many water birds and other aquatic species, including as permanent refuges and breeding sites for two threatened frog species.

The Gippsland Lakes have been identified as being of outstanding importance for waterbirds, regularly supporting more than 20,000 waterfowl. Waterbird species which are considered to have met the one per cent population threshold are: Red-necked Stint, Black Swan, Sharp-tailed Sandpiper, Chestnut Teal, Musk Duck, Fairy Tern and Little Tern.

Gippsland Lakes provides important habitats, feeding areas, dispersal and migratory pathways, and spawning sites for numerous fish species of direct and indirect fisheries significance. These fish have important fisheries resource values both within and external to the site. Currently, parts of the Lakes system are heavily used for commercial and recreational fisheries and boating activities, while the immediate hinterland has been developed for agricultural use, and limited residential and tourism purposes (DoEE, 2017b).

The Lakes are protected as a Ramsar site by the Lakes National Park and the Gippsland Lakes Coastal Park (Refer Section 3.5.6). In the context of the TGP operations and predicted extent of the ZPI , critical components (C)/ processes (P)/ services (S) that may be affected by a diesel spill event include marine sub-tidal aquatic beds (C1), waterbird breeding (P2), threatened species (S1) and fisheries resource values (S2) (DSEWPAC 2010).

3.5.1.2 Corner Inlet Ramsar Site

The Corner Inlet Ramsar Site is located on the south-east coast of Victoria. It is bounded to the west and north by the South Gippsland coastline, in the south-east by a series of barrier islands and sandy spits lying end to end and separated by narrow entrances, and to the south by the hills of Wilsons Promontory.

The Corner Inlet Ramsar Site also meets six of the Ramsar criteria: 1, 2, 4, 5, 6 and 8 (as described in DoEE 2019)

Corner Inlet is a very good example of a wetland enclosed by barrier islands in Victoria and contains the most extensive intertidal mudflats in Victoria. The area contains the only extensive

bed of the Broad-leafed seagrass in Victoria. The islands of Corner Inlet, although not rich in plant diversity, are of high biogeographical significance as a result of their geological history and connectivity to the mainland during ice ages. The islands also contain significant areas of saltmarsh and mangroves, both of which are communities of very limited distribution. These communities filter pollutants, stabilize sediments and protect the shoreline from erosion. Corner Inlet provides breeding habitat for a variety of waterbirds, including several species listed as threatened at the State level and/or occurring in significant numbers and habitat for significant aggregations of waterbirds during post-breeding, and as a refuge during adverse environmental conditions. Corner Inlet regularly supports well over 20,000 waterbirds including species such as the Eastern Curlew, Curlew Sandpiper, Bar-tailed Godwit, and Double-banded Plover.

The Corner Inlet Ramsar Site has regularly supported more than one per cent of the population of the Pied Oystercatcher, Sooty Oystercatcher, Pacific Gull, Fairy Tern, Red Knot, Red-necked Stint and Chestnut Teal.

Corner Inlet supports the nationally critically endangered Orange Bellied Parrot as well as several other vulnerable and endangered species, including the Growling Grass Frog and Australian Grayling. The Southern-right Whale, Leathery Turtle, Swift Parrot and Shy Albatross have all also been recorded at the site.

Corner Inlet provides important habitats, feeding areas, dispersal and migratory pathways, and spawning sites for numerous fish species.

Corner Inlet was used traditionally by Indigenous people and many archaeological sites including scarred trees, burial sites, artefact scatters, shell middens and camps have been found. Currently, the Ramsar site is used for biological conservation, ports with servicing facilities for off-shore oil and natural gas exploration, commercial fishing, recreational fishing, and other recreational activities. Diving is popular around the numerous shipwreck sites in Corner Inlet and around the barrier islands (DoEE, 2017c).

The site is protected as a Ramsar site by the Nooramunga and Corner Inlet Marine and Coastal Parks, and by part of it lying within the Corner Inlet Marine National Park (Section 3.5.6). In the context of the TGP operations and predicted extent of the ZPI, critical components (C)/processes (P) /services (S) that may be affected by a diesel spill event include seagrass, mangroves, saltmarshes and intertidal and subtidal waters (C1), waterbird breeding (P1), threatened species (S1) and fish abundance (S2) (DSEWPAC 2011).

3.5.1.3 Threatened Ecological Communities

Giant Kelp Marine Forests of South East Australia – As of August 2012, these areas have been protected under the EPBC Act, as a threatened ecological community (TEC). Giant kelp (*Macrocystis pyrifera*) is the foundation species of the community, with other components including a large range of algae, reef associated fish and numerous invertebrates that shelter, feed and reproduce within the kelp (DSEWPAC, 2012). Remaining populations occur along coastal Tasmania and Victoria and in small patches around the Kent Group. Giant kelp marine forests favour temperate south east waters on rocky reefs, where conditions are cool and relatively nutrient rich. The Offshore TGP route passes through deeper waters and does not impact directly on any known populations.

Subtropical and Temperate Coastal Saltmarsh - Is listed as a vulnerable TEC under the EPBC Act, and its known distribution includes the southern and eastern coasts of Australia. The Subtropical and Temperate Coastal Saltmarsh ecological community occurs within a relatively narrow margin along the Australian coast, within the subtropical and temperate climatic zones; and includes coastal saltmarsh occurring on islands within these climatic zones. The physical environment for the ecological community is coastal areas under regular or intermittent tidal influence (TSSC, 2013).

The ecological community consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges, rushes and shrubs. Many species of non-vascular plants are also found in saltmarsh, including epiphytic algae, diatoms and cyanobacterial mats. The ecological community is inhabited by a wide range of infaunal and epifaunal invertebrates, and temporary inhabitants

such as prawns, fish and birds (and can often constitute important nursery habitat for fish and prawn species). Insects are also abundant and an important food source for other fauna, with some species being important pollinators. The dominant marine residents are benthic invertebrates, including molluscs and crabs that rely on the sediments, vascular plants, and algae, as providers of food and habitat across the intertidal landscape (TSSC, 2013).

The key threats affecting the ecological community include: clearing and fragmentation, invasive species, damage from recreational activities and pollution (including oil spills) (TSSC, 2013). The Offshore TGP route does not impact directly on any known communities.

Littoral Rainforest and Coastal Vine Thickets of Eastern Australia - is listed as a critically endangered TEC under the EPBC Act. The ecological community is a complex of rainforest and coastal vine thickets on the east coast of Australia influenced by its proximity to the sea; and provides habitat for over 70 threatened plants and animals and provides important stepping stones along the eastern Australian coast for various migratory and marine birds (DoE&PI, 2014). The Offshore TGP route does not impact directly on the closest occurrence of this TEC at Lakes Entrance.

3.5.2 Commonwealth Marine Areas

Six marine regions have been identified in Commonwealth waters around Australia. The ZPI lies within the South-east Marine Region.

The key conservation values of the South-east Marine Region are:

- Features with high biodiversity and productivity, such as the east Tasmania subtropical convergence zone, Bass Cascade, Upwelling East of Eden, Seamounts south and east of Tasmania and Bonney Upwelling.
- Breeding and resting areas for Southern-right Whale.
- Migration areas for Blue, Fin, Sei, Southern-right and Humpback Whales. Foraging areas for Australian Sea-lion, White Shark, Harrison's Dogfish, Killer and Sei Whales, Australasian Gannet, Fairy Prion, Black-faced Cormorant, Little Penguin, Crested Tern, and several species of seal, albatross, petrel, shearwater and gull.
- Wrecks of MV City of Rayville, SS Cambridge and ketch Eliza Davies.
- 10 provincial bioregions and 17 seafloor types are represented in the network (DoEE, 2015b)

3.5.3 Australian Marine Parks (formerly Commonwealth Marine Reserves)

The **Beagle Australian Marine Park** (AMP) - Declared in June 2007, covers 2,928 km^2 of Commonwealth ocean territory, and incorporates the Kent Island Group, Hogan Island Group and Curtis Island Group. It is situated within shallow topography, mostly at depths of 50 m to 70 m, with the north-western edge abutting Victorian waters to the south-east of Wilson's Promontory. The Offshore TGP is oriented between the Hogan and Kent Island Groups, traversing the entire marine reserve in a north-south direction. The Marine Reserve is traversed by the Offshore TGP between KP 110 and KP 170 (refer to Figure 7). The Reserve is zoned for 'Multiple Use' (category VI under the classification system established by the International Union for Conservation of Nature (IUCN) and adopted by the Commonwealth government). The Reserve is effectively a managed resource protected area that is administered to ensure long-term protection and maintenance of biological diversity, but with a sustainable flow of natural products and services to meet community needs. The general zoning allows for a number of activities including mining exploration and development activities, select commercial fishing methods, recreational and charter fishing, shipping and general transit, scientific research and commercial tourism. Demersal trawl, scallop dredging, mesh netting and Danish seine commercial fishing methods, however, are not permitted.

Table 9: Beagle AMP: SE Commonwealth Marine Reserves Network Management Plan 2013-2023 (DNP, 2013)

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN VI—Multiple Use Zone			
Assigned zones in reserve:	IUCN Ia	IUCN II	IUCN IV	IUCN VI
				Multiple Use Zone
Depth of reserve below seabed	100 m			
Total area	2,928 km^2 (292 800 ha)			
Major conservation values	Ecosystems, habitats and communities associated with: • the Southeast Shelf Transition. and associated with sea-floor features: • basin • plateau • shelf • sill Important migration and resting on migration area for: • Southern-right Whale Important foraging area for: • Australian Fur Seal • Killer Whale • Shy Albatross, Australasian Gannet, Short-tailed Shearwater, Pacific and Silver Gulls, • Crested Tern, Common Diving Petrel, Fairy Prion, Black-faced Cormorant and Little Penguin • White Shark Cultural and heritage sites: • the wreck of the steamship SS Cambridge • the wreck of the ketch Eliza Davies			
Location	The Beagle Commonwealth Marine Reserve lies entirely within Bass Strait, with its north-western edge abutting Victorian waters south-east of Wilson's Promontory. It is a shallow-water reserve surrounding a collection of Bass Strait islands.			
General description of the reserve	The Beagle Commonwealth Marine Reserve represents an area of shallow continental shelf ecosystems in depths of about 50–70 m that extends around south-eastern Australia to the east of Tasmania. The sea floor that it covers formed a land bridge between Tasmania and Victoria during the last ice age 10 000 years ago. Its boundary encloses Tasmania's Kent Group Marine Reserve and the Hogan and Curtis Island groups. Nearby to the north-east is Victoria's Wilsons Promontory Marine National Park. The reserve encompasses the fauna of central Bass Strait, which is expected to be especially rich based on studies of several sea floor–dwelling animal groups. Its ecosystems are similar to those documented for the deeper sections of the Kent Group Marine Reserve, especially those based around habitats of rocky reefs supporting beds of encrusting, erect and branching sponges, and sediment composed of shell grit with patches of large sponges and sparse sponge habitats. Islands encompassed by the reserve and nearby islands support important breeding colonies for many seabirds and for the Australian Fur Seal. The waters of the reserve provide an important foraging area for those species breeding nearby. The rich marine life also attracts top predators, such as the White Shark and Killer Whales. The SS Cambridge, a British freighter, which lies in the reserve to the east of Wilson's Promontory, was sunk in 1940 by a WWII mine. The trading ketch Eliza Davies, which lies in the reserve to the east of Wilson's Promontory, sunk under tow in 1924.			

3.5.4 Key Ecological Features

Key Ecological Features (KEF) are elements of the Commonwealth marine environment that are considered to be of regional importance for either a region's biodiversity or its ecosystem function and integrity. KEFs are not matters of national environmental significance (Appendix E) and have no legal status in their own right. However, they are components of the Commonwealth marine area.

The Upwelling East of Eden is defined as a key ecological feature as it is an area of high productivity and aggregations of marine life. Dynamic eddies of the East Australian Current cause episodic productivity events when they interact with the continental shelf and headlands. The episodic mixing and nutrient enrichment events drive phytoplankton blooms that are the basis of productive food chains including zooplankton, copepods, krill and small pelagic fish. The upwelling supports regionally high primary productivity that supports fisheries and biodiversity, including top order predators, marine mammals and seabirds. This area is one of two feeding areas for Blue Whales and Humpback Whales, known to arrive when significant krill aggregations form. The area is also important for seals, other cetaceans, sharks and seabirds. This feature displays seasonal and annual variation and is present along the eastern Victorian and southern NSW coasts.

3.5.5 National Parks and Reserves

A number of areas adjacent to or within Victorian and Tasmanian State waters have been declared as National Parks or Marine Protected Areas. These are shown in Figure 13 and include the following reserves within the vicinity of the Offshore TGP:

- **The Lakes National Park and Gippsland Lakes Coastal Park** - The Gippsland Lakes are a group of large coastal lagoons in eastern Victoria, separated from the sea by sand dunes and fringed on the seaward side by Ninety Mile Beach. The main lakes - Wellington, Victoria and King cover an area of 340 km2 and have a shoreline of 320 km. The lakes are fed by a number of river systems. The largest of the rivers are the Latrobe River and the Avon River (flowing into Lake Wellington), and the Mitchell River, Nicholson River and Tambo River (flowing into Lake King). The system is linked to the sea by an artificial entrance near the eastern end, opened in 1889, where the town of Lakes Entrance is now situated (ParksVic, 2017a).

  The Lakes National Park covers 2390 ha bounded by Lake Victoria, Lake Reeve and the township of Loch Sport. Gippsland Lakes Coastal Park is a narrow coastal reserve covering 17,600 ha along approximately 90km of Ninety Mile Beach from Seaspray to Lakes Entrance. The Lakes National Park contains large areas of diverse and relatively undisturbed flora and fauna communities representative of the inner barrier of the Gippsland Lakes system. Gippsland Lakes Coastal Park takes in extensive coastal dune systems, woodlands and heathlands, as well as water bodies such as Lake Reeve and Bunga Arm (ParksVic 2017). The Gippsland Lakes system is listed under the Convention on Wetlands of International Importance (Ramsar). The Gippsland Lakes provide important feeding, resting and breeding habitat for approximately 80 waterbird species (ParksVic 2003, 2017a), and the lakes, and associated swamps and morasses, regularly support approximately 40,000 to 50,000 waterbirds.

  Clydebank Morass, Macleod Morass and Jones Bay (within Lake King) support many species of migratory waders. Lake Wellington, Lake Victoria and Lake King support migratory seabirds, including the Little Tern and Fairy Tern, as well as a range of other waterfowl. Lake Reeve provides significant habitat for a large number of migratory waders, and is listed as one of the five most important areas for shorebirds in Victoria. Bunga Arm supports breeding populations of threatened species e.g. Little Tern, Fairy Tern, Hooded Plover and White-bellied Sea-eagle (ParksVic 2003, 2017a).

  The far south-western boundary of the Park is located approximately 100 m north-east of the Offshore TGP commencement point.

- **Ninety Mile Beach Marine National Park** – Is located 550 m south west of Seaspray, Victoria and is also managed by Parks Victoria. The Park covers 2750 ha and stretches south-west

along 5 km of coastline and 3 NM offshore to the boundary of Victorian waters. Marine habitat consists of sandy beach, sub tidal soft sediment and 8 ha of low profile calcarenite reef. The Park is frequented by a number of threatened shorebird species including the Hooded Plover (Thinornis rubricollis), Little Egret (Egretta garzetta), Little Tern (Sterna albifrons sinensis), Royal Spoonbill (Platalea regia) and Whiskered Tern (Chlidonias hybridus). The area contains diverse fish species, with schools of pelagic fish including pike, school whiting and snapper common to the area. The area is also a nursery and feeding ground for Great White Sharks (Carcharodon carcharias). The Park is located approximately 2 km west of the Offshore TGP.

- **Corner Inlet and Nooramunga Marine and Coastal Parks** - Are protected from Bass Strait by sand barrier islands and Wilsons Promontory. Corner Inlet and Nooramunga consist of shallow marine waters, intertidal mudflats and a series of sand islands. Corner Inlet and Nooramunga Marine and Coastal Parks contain a diverse range of habitats including large stands of white mangrove and saltmarsh areas. Seaward of the mangroves are extensive areas of intertidal mud and sand flats which provide food for thousands of migratory wading birds each year.

  Thirty two species of migratory waders have been recorded, including the largest concentrations of Bar Tailed Godwit and Great Knot in south eastern Australia. In summer, the ocean beaches and sand spits are also used as nesting sites by shorebirds like the Pied Oystercatcher, Crested Tern, Caspian Tern, Fairy Tern, Hooded Plover and the endangered Little Tern. Fringing the saltmarshes and mangroves on the mainland and islands are stands of swamp paperbark and coast tea-tree, and further inland woodlands of coast banksia and manna gum. These are home for a variety of animals including the New Holland Mouse, Swamp Antechinus, Orange-bellied Parrot, Ground Parrot and White-bellied Sea Eagle. The parks are recognised as wetlands of international importance under the Ramsar convention (ParksVic 2017b, ParksVic 2017c).

- **Corner Inlet Marine National Park** - Is located north and east of Wilson's Promontory adjacent to the southern shores of Corner Inlet. The National Park protects large areas of seagrass including the only extensive Posidonia australis meadow in southern Australia. Amongst the seagrass live over 300 marine invertebrates including crabs, seastars, sea snails, squid and many fish including pipefish, stingrays, flathead, whiting and flounder. The seagrass and surrounding marshes are particularly important for international migratory birds such as the Eastern curlew (ParksVic 2017b). The area has been listed as part of the Corner Inlet Ramsar Site.

- **Wilsons Promontory Marine National Park** - Is Victoria's largest Marine Protected Area at 15,550 ha and is located around the southern tip of Wilsons Promontory. There is a diversity of marine life including octopus, sharks and rays. It is a popular location for recreational divers particularly around the sponge gardens. The offshore islands support many colonies of fur seals and oceanic birds such as Little Penguins, Fairy Prions, Silver Gulls and Pacific Gulls (ParksVic 2017d).

- **Wilsons Promontory National Park** - Is a popular tourist destination due to its coastal scenery and diverse natural environments. Tourist activities include walking, camping, sightseeing, viewing wildlife, fishing, boating, diving, sea kayaking and surfing.

  This terrestrial park is important for its range of plants and animals, including many threatened species including the New Holland Mouse, Ground Parrot and White-bellied Sea Eagle. Coastal features include expansive intertidal mudflats, sandy beaches and sheltered coves interrupted by prominent headlands and granite cliffs in the south, backed by coastal dunes and swamps.

  The avifauna recorded for Wilsons Promontory includes around half of all Victorian bird species. Significant species of migratory wading birds feed on the tidal mudflats of Corner Inlet within and adjoining the park. The offshore islands have breeding and roosting sites for sea birds, including a large number of Short-tailed Shearwaters (ParksVic 2017c).

- **The Kent Group National Park** – A terrestrial park managed by the Parks and Wildlife Service of Tasmania. There are three major islands (Deal, Dover and Erith), two minor islands (North East and South West) and Judgement Rocks incorporated into the national park. The Offshore TGP is oriented in close proximity to South West Island and Judgement Rocks, with KP 130.7

positioned approximately 10 km west of the park boundary. Breeding seabird colonies are large, particularly on the two small islets known as North East and South West islands. Common Diving Petrels, Short-tailed Shearwaters, Little Penguins, Pacific Gulls, Sooty Oystercatchers and cormorants are the primary inhabitants as are the Little Tern (Sterna albifrons sinensis), endangered under Tasmanian legislation, and the Fairy Prion (Pachyptila turtur subantarctica) listed as vulnerable under the EPBC Act (Kent Management Plan, 2005). Judgement Rocks is also an important Australian Fur Seal (Arctocephalus pusillus) breeding colony, being the largest within Tasmanian waters. However, the distance of approximately 10 km is expected to buffer nesting sites from Offshore TGP activities.

- **The Kent Group Marine Reserve** – Also managed by the Parks and Wildlife Service of Tasmania, extends 3 NM (about 5.6 km) offshore from the main islands of the Kent Group, and includes a Habitat Protection Zone (restricted take) and Sanctuary Zone (no take). The submarine topography surrounding these islands is dominated by massive granite blocks interspersed with clefts, ledges and caverns. The diversity in fish species is considered unusually high given the proximity to more homogenous substrates across the Bass Strait. It is considered unique in faunal assemblage and of high scientific value, partly due to its unique biogeographical location at the convergence of the three marine biogeographical regions. The Sanctuary Zone covers the western part of the Kent Group, including Dover and Erith Islands and Murray Passage, as well as part of the western coast of Deal Island. The Marine Reserve lies 23 km east of the Offshore TGP.
- A number of other islands lying about 10 km to 25 km from the Offshore TGP are listed as nature reserves under the Nature Conservation Act 2002 (Tasmania). They include: West Moncoeur Island, East Moncoeur Island, Bass Pyramid, Curtis Island, Devils Tower, Tenth Island and Wright Rock. The islands not only provide resting sites from foraging, but also serve as breeding sites for some species of birds and, in some cases, for seals.

  All wildlife is protected by State or Commonwealth laws within declared nature reserves. The Offshore TGP route was originally chosen to minimise impacts on these sensitive areas, with the only area in direct contact with the Offshore TGP being the Beagle AMP. Management Guidelines, to ensure National Parks, Marine Reserves and all environmentally significant areas remain protected, are outlined in Section 6.

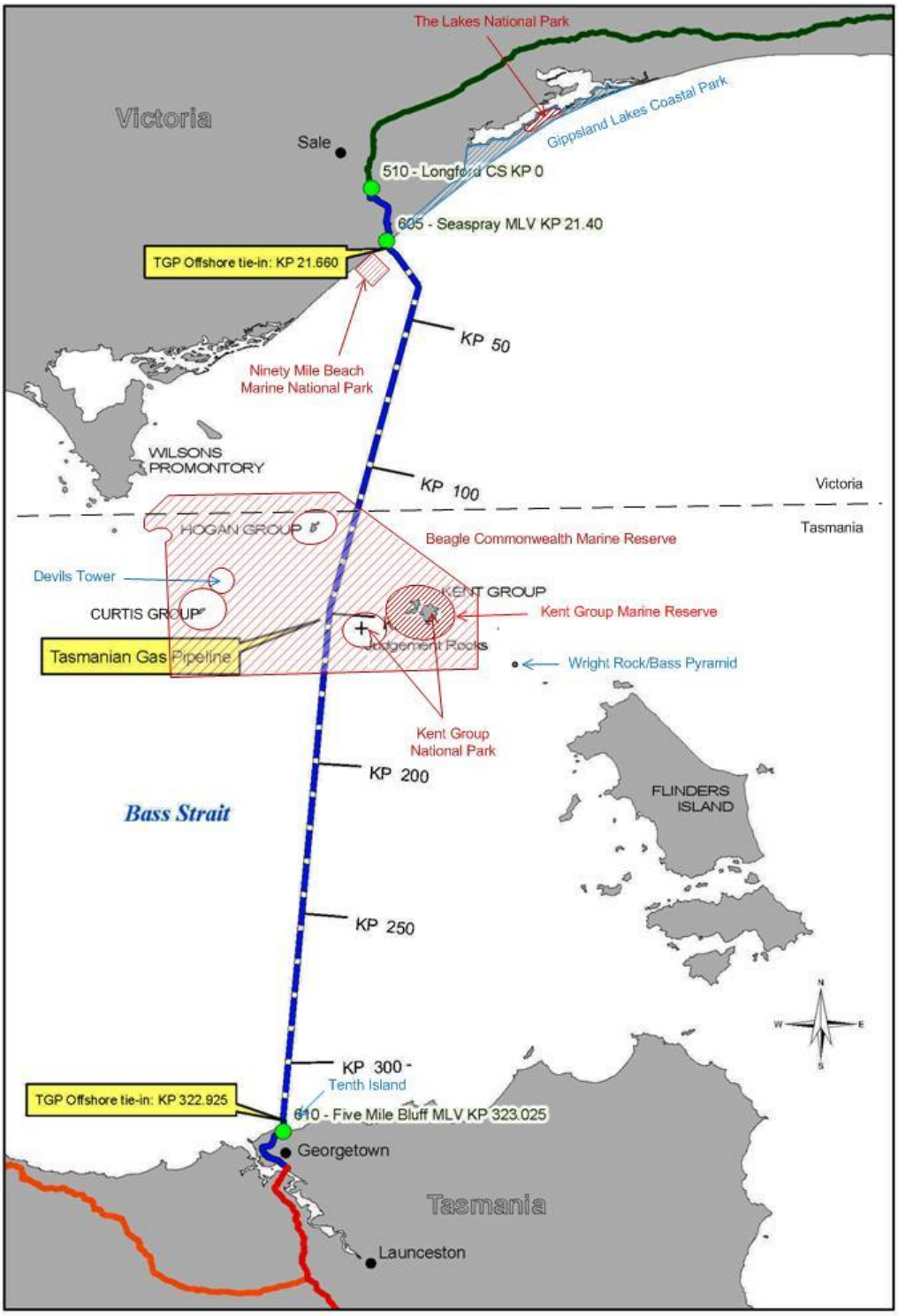


Figure 13: Environmentally Significant Areas along the Offshore TGP route

4. REGULATORY AND OTHER REQUIREMENTS

4.1 Legislative and Regulatory Requirements

The TGP is operated in accordance with strict statutory and regulatory requirements and company policy which includes provisions for environmental protection. The Offshore TGP route spans three administrative jurisdictions:

- Victoria – Seaspray high water mark to 3 NM offshore
- Commonwealth – 3 NM offshore from Seaspray to 3 NM offshore from Five Mile Bluff in Tasmania
- Tasmania – 3 NM offshore to Five Mile Bluff low water mark

The Offshore TGP is subject to the requirements of State and Commonwealth legislation, and operation of the offshore pipeline must comply with a range of acts, regulations, codes, licences and policies under State and Commonwealth jurisdictions. Those relevant to environmental management and the EP are listed in the following sections. A summary of relevant Commonwealth and State legislation is also provided in Appendix B.

4.1.1 Commonwealth OPGGS Act and Environmental Regulations

The Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) provides the regulatory framework for all offshore petroleum exploration, production and greenhouse gas activities in Commonwealth waters. The OPGGS Act is supported by regulations and directions covering matters such as safety, diving, petroleum resource management and environmental management.

The objective of the OPGGS Act is to ensure that offshore petroleum operations are performed in a way that is consistent with the principles of ecologically sustainable development (ESD), through an accepted EP with agreed environmental outcomes and performance standards.

Approvals required of a titleholder under the OPGGS Act relevant to the activity include the following:

- Environment Plan (EP) assessment and acceptance
- Oil Pollution Emergency Plan (OPEP) (Section 9.4) assessment and acceptance

NOPSEMA has responsibility for the assessment and acceptance of this EP in accordance with the provisions of the OPGGS(E) Regulations.

Prior to accepting an EP, NOPSEMA must be reasonably satisfied that the titleholder has demonstrated compliance with the financial assurance requirements of subsection 571(2) of the OPGGS Act in a form acceptable to NOPSEMA.

The Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E) Regulations) are intended to ensure that petroleum activities are consistent with the principles of ecologically sustainable development (ESD), and in accordance with an accepted EP that has appropriate environmental performance outcomes and standards, as well as measurement criteria for determining whether the objectives and standards are met.

The OPGGS(E) Regulations define the following core elements as critical components of the EP:

- Identifying the applicable environmental regulatory requirements
- Identifying and assessing the potential environmental effects and risks associated with normal (routine), as well as unforeseen (non-routine) events
- Documenting the environmental outcomes, performance standards and measurement criteria to be implemented to reduce potential environmental effects of the activity to ALARP
- Documenting the environmental management strategies that are to be implemented to manage potential environmental effects associated with the activity

- Demonstration of appropriate levels of consultation with defined stakeholders
- The OPGGS(E) Regulations have been made under the OPGGS Act with the objective of ensuring that any petroleum or greenhouse gas activity carried out in the offshore area is carried out in a manner:
  - Consistent with the principles of ecologically sustainable development (ESD) as set out in section 3A of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
  - By which the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable (ALARP)
  - By which the environmental impacts and risks of the activity will be of an acceptable level

The main sections of the OPGGS(E) Regulations that are applicable to this Offshore EP are Part 2, which addresses the requirements for environment plans; and Part 3, which describes the requirements for notification of reportable and recordable incidents, reporting environmental performance and storage and accessibility of records.

4.1.2 EPBC Act

The EPBC Act is the Australian Commonwealth Government's central piece of environmental legislation. The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance (MNES). The 9 MNES to which the EPBC Act applies are:

- world heritage properties
- national heritage places
- wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed)
- nationally threatened species and ecological communities
- migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mining); and
- a water resource, in relation to coal seam gas development and large coal mining development

With respect to operation, inspection and maintenance of the Offshore TGP, the relevant MNES are: wetlands of international importance; nationally threatened species and ecological communities; migratory species; and Commonwealth marine areas.

Under the EPBC Act, activities in Commonwealth areas that could potentially result in killing, injuring, taking, trading, keeping or moving a member of a listed threatened species or ecological community, a member of a listed migratory species or a member of a listed marine species are illegal without a permit. Also, under the EPBC Act, all cetaceans (whales, dolphins and porpoises) are protected in Australian waters. The Australian Whale Sanctuary includes all Commonwealth waters from the 3 NM State waters limit out to the boundary of the Exclusive Economic Zone (i.e. out to 200 NM and further in some places). It is an offence to injure, take, trade, keep, move, harass, chase, herd, tag, mark or brand a cetacean in the Australian Whale Sanctuary without a permit.

NOPSEMA's environmental management authorisation process has been endorsed by the Federal Minister for the Environment as a program that meets the requirements of Part 10 (Section 146) of

the EPBC Act. Since February 2014, NOPSEMA has responsibility for assessing oil and gas activities under the EPBC Act as part of its EP assessment process.

The OPGGS Act requires all activities to be consistent with the principles of ecological sustainable development (ESD), as defined by the EPBC Act (Part 3A). TGPPL has incorporated the principles of ESD into the assessment methodology described in Section 5, in the development of control measures, the criteria for risk acceptance and in the definition of environmental performance outcomes and standards for each impact or risk. TGPPL believes that the commitments made within this EP demonstrate that the environmental management of the activity will be conducted in accordance with the principles of ESD.

TGPPL has confirmed in writing (letter from Director of National Parks dated 1 November 2013) that the pipeline licences issued under the Petroleum (Submerged Lands) Act 1967 are usage rights in relation to the seabed for the purposes of section 359 of the EPBC Act and that as the licences were held immediately before the Beagle Australian Marine Park commenced a permit is not required from the Director of National Parks to undertake repairs and maintenance.

4.1.3 Other Relevant Legislation

Commonwealth

- Aboriginal and Torres Strait Islander Heritage Protection Act 1984
- Australian Heritage Council Act 2003
- Australian Maritime Safety Authority Act 1990
- Biosecurity Act 2015 and Regulations 2016
- Biosecurity Amendment (Ballast Water and Other Measures) Act 2017
- Australian Ballast Water Management Requirements (Department of Agriculture and Water Resources (DAWR), 2017)
- Environment Protection and Biodiversity Conservation Regulations 2000
- Environment Protection (Sea Dumping) Act 1981
- Environment Protection (Sea Dumping) Regulations 1983
- Historic Shipwrecks Act 1976 and Regulations 1978
- National Environment Protection Council Act 1994
- National Greenhouse and Energy Reporting Act 2007
- Navigation Act 2012
- Navigation Regulations 2013
- Offshore Petroleum (Safety) Regulations 2009
- Ozone Protection and Synthetic Greenhouse Gas Management Act 1989
- Protection of the Sea (Harmful Antifouling Systems) Act 2006
- Protection of the Sea (Prevention of Pollution from Ships) Act 1983
- Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994
- Protection of the Sea (Powers of Intervention) Act 1981
- Protection of the Sea (Powers of Intervention) Regulations 1983
- Protection of the Sea (Civil Liability for Bunker Oil Pollution Damage) Act 2008
- Protection of the Sea (Shipping Levy) Act 1981
- Submarine Cables and Pipelines Protection Act 1963.

Victoria

- Aboriginal Heritage Act 2006
- Aboriginal Heritage Amendment Act 2016
- Aboriginal Heritage Regulations 2007
- Coastal Management Act 1995
- Dangerous Goods Act 1985
- Dangerous Goods (Storage and Handling) Regulations 2012
- Emergency Management Act 2013 and Regulations 2003
- Environment Protection Act 1970
- Flora and Fauna Guarantee Act 1988
- Flora and Fauna Guarantee Regulations 2011
- Heritage Act 1995
- Heritage (Historic Shipwrecks) Regulations 2007
- Marine Safety Act 2010
- Marine Safety Regulations 2012
- Marine (Drug, Alcohol and Marine Pollution) Act 1988
- Marine (Drug, Alcohol and Marine Pollution) Regulations 2012
- Marine (Drug, Alcohol and Pollution Control) Amendment Regulations 2013
- National Parks Act 1975
- Offshore Petroleum and Greenhouse Gas Storage Act 2010
- Offshore Petroleum and Greenhouse Gas Storage Regulations 2011
- Pollution of Waters by Oils and Noxious Substances Act 1986
- Pollution of Waters by Oil and Noxious Substances Regulations 2012
- SEPP – Waters of Victoria (2003)
- Wildlife Act 1975
- Wildlife Regulations 2013
- Wildlife (Marine Mammals) Regulations 2009.

Tasmania

- Aboriginal Relics Act 1975
- Emergency Management Act 2006
- Environmental Management and Pollution Control Act 1994
- Historic Cultural Heritage Act 1995
- Nature Conservation Act 2002
- National Parks and Reserves Management Act 2002
- Petroleum (Submerged Lands) Act 1982
- Petroleum (Submerged Lands) (Management of Environment) Regulations 2012
- Pollution of Waters by Oil and Noxious Substances Act 1987
- Pollution of Waters by Oil and Noxious Substances Regulations 2007

- State Policy on Water Quality Management (1997)
- Threatened Species Protection Act 1995
- Threatened Species Protection Regulations 2016
- Whales Protection Act 1988.

4.1.4 International Agreements and Conventions

Australia is a signatory to various international agreements that have marine environment protection aspects. Activities within Commonwealth waters are expected to comply with the relevant requirements of each agreement and convention, including:

- Agreement on the Conservation of Albatrosses and Petrels (ACAP)
- China-Australia Migratory Bird Agreement 1986 (CAMBA)
- Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties 1969 (the Intervention Convention)
- Convention on the International Regulations for Preventing Collisions at Sea 1972 (COLREGs)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matter 1972 [London Convention]
- Convention on the Protection of the Underwater Cultural Heritage (UNESCO 2001)
- Convention on the Suppression of Unlawful Acts against the Safety of Maritime Navigation
- Convention on Wetlands of International Importance 1971 (Ramsar Convention)
- Framework Convention on Climate Change 1992
- International Convention on Civil Liability for Oil Pollution Damage 1992
- International Convention for the Control and Management of Ships' Ballast Water and Sediments
- International Convention on the Control of Harmful Anti-fouling systems on ships (HAFS Convention)
- International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC) - 1990
- International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)
    - Annex I (Prevention of pollution by oil)
    - Annex II (Control of pollution from noxious liquid substances)
    - Annex III (Prevention of pollution by harmful substances in packaged form)
    - Annex IV (Prevention of pollution by sewage from ships)
    - Annex V (Prevention of pollution by garbage from ships)
    - Annex VI (Prevention of air pollution from ships)
- International Convention on the Safety of Life at Sea 1974 (SOLAS Convention)
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW)
- Japan-Australia Migratory Bird Agreement 1974 (JAMBA)
- Montreal Protocol on Substances that Deplete the Ozone Layer 1987
- Protocol on the Prevention of Marine Pollution by Dumping of Waste and Other Matter 1996 [London Protocol]

- Protocol Relating to Intervention on the High Seas in Cases of Marine Pollution by Substances other than Oil 1973
- Protocol on Preparedness, Response and Cooperation to Pollution Incidents by Hazardous and Noxious Substances (OPRC-HNS Protocol)
- Republic of Korea-Australia Migratory Bird Agreement 2002 (ROKAMBA).
- Vienna Convention on the Protection of the Ozone Layer 1985

References to legislation governing the environmental impacts of Offshore TGP operations are summarised in **Error! Reference source not found.** (Regulatory Requirements Summary). A Compliance Calendar identifying the key legislative compliance requirements is maintained by the General Manager TGPPL and includes relevant environmental requirements. Refer also to Section 8.7 for further information regarding environmental reporting requirements.

Detailed, current and cross-referenced guidance for all relevant environmental regulatory requirements in Victoria and Tasmania are available to all staff via the TGPPL Intranet. TGPPL also maintains a number of subscription services with external service providers to ensure that management are informed when there are legislative or regulatory changes (refer to Section 8.6.1 for further detail).

4.2 Standards, Industry Codes and Guidelines

The principal relevant industry codes of practice, Australian Standards (AS) and guidelines applicable to Offshore TGP operations are provided below. These documents are to be referenced during operations to aid in environmental management of the Offshore TGP.

4.2.1 NATPLAN

The National Plan for Maritime Environmental Emergencies (NATPLAN) (AMSA 2016) is managed by AMSA and sets out national arrangements, policies and principles for the management of maritime environmental emergencies. It gives administrative effect to Australia's emergency response obligations relating to the:

- International Convention on Oil Pollution Preparedness, Response and Co-operation 1990
- Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances 2000
- International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties 1969
- Articles 198 and 221 of the UNCLOS.

Further details on NATPLAN and oil spill response are described in detail within the OPEP in Section 9.4.

4.2.2 Industry Codes of Practice

- Australian Petroleum Production & Exploration Association (APPEA) - Code of Environmental Practice 2008
- AMSA 2013, Technical Guideline for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities,
- International Marine Contractors Association (IMCA) - Code of practice for the safe and efficient operation of remotely operated vehicles 2009 (IMCA R 004)
- International Maritime Organisation (IMO) - International Maritime Dangerous Goods (IMDG) Code 2008
- Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)]
- Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

- Safe Work Australia – Managing Risks of Hazardous Chemicals in the Workplace – Code of Practice (July 2012).

4.2.3 Industry Standards / Guidelines

- ASME B31.8: 2018 - Gas Transmission and Distribution Piping Systems
- AS 1940: 2017 - The storage and handling of flammable and combustible liquids
- AS 2885.1: 2018 – Pipelines – Gas and Liquid Petroleum – Part 1: Design and construction
- AS 2885.3: 2012 – Pipelines – Gas and Liquid Petroleum – Part 3: Operation and maintenance
- AS 2885.4: 2010 - Pipelines - Gas and Liquid Petroleum – Submarine Pipeline Systems
- AS 3780: 2008 - The storage and handling of corrosive substances
- AS ISO 19600:2015 – Compliance Management Systems – Guidelines
- AS/NZS ISO 14001: 2016 Environmental Management Systems – Requirements with guidance for use
- AS/NZS ISO 31000: 2009 - Risk Management – Principles and Guidelines
- SA/SNZ HB 436: 2013 – Risk Management Guidelines – Companion to AS/ZS ISO 31000: 2009)
- DNV Standard DNV-OS-F101: 2000 – Submarine Pipeline Systems (latest version 2013)
- DNV-RP B401: 2005 – Recommended Practice - Cathodic Protection Design
- DNV-RP-F105: 2006 Recommended Practice – Free Spanning Pipelines
- DNV-RP-F109: 2010 - On-bottom Stability Design of Submarine Pipelines (previously DNV-RP E305: 1988)
- DNV-RP-C205: 2014 – Environmental Conditions and Environmental Loads (previously DNV CN 30.5)
- DNV-RP-F111: 2014 - Interference between Trawl Gear and Pipelines
- HB 203: 2012 – Managing environment-related risk
- IMCA D042 - Diver and ROV based concrete mattress handling, deployment, installation, repositioning and decommissioning (also IMCA R016 2011), Rev. 1 (September 2011).

4.2.4 Other Environmental Guidelines

- Australian National Guidelines for Whale and Dolphin Watching 2017 (DoEE)
- EPBC Act Significant Impact Guidelines 1.1 – Matters of National Environmental Significance
- Environmental Management in Oil and Gas Exploration and Production, International Association of Oil and Gas Producers (OGP) (1997)
- National biofouling management guidance for the petroleum production and exploration industry (Commonwealth of Australia, April 2009)
- National Strategy for Ecologically Sustainable Development, ESDSC (1992)
- NOPSEMA Guidance Notes:
    - GN-1344 - Environment Plan Content Requirements
    - GN-1488 - Oil Pollution Risk Management
    - GN-1785 - Petroleum Activities and Australian Marine Parks
    - GN-0926 - Notification and Reporting of Environmental Incidents

5. ENVIRONMENTAL MANAGEMENT FRAMEWORK

The environmental management of the Offshore TGP will be guided by this Offshore EP, AS/NZS ISO 14000 and the environmental policies of PIMS / TGPPL and its contractors.

AS 2885.1: 2012, Clause 2.5 also requires the threats to the environment from each part of the life cycle of the pipeline to be identified and control measures implemented so that the risks to the environment are reduced to an acceptable level.

5.1 Environmental Risk Management

TGPPL has undertaken an environmental risk assessment (ERA) to identify potential environmental risks associated with operation, inspection and maintenance of the Offshore TGP to ensure that identified risks are reduced to ALARP and will be of an acceptable level consistent with TGPPL and industry standards. The environmental risk management process is outlined in Section 5.1.2 below.

5.1.1 Definitions

The following definitions are relevant to the environmental risk assessment and management process. Where not specifically referenced, the definitions are from AS/NZS ISO 31000: 2009 – Risk Management – Principles and Guidelines.

- **Consequence** - outcome of an event affecting objectives. An event can lead to a range of consequences, and a consequence can be certain or uncertain and can have positive or negative effects on objectives. Consequences can be expressed qualitatively or quantitatively. Initial consequences can escalate through knock-on effects.
- **Control** - measure that is modifying risk, and may include any process, policy, device, practice, or other actions which modify risk.
- **Environmental aspect** - element of an organization's activities or products or services that can interact with the environment (AS/NZS ISO 14001: 2004).
- **Environmental impact** – any change to the environment or a component of the environment, whether adverse or beneficial, wholly or partly resulting from an organisation's environmental aspects (AS/NZS ISO 14001: 2004).
- **Event** - occurrence or change of a particular set of circumstances. An event can sometimes be referred to as an "incident" or "accident", and an event without consequences may be referred to as a "near miss".
- **Inherent risk** – is essentially the risk prior to risk treatment, i.e. without any mitigation measures / management controls in place.
- **Likelihood** - chance of something happening, whether defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically (such as a probability or a frequency over a given time period).
- **Level of risk** - magnitude of a risk or combination of risks, expressed in terms of the combination of consequences and their likelihood.
- **Monitoring** - continual checking, supervising, critically observing or determining the status in order to identify change from the performance level required or expected. Monitoring can be applied to a risk management framework, risk management process, risk or control.
- **Residual risk** – risk remaining after risk treatment.
- **Review** - activity undertaken to determine the suitability, adequacy and effectiveness of the subject matter to achieve established objectives. Review can be applied to a risk management framework, risk management process, risk or control.
- **Risk** – effect of uncertainty on objectives.
- **Risk analysis** - process to comprehend the nature of risk and to determine the level of risk.

- **Risk assessment** – the overall process of risk identification, risk analysis and risk evaluation.
- **Risk criteria** - terms of reference against which the significance of a risk is evaluated.
- **Risk evaluation** - process of comparing the results of risk analysis with risk criteria to determine whether the risk and/or its magnitude is acceptable or tolerable.
- **Risk identification** - process of finding, recognizing and describing risks.
- **Risk management** - coordinated activities to direct and control an organization with regard to risk.
- **Risk management process** - systematic application of management policies, procedures and practices to the activities of communicating, consulting, establishing the context, and identifying, analysing, evaluating, treating, monitoring and reviewing risk.
- **Risk source** - element which alone or in combination has the intrinsic potential to give rise to risk.
- **Risk treatment** - process to modify risk. Risk treatment can involve: avoiding the risk by deciding not to start or continue with the activity that creates the risk; taking or increasing risk in order to pursue an opportunity; removing the risk source; changing the likelihood; changing the consequences; sharing the risk with another party or parties (including contracts and risk financing); and retaining the risk by informed decision. Risk treatments that deal with negative consequences are sometimes referred to as "risk mitigation", "risk elimination", "risk prevention" and "risk reduction".

5.1.2 Environmental Risk Management Model

Environmental risk assessment and management for this Offshore EP has been undertaken using a methodology that is consistent with the approach outlined in the following standards and guidelines:

- AS/NZS ISO 14001: 2004 - Environmental Management Systems- Requirements with Guidance for Use;
- AS 2885.1: 2012 - Pipelines - Gas and Liquid Petroleum, Part 1 – Design and Construction;
- AS/NZS 31000: 2009 - Risk Management – Principles and Guidelines; and
- HB 203: 2012 – Managing environment-related risk.

The model used to evaluate and manage environmental risks potentially resulting from Offshore TGP operation and associated inspection and maintenance activities comprises the following main components:

- **Risk identification** - Identification of the environmental aspects of operations (i.e. elements of those activities carried out on the Offshore TGP that can interact with the environment) and potential impacts or changes to the environment resulting from these environmental aspects.
- **Risk analysis** – Developing and understanding of the risks and controls in place, i.e. analysing risks in terms of controls, consequences and likelihood to determine an estimated level of risk of the impact from each aspect. Table 7 and Table 11 provide criteria for determining potential environmental consequences and likelihood, respectively.
- **Risk evaluation** - Assessment of the environmental risk according to the allocated likelihood and consequence to rate or rank the risk, and identify those aspects with risks considered to be significant. The Environmental Risk Matrix provided as Figure 14 is used to determine risk ratings and identify significant risks that require further treatment.
- **Risk treatment** - Reviewing the proposed management controls for each of the significant risks identified and proposing additional controls or recommending further actions or treatments to mitigate the risk to a level that is deemed to be ALARP and acceptable.

Table 10: Environmental Consequences Classification

Consequence classification	Biodiversity		Environmental Quality			Societal considerations		
	Protected species	Ecological diversity	Water quality	Marine sediment quality	Air quality	Protected areas	Cultural matters	Compliance
Catastrophic (A)	Eradication of local population. Loss of critical habitats or activities.	Significant and permanent effects on ecological diversity on a regional scale.	Continuous or regular water contamination above background, national / international quality standards and/or known biological effect concentrations on a regional scale.	Permanent to long-term contamination above background, national / international quality standards and/or known biological effect concentrations on a regional scale.	Continuous exceedance of national or international air quality standards. Human fatalities possible.	Significant permanent impact on one or more of protected-areas values.	Significant permanent effect on aesthetic, heritage, economic or recreational values. Overall societal benefits do not outweigh impacts.	Significant and continuous licence, regulatory or company target exceedances. Fines and/or prosecutions incurred or expected.
Severe (B)	Extensive impact on population(s). Significant impact on critical habitats or activities.	Significant and permanent effects on ecological diversity on large scale.	Continuous or regular water contamination above background, national / international quality standards and/or known biological effect concentrations on a large scale.	Permanent to long-term contamination above background, national / international quality standards and/or known biological effect concentrations on a large scale.	Frequent and sustained exceedance of national or international air quality standards. Human fatalities possible.	Significant long-term impact on one or more of protected-areas values.	Significant long-term effect on aesthetic, heritage, economic or recreational values. Overall societal benefits do not outweigh impacts.	Frequent and significant licence, regulatory or company target exceedances. Fines or prosecutions likely.
Major (C)	Minor disturbance to significant portion of population. Minor impacts on critical habitats or activities. No threat to overall population viability.	Significant and permanent effects on ecological diversity on medium scale.	Continuous or regular discharge, with contamination above background, national / international quality standards and/or known biological effect concentrations on a medium scale.	Permanent to long-term contamination above background, national / international quality standards and/or known biological effect concentrations on a medium scale.	Frequent, short-term exceedance of national or international air quality standards. Human illness and environmental impacts possible.	Moderate long-term or permanent impact on one or more of protected-areas values.	Moderate effect on aesthetic, heritage, economic or recreational values. Overall societal benefits do not outweigh impacts.	Frequent, minor to moderate licence, regulatory or company target exceedances. Fines or prosecutions possible.
Moderate (D)	Minor disturbance or impact on a small portion of population. Minor and temporary impact on critical habitat or activity. No threat to overall population viability.	Loss of ecological diversity on a medium scale. Community or habitat maintains ecological integrity but some change in species composition or abundance. Communities, habitats and species well represented regionally.	Continuous or regular discharge, with contamination above background, national / international quality standards and/or known biological effect concentrations on a local or medium scale.	Short- to medium-term contamination above background, national / international quality standards and/or known biological effect concentrations on a medium scale.	Frequent temporary exceedance of national or international air quality standards. Human illness and environmental impacts possible.	Moderate medium term impact on one or more of protected-areas values. Full recovery expected.	Moderate effect on aesthetic, heritage, economic or recreational values. Overall societal benefits outweigh impacts.	Occasional significant licence, regulatory or company target exceedances. Fines or prosecutions possible.
Minor (E)	Minor and temporary disturbance to small portion of population. No impact on critical habitat or activity.	Loss of ecological diversity on a localised scale. Community or habitat maintains ecological integrity but some change in species composition or abundance. Communities, habitats and species well represented regionally.	Continuous or regular discharge, with contaminants reduced to below background, national / international quality standards and/or known biological effect concentrations within a small mixing zone.	Short- to medium-term contamination above background, national / international quality standards and/or known biological effect concentrations on a localised scale.	Occasional and temporary exceedance of national or international air quality standards. No effect on human health or the environment.	Minor medium-term impact on one or more of protected-areas values. Full recovery expected.	Minor effect on aesthetic, heritage, economic or recreational values.	Occasional minor licence, regulatory or company target exceedances. No fines or prosecutions.
Slight (F)	Behavioural responses of negligible ecological significance.	Minor loss of ecological diversity on localised scale. Communities, habitats and species well represented on medium scale.	Occasional discharge, with contaminants reduced to below background, national / international quality standards and/or known biological effect concentrations within a small mixing zone	Short-term contamination above background, national / international quality standards and/or known biological effect concentrations over a very small area (<1 km^2).	Very infrequent and temporary exceedance of national or international air quality standards. No effect on human health or the environment.	Negligible impact on protected-areas values.	Negligible effect on aesthetic, heritage, economic or recreational values.	Very infrequent minor licence, regulatory or internal target exceedances.

Table 11: Likelihood Classes

Likelihood class	Likelihood description
1. Highly Likely	Has occurred frequently at the location
2. Likely	Has occurred frequently within the company
3. Possible	Has occurred once or twice in the company
4. Unlikely	Has occurred several times within the industry but not within the company
5. Highly Unlikely	Has occurred once or twice in the industry
6. Remote	Unheard of in the industry

It should be noted that, although AS 2885.1 details a risk management process specific to pipelines, a more general ERA process was adopted to more effectively address environmental risks associated with pipeline operation, inspection and maintenance activities in the marine environment. Therefore, although there are some similarities, the consequence, likelihood and risk matrix tables provided below (Table 10, Table 11 and Figure 14, respectively) do not resemble those in AS 2885.1. For further details of the AS 2885.1 risk assessment process employed as part of the Formal Safety Assessment (FSA) for the Offshore TGP, refer to Section 3.4 of the *TGP Offshore Safety Case (TGP-698-RP-AU-003).*

During development of the Offshore EP, inherent risk was also determined based on a scenario which considered that there were no management controls / mitigation measures in place, i.e. pre-treatment. This enabled the effectiveness of the controls, resulting in the residual risk, to be determined.

The environmental risk management process includes the identification of hazards or risks that are applicable to operational and maintenance activities and determination of the possible causes that could lead to the environmental risks identified. Each risk is evaluated using the Environmental Risk Matrix provided in Figure 14 to determine a risk ranking based on a combination of the expected frequency of the event occurring and the projected consequences from the event. As a result of the assessment, the appropriate management and control measures or treatments are implemented to keep the risks at a level considered to be ALARP. Further information is provided in Sections 5.1.3 and 5.1.4 below.

Although this Section of the Offshore EP only addresses the environmental risk management process, the overall TGP Risk Management process is a whole of life process conducted during the three project phases of design, pre-commissioning, post-commissioning and continuing through ongoing operations and eventually de-commissioning. The process incorporates a range of activities to ensure that all risks to people, the facilities, environment and continuity of supply are identified and managed to be ALARP and acceptable.

5.1.3 Environmental Risk Assessment (ERA) Process

The ERA process applied is a detailed and systematic assessment of the risk associated with each identified hazard, including an assessment of the consequences and likelihood of each potential incident. The process is summarised as follows:

- ERAs are undertaken as structured workshops facilitated by an independent facilitator, with involvement from members of the workforce (where appropriate) and other external personnel with experience and knowledge appropriate to issues being considered
- The identified hazards or potential incidents are reviewed and the associated risks (without controls) are analysed in terms of the likelihood of their occurrence and the consequences that would result if they did occur. Based on the combination of likelihood and consequences, a resultant risk ranking (inherent risk) is attributed using the Risk Matrix in Figure 14
- Controls and mitigation measures in place to prevent, mitigate or recover from the potential risk are then analysed and the likelihood and consequences of the risk, following the

application of these controls and consideration of any assumptions and uncertainties, is re-evaluated. This results in a residual risk ranking, which is also assigned using the Risk Matrix in Figure 14. Where the risk assessment is a review of previous risk assessments, only the existing residual risk ranking is reviewed in consideration of any new information relevant to the hazard being considered

- As detailed in Section 5.1.4 below, residual risks that are rated as "Low" are considered "Acceptable", whereas residual risks classified as "Critical" are considered "Intolerable" risks that must be managed immediately to reduce the risk
- "High" and "Medium" level risks are considered to be "Tolerable", however, they must be subject to an ALARP assessment to determine whether the risks can be further reduced by implementing additional controls and mitigation measures
- ALARP assessments are reviewed for relevance and consistency as part of the ERA review process (refer below)
- Matters requiring action are recorded in an Action Plan. It is a requirement that these action plan items are followed up and closed out in a timely manner
- The TGP Offshore ERA / Environmental Aspects and Impacts Register (**Error! Reference source not found.**) is updated as part of the ERA process

It should be noted that the TGP Offshore ERA / Environmental Aspects and Impacts Register (**Error! Reference source not found.**) is a "live" document that is used and continually updated, as required, during operation, inspection and maintenance of the Offshore TGP to facilitate the appropriate management of all identified environmental risks. The environmental risk associated with Offshore TGP activities will be continually assessed as part of the "continual improvement" component of the environmental management process. The TGP Offshore ERA / Environmental Aspects and Impacts Register will be reviewed and updated, where required, whenever a review and amendment of the Offshore EP is required (refer to Section 8.6.4).

5.1.4 Risk Acceptance / ALARP Demonstration

The residual risk rankings from the ERA process were evaluated to determine whether identified risks were considered acceptable or whether further management controls and mitigation measures were deemed necessary.

ALARP is defined as a level of risk that is tolerable and cannot be further reduced without the expenditure of costs that are disproportionate to the benefit gained or where the solution is impractical to implement. Consequently, a risk reduction measure could be considered as being reasonably practicable if the costs to implement it are not grossly disproportionate to the reduction in risk achieved.

As per Section 3.6.3 of HB 203: 2012, environmental risks with adverse impacts can generally be placed into the following 3 categories:

- **Intolerable Risks** – Risks that are unacceptable in any circumstances or at any level, or exceed thresholds set by regulations
- **Tolerable Risks** – Risks that require further consideration to decide whether and how to treat them. This could involve a more detailed analysis to better understand the risk or a cost-benefit analysis of different potential treatment options. Risks are referred to as "tolerable" because they are tolerated under particular circumstances or for a specified time
- **Acceptable Risks** – Risks that are at an acceptable level and do not need to be considered further

As shown in Figure 14, residual risks classified as "Critical" are considered "Intolerable" risks that must be managed immediately to reduce the risk. Risks classified as "Low" are considered "Acceptable" risks, with no further risk reduction required. "High" and "Medium" level risks are considered to be "Tolerable", however, they must be subject to an ALARP assessment to determine whether the risks can be further reduced by implementing additional controls and mitigation

measures. Obviously, “High” level risks must be managed as a higher priority and within a shorter timeframe than those risks classified as “Medium” level.

5.1.5 Demonstration of Acceptable Level

An environmental impact or risk is considered to be reduced to acceptable levels if:

- The level of residual environmental risk was assessed as being ALARP; per Section 5.1.4); and
- The level of residual environmental risk was either Low or Medium; and
- The activity is commonplace in current offshore practice, and is compliant with current industry/TGPPL policy and standards, and Australian legislation; and
- Valid claims or objections to the risk from relevant persons or stakeholders, if any, are considered

These factors are used to demonstrate acceptability in Section 6.

5.1.6 Environmental Risk Management Review

The General Manager TGPPL ensures that the TGP Offshore ERA / Environmental Aspects and Impacts Register (**Error! Reference source not found.**) is maintained and that a regular review of the contents of the register is undertaken to ensure that the information contained is both current and accurate as it relates to TGPPL’s operations. As discussed in Section 5.1.3 above, as an integral component of the Offshore EP, the TGP Offshore ERA / Environmental Aspects and Impacts Register will also be reviewed and amended, as required, in line with the requirements of Section 8.6.5.

The General Manager TGPPL also manages an *Incident Management System* (IMS) for the TGP. This system registers all TGP incidents and the progress of actions to resolve issues and is available to all TGP personnel.

			Likelihood					
			6	5	4	3	2	1
			Remote	Highly unlikely	Unlikely	Possible	Likely	Highly likely
Consequence	A	Catastrophic						
	B	Severe					Critical	
	C	Major				High		
	D	Moderate			Medium			
	E	Minor		Low				
	F	Slight						

Risk Level	Description	Risk Management Actions
Critical	Intolerable	Undertake an ALARP assessment to try to modify the threat, likelihood or consequences. For an operating pipeline or existing activity, the risk should be reduced immediately.
High	Tolerable	Further assess risk and manage to an ALARP level. For an operating pipeline or existing activity, the risk should be reduced as soon as possible, typically within a few weeks.
Medium		Review to ensure that adequate barriers and controls are in place. Try to implement additional mitigation measures / controls to further reduce risk.
Low	Acceptable	Manage by operational documentation / procedures. No further risk reduction required.

Figure 14: Environmental Risk Matrix

5.2 Sources of Environmental Risk

5.2.1 Planned Activities

The main potential sources of environmental risk associated with the Offshore TGP relate to activities which are planned and undertaken on a periodic basis only (approximately every 2 to 5 years). Examples of these sources of environmental risk include:

- Routine inspection surveys, including the timing, location, use and presence of vessels and inspection equipment;
- Pipeline maintenance activities, such as span correction and anode replacement; and
- Storage, handling and disposal of waste and chemicals on board vessels during inspection and maintenance activities.

Generally, the potential environmental impacts associated with planned activities are less significant than those potentially resulting from unplanned activities or incidents. However, as these sources of risk relate to planned activities occurring on a routine basis, this Offshore EP and associated TGP Offshore ERA / Environmental Aspects and Impacts Register (**Error! Reference source not found.**) contain a number of controls and mitigation measures to ensure environmental impacts and risks are reduced to ALARP and are of an acceptable level.

For further details regarding potential environmental impacts from Offshore TGP activities and the proposed controls and mitigation measures to minimise these impacts, refer to Section 6 and **Error! Reference source not found.**.

5.2.2 Unplanned Activities

Unplanned activities or events that could potentially impact on the Offshore TGP are largely related to management of pipeline integrity (refer to Section 5.3.1 below). Measures to manage such issues are addressed in the *TGP Offshore Pipeline Integrity Management Plan (TGP-698-PA-IP-002).*

The TGP is licensed to carry natural gas only, i.e. it contains no liquid hydrocarbons or contaminating compounds. Therefore, in the event of loss of pipeline integrity, the Offshore TGP is not considered a credible source of liquid hydrocarbon spills. As detailed in Section 2.3.1, a subsea gas leak due to loss of pipeline integrity is not expected to have any adverse environmental impacts.

During the ERA process, a number of unplanned activities or environmental incidents that could potentially result in environmental impacts were also identified, including: vessel collision with marine megafauna, potentially resulting in injury or death (refer to Section 6.1); small scale chemical spills from vessel decks and inspection / maintenance equipment (refer to Section 6.7); introduction of invasive marine species from vessel ballast water discharge or biofouling (refer to Section 6.8) and relatively large scale fuel spills caused by vessel accidents (refer to Section 6.9).

Response requirements in the event of an emergency or incident are discussed in Section 9 of this Offshore EP, and oil spill response requirements are detailed in Section 9.4 Oil Pollution Emergency Plan.

5.3 Other TGP Risk Management Studies

In addition to the ERA, many other risk assessment studies related to pipeline integrity and safety have also been performed for the Offshore TGP, as outlined in the following sub-sections.

5.3.1 Design Phase

An AS 2885.1 pipeline risk assessment was undertaken at the design phase to ensure that each threat to the pipeline and each risk that could cause loss of pipeline integrity was systematically identified and evaluated. Actions to reduce threats and risks that could potentially cause loss of pipeline integrity were taken at the design phase to reduce risks to ALARP.

Significant pipeline integrity threats identified during the design phase were:

- Damage caused by anchor dragging from shipping
- Damage from heavy objects dropped from shipping
- Excessive spanning of pipeline
- Pig stuck in the pipeline
- Terrorist activity
- Vandalism to shore portion of MLV facilities that impact on offshore gas security
- Corrosion; and
- Basslink operation

If must be noted that surface Onshore TGP facilities such as pig launchers and receivers, metering stations and pressure reduction facilities were not assessed in the design phase pipeline risk assessment. However, these fixed facilities were subject to a separate, detailed hazard and operability (HAZOP) study (refer to Section 3.3.2 of the *TGP Offshore Safety Case (TGP-698-RP-AU-003)).*

The findings of the pipeline risk assessment were used in the development of operations plans and procedures in order to reduce risks to ALARP.

Risk management related to safety and pipeline integrity for TGP offshore operations is detailed in the:

- TGP Offshore Safety Case (TGP-698-RP-AU-003), which provides information on the means by which TGPPL ensures the integrity and safe operation of the Offshore TGP; and
- TGP Offshore Pipeline Integrity Management Plan (TGP-698-PA-IP-002), which outlines the risks associated with loss of pipeline structural integrity, both internally and externally

5.3.2 Operations Phase

Risk assessment processes applied during the operations phase include:

- A formal risk assessment for any new onshore pipeline lateral designs using the AS 2885.1 methodology, and the Pipeline Risk Assessment Database updated with the outcomes of the new risk assessment studies
- HAZOP studies are performed for any design changes related to onshore facilities
- Procedural risk control measures identified during either the AS 2885.1 risk assessment process or the HAZOP process are documented in procedures and work instructions before the new onshore laterals or modified onshore facilities come on line. Changes introduced by new designs are managed using a formal change management process in accordance with the TGP Change Management Plan (TGP-698-PA-CM-001)
- Development and maintenance of the TGP Operational Risk Register to identify and manage hazards associated with work activities on the Offshore TGP
- Development and maintenance of the TGP Offshore ERA / Environmental Aspects and Impacts Register to identify and manage environmental impacts associated with work activities on the Offshore TGP (refer to Section 5.1.3 above)
- Hazard Identification (HAZID) risk assessment performed prior to any Offshore TGP inspection or maintenance activities being carried out
- The Job Hazard Analysis (JHA) risk assessment process is used for all work activities on the TGP to identify and control hazards and reduce associated risks. The JHA is an integral component of the TGP Permit to Work (PTW) Procedure (TGP-698-PR-HSE-004)
- A full AS 2885.1 pipeline risk assessment (Safety Management Study) is conducted at least every five years, with changes managed using the GIS system, operator knowledge and the TGP Risk Register

- An annual AS 2885.1 pipeline risk assessment / review is conducted on the Offshore TGP in accordance with the TGP Offshore Pipeline Integrity Management Plan (TGP-698-PA-IP-002). The most recent pipeline risk assessment / review was undertaken in August 2019
- Any alterations to the Offshore TGP will be in accordance with the TGP Offshore Pipeline Modification and Alteration Plan (TGP-600-PA-PL-003) and TGP Change Management Plan (TGP-698-PA-CM-001) and will be subject to a thorough engineering review. However, no modifications to the Offshore TGP are envisaged at this time

Prior to any pipeline inspection or maintenance works being carried out on the Offshore TGP (e.g. ROV / AUV surveys, SSS or diving inspections), a formal HAZID risk assessment is performed to address all proposed activities. A HAZID workshop is convened to identify the key activity risks, controls and required actions to reduce the associated risks to ALARP. As well as the planned activities, the HAZID will also cover the vessel and mobilisation / demobilisation activities. Representatives from all involved parties will be present at the HAZID workshop.

All previous risk assessment studies undertaken during design, construction and operation of the Offshore TGP are detailed in Section 3.3 of the *TGP Offshore Safety Case (TGP-698-RP-AU-003).*

The TGP management system implemented by TGPPL enables direct application of systemic control measures and support for the application of technical control measures. These can be grouped as either Physical / Technical, Procedural Controls or Recovery Strategies:

- **Physical / technical control measures** (includes design controls) - prevent external interference with the asset and provide adequate resistance to damage or penetration of the pipeline itself
- **Procedural controls** - are applied to minimise the likelihood of human activities with potential to damage the pipeline; and
- **Recovery strategies** - minimise injury, damage to property and the environment, and interruption to supply in the event of serious damage to the pipeline

Further details on pipeline integrity management can be found in the *TGP Offshore Safety Case (TGP-698-RP-AU-003).*

Monitoring of pipeline integrity is predominantly undertaken via the Master SCADA system operated by Zinfra (refer to Section 2.2.1). The SCADA system ensures that all relevant alarms and protective systems are in place so that pipeline integrity and safety of personnel and the public is not compromised, and that security of supply is maintained. Remote shutdown, opening and closing of onshore MLVs in the event of LOC from the Offshore TGP and other ancillary functions are all conducted from the Control Room using SCADA.

6. ENVIRONMENTAL MANAGEMENT ACTIVITIES AND CONTROLS

The TGP is an operating pipeline transporting sales quality natural gas from Victoria to Tasmania and, therefore, there are no daily activities on the pipeline itself.

Excluding emergencies, the key sources of risk that may have an impact on the environment during operation of the Offshore TGP are related to either the physical presence of the pipeline or from activities required to ensure pipeline operation is maintained in a safe manner: Inspection surveys of the Offshore TGP to assess pipeline integrity and any maintenance requirements are undertaken on a periodic basis and occur every 2 to 5 years. These activities may be broadly categorised as:

- Routine surveys using vessels and other equipment to inspect the status of the subsea pipeline
- Maintenance activities required on the subsea pipeline, such as span correction and anode replacement

The key operations, inspection and maintenance activities undertaken along the Offshore TGP have been assessed and the risks associated with each of the activities were identified for both planned and unplanned events using the process described in Section 5. These risks have been incorporated into the TGP Offshore ERA / Environmental Aspects and Impacts Register, which is provided in **Error! Reference source not found.**.

The TGP Offshore ERA / Environmental Aspects and Impacts Register identifies all environmental risks associated with the operation, inspection and maintenance of the Offshore TGP, implements the risk assessment process to identify the magnitude and significance of the risks, and identifies the appropriate controls and mitigation measures to be implemented to reduce the impacts and risks to ALARP and acceptable levels.

A summary of the ERA for each specific environmental issue is provided in Sections 6.1 to 6.10 below.

As detailed in Section 5.1.3, the rating of environmental risk is assessed at two levels:

- Inherent (untreated) risk (before any controls are put in place)
- Residual (treated) risk (after controls and treatments have been put in place)

The TGP Offshore ERA / Environmental Aspects and Impacts Risk Register contained in **Error! Reference source not found.** identifies the risk rating for each environmental aspect both pre and post application of controls and/or treatments.[1]

Management measures to minimise environmental impacts associated with each of the identified environmental issues and aspects are discussed in the following sections. For each of the identified environmental issues, the following sections:

- Identify aspects or activities and potential incidents that could result in environmental impacts
- Describe the key environmental risks or impacts associated with each identified activity or incident and their significance
- Detail the controls and mitigation measures that are implemented to ensure the identified environmental risk is reduced to ALARP
- Provide a summary of the ERA related to each environmental issue
- Provide a summary of the ALARP assessment: and

[1] Controls are the measures used that reduce the consequences and/or likelihood of the risk. In some cases, existing controls will be deemed to be adequate and effective and the risk will be accepted as it stands. In other instances, further treatments may be required to reduce the risk to an acceptable level. Controls used to mitigate risk for each aspect are summarised in the Register.

- Provide a demonstration of acceptability

All environmental risks identified for Offshore TGP operational, inspection and maintenance activities have been assessed as 'Low' following the application of controls and mitigation measures. All identified environmental risks are therefore considered to be ALARP.

A detailed listing of the environmental performance outcomes, performance standards and measurement criteria for these performance outcomes and standards is provided in Section 7.

6.1 Protection of Marine Flora and Fauna

A number of marine flora and fauna species and communities have been identified along the Offshore TGP route (refer to Section 3.2 for a summary of the Biological Environment).

Threatened species and communities listed under the EPBC Act are protected by legislation and include species listed as endangered or vulnerable, migratory species including birds and mammals, and cetaceans including whales and dolphins. In addition, State legislation protects threatened species, communities and whales in coastal waters (refer to **Error! Reference source not found.**). Under State and Commonwealth legislation it is an offence to kill, injure, take or interfere with threatened species, migratory species and cetaceans.

TGP offshore inspection and maintenance activities have the potential to impact on marine flora and fauna through the presence and use of vessels and inspection / maintenance equipment. Benthic fauna and flora may also be affected by any activities that lead to disturbance to the seabed. However, there are currently no species of marine flora listed under the EPBC Act or listed marine ecological communities within the direct vicinity of the Offshore TGP. Therefore, the following sections will only address potential impacts related to marine fauna.

6.1.1 Environmental Aspects and Potential Incidents

There will be no impacts to marine fauna during the normal day to day operation of the Offshore TGP. Daily pipeline operations (i.e. continuous transport of gas) are completely internal to the pipeline, with no offshore activities or external effects during standard operating conditions.

Impacts to marine fauna will only potentially occur during Offshore TGP inspection and maintenance activities. Activities and incidents associated with the Offshore TGP that could potentially result in impacts to marine fauna include:

- Vessel movements (vessel strike, underwater noise (refer to Section 6.4) and artificial lighting)
- Pipeline inspection / survey activities, e.g. use of ROV / AUV or SSS (underwater noise) (refer to Section 6.4)
- Inappropriate ballast water or biofouling management on vessels (refer to Section 6.8)
- Dropped objects from vessels (including inspection and maintenance equipment) (refer to Section 6.2)
- Pipeline maintenance activities (e.g. span correction) (refer to Section 6.2)
- Vessel anchor dragging along the seabed (refer to Section 6.2)

6.1.2 Potential Environmental Impacts

The key potential impacts to marine fauna in proximity to the Offshore TGP during pipeline inspection and maintenance activities are:

- Injury to, or death of, marine megafauna (including listed species) as a result of vessel strike
- Disturbance to marine fauna (including altered feeding, nesting, nursing, mating or migrating behaviour) as a result of underwater noise generated by the vessel or inspection activities (refer to Section 6.4)
- Disturbance to marine fauna (including altered feeding, nesting, nursing, mating or migrating behaviour) as a result of artificial lighting on inspection and maintenance vessels
- Disturbance to benthic communities due to dropped objects or dragging of vessel anchors or inspection / maintenance equipment on the seabed (refer to Section 6.2); and
- Introduction of marine pests due to inappropriate vessel ballast water and biofouling management (refer to Section 6.8), potentially displacing native species, altering ecosystem function and affecting biodiversity

Inspection and maintenance vessels are expected to be required less than once every 2 years on average, with the maximum length of any one voyage likely to be less than 4 weeks. Any activities are localised, with no activity of long-term duration at any one location.

The majority of Offshore TGP inspection and maintenance activities will be occurring in the open ocean and vessels appropriate to this environment will be contracted to perform the required work. No vertebrate fauna populations are known to inhabit the immediate area of the pipeline outside the coastal zone, with inspection and maintenance activities confined to areas located at least 8 km from the nearest onshore breeding or home habitat.

There is the potential for some larger marine megafauna (cetaceans, pinnipeds, turtles, etc.) to traverse the Offshore TGP route when pipeline inspection and maintenance activities are being undertaken, particularly in the vicinity of the marine reserves noted in Section 3.5.

Vessel strike is referenced as a key threat in the Conservation Advice / Management Plans for Pygmy Blue Whale and Southern Right Whale. The OA overlaps Pygmy Blue Whale distribution and possible foraging habitat but is not within a recognised feeding area such as the Bonney Upwelling (DOEE, 2015c). The Southern Right Whale migration BIA overlaps the Victorian coastal section of the OA.

During inspection and maintenance activities, however, the vessel is either stationary or moving slowly. The risk of vessel strike during Offshore TGP inspection and maintenance activities is therefore considered very low.

Potential impacts on marine megafauna associated with underwater noise from vessels and inspection / maintenance equipment (e.g. SSS and ROV / AUV operation) are addressed in Section 6.4 of this EP.

Lighting on inspection and maintenance vessels is not expected to have any adverse impacts on marine fauna above that of normal commercial shipping traffic in Bass Strait. Vessels used are generally smaller than most commercial shipping traffic and will be undertaking inspection and maintenance activities during daylight hours. Activities at any one location will be temporary and localised as the vessel proceeds along the Offshore TGP route. While vessels used in inspection and maintenance activities may be lit at night, no additional lighting above that of normal safe vessel operation will be required. Also, as stated in Section 3.2, although some of the islands in the vicinity of the Offshore TGP route are known breeding colonies for seals and seabirds, there are no recognised aggregation areas (nesting, resting, breeding and feeding areas) for protected whales, dolphins or turtles within the area. The risk of disturbance to marine fauna associated with vessel lighting is therefore considered not credible.

The occasional use of inspection equipment such as ROV / AUV and SSS may have potential for minor physical impacts as they pass through the survey area. However, the small size of the equipment and its position above the pipeline within the water column ensures no disruption to the seabed or epibenthos. Also, as stated in Section 3.2, the substrate along the Offshore TGP route represents a largely homogenous habitat type, which is not significantly diverse from other regions within Bass Strait. Most of these species are widely distributed throughout the region. Inspection and maintenance vessels will avoid anchoring (unless in an emergency). In the highly unlikely event that vessels have to anchor, any impacts will be localised and unique faunal elements are unlikely to be disturbed.

Works in near coastal environments at either end of the Offshore TGP are generally undertaken using smaller vessels than those used for open ocean work. Such operations are generally diver based operations and therefore of a smaller scale than the major open ocean surveys. The risk of impact to marine fauna during inspection and maintenance activities in the nearshore area is therefore considered to be very low.

6.1.3 Environmental Control Measures

The following controls and mitigation measures have been adopted to ensure appropriate environmental management of Offshore TGP inspection and maintenance activities in order to reduce the risk of impacts to marine fauna to ALARP:

- Vessel Masters will be briefed on caution and 'no approach' zones and other vessel-marine megafauna interaction management controls
- Vessel Master or delegate will be on duty at all times
- Crew members on active duty will report observations of megafauna in the caution zone to the Vessel Master or delegate
- Vessel Crew have completed an environmental induction covering the requirements for vessel-marine fauna interaction management, including a requirement to notify the bridge if marine megafauna are sighted in the caution zone
- Refer to Section 6.2.3 for control measures related to dropped objects and dragging of vessel anchors
- Refer to Section 6.5.3 for control measures related to underwater noise
- Refer to Section 6.9.3 for control measures related to vessel ballast water and biofouling management

Management controls for interactions with cetaceans will be in accordance with Part 8 of the EPBC Regulations and Wildlife (Marine Mammals) Regulations 2009. The Vessel Master will ensure that inspection and maintenance vessels comply with following requirements in the event of cetacean encounters, where practicable to do so:

- The no-approach and caution zones established for whales and dolphins will be adhered to
- Operating speeds of 6 knots will apply within caution zones, and Vessel Master to avoid sudden changes in speed or direction
- If the cetacean shows signs of being disturbed, the vessel will immediately move away from the caution zone at a constant speed of less than 6 knots
- The vessel shall not restrict the path of, or pursue, the cetacean

With respect to seal breeding colonies in the vicinity of the Offshore TGP, should they be encountered, the following control measures are to be implemented in adherence with Victorian Wildlife (Marine Mammals) Regulations 2009, where practicable to do so:

- During the pupping season (November to December), interaction with seals is to be avoided and vessel speeds are to be reduced to less than 10 knots within 200 m of a seal colony and 5 knots within 100 m of a colony
- During pupping season, inspection and maintenance vessels are not to pass closer than 100 m of the seal colony
- At all other times of the year, vessels are to travel no closer than 50 m to a seal colony

6.1.4 ERA Summary

The complete ERA for the offshore component of the TGP is provided in **Error! Reference source not found.**, however, the risk assessment associated with protection of marine fauna is summarised below.

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
Offshore TGP inspection or maintenance using vessels and equipment (e.g. ROV / AUV, SSS).	Vessel movements – vessel strike (ERA Ref No. .1)	Injury or death to marine megafauna.	Low
	Artificial lighting on inspection and maintenance vessels (ERA Ref No. 3).	No credible risk of disturbance to marine fauna.	-

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
	Dropped objects or dragging of vessel anchors or inspection / maintenance equipment on the seabed.	Refer to Section 6.6.4.	Section 6.6.4
	Pipeline maintenance activities (e.g. span correction).	Refer to Section 6.6.4.	Section 6.6.4
	Underwater noise.	Refer to Section 6.4.4.	Section 6.4.4

6.1.5 Assessment of ALARP

Given the control measures listed above, and the infrequent nature, relatively small scale and short duration of Offshore TGP inspection and maintenance activities, the risk of disturbance to marine fauna is considered low and therefore ALARP.

6.1.6 Demonstration of Acceptability

For this aspect the residual risk was assessed as low and therefore ALARP. As all relevant standards (TGPPL policy and Industry best practice) and Australian legislative requirements have been met and there were no stakeholder concerns, TGPPL considers the impacts and risk are acceptable in accordance with the criteria defined in Section 5.1.5.

The environmental performance outcomes and environmental performance standards for the controls above are given in Table 9.

6.2 Protection of Marine Environment

The entire offshore component of the TGP traverses a marine environment which includes Victorian and Tasmanian coastal waters and the sea strait of Bass Strait.

A number of ecologically significant areas have been identified along sections of the Offshore TGP route which have important environmental features including the significant fauna communities in Section 3.2. These include a number of Commonwealth or State declared marine reserves, most of which (except for the Beagle Australian Marine Park) lie outside the Offshore TGP area (refer to Section 3.5).

6.2.1 Environmental Aspects and Potential Incidents

There will be no impacts to the marine environment during the normal day to day operation of the Offshore TGP. Daily pipeline operations (i.e. continuous transport of gas) are completely internal to the pipeline, with no offshore activities or external effects during standard operating conditions.

Impacts to the marine environment will only potentially occur during Offshore TGP inspection and maintenance activities. Activities and incidents that could potentially result in impacts to the marine environment in the vicinity of the Offshore TGP include:

- Chemical spills from vessels and inspection / maintenance equipment (refer to Section 6.7);
- Vessel accidents / collisions leading to fuel spills (refer to Section 6.8);
- Inappropriate management of wastes from vessels (refer to Section 6.6);
- Vessel anchor or inspection / maintenance equipment dragging along the seabed;
- Dropped objects from vessels (including inspection and maintenance equipment);
- Pipeline maintenance activities (e.g. span correction);
- Inappropriate discharge of vessel ballast water (refer to Section 6.8); and
- Poor biofouling management (refer to Section 6.8).

6.2.2 Potential Environmental Impacts

The key potential impacts to the marine environment in proximity to the Offshore TGP during pipeline inspection and maintenance activities are:

- Contamination of the local marine environment leading to degradation of marine ecosystems (including ecologically significant areas such as National Parks and Marine Reserves) and potential toxicity impacts on marine biota (refer to Section 6.6 and 6.8)
- Oiling of the coastal environment (refer to Section 6.8)
- Visible pollution / reduction of visual amenity (refer to Sections 6.6 and 6.8)
- Introduction of marine pests due to inappropriate vessel ballast water and biofouling management (refer to Section 6.8), potentially displacing native species, altering ecosystem function and affecting biodiversity; and
- Disturbance to sensitive benthic marine ecosystems due to dropped objects or dragging of vessel anchors or inspection / maintenance equipment on the seabed
- Disturbance to benthic marine habitats due to maintenance activities e.g. jetting to remove high points, installation of grout bags or concrete mattresses

Inspection and maintenance vessels are expected to be required less than once every 2 years on average, with the maximum length of any one voyage likely to be less than 4 weeks. Any activities are localised, with no activity of long-term duration at any one location.

Due to the short duration of Offshore TGP inspection and maintenance activities, the amount of waste and chemicals stored on-board vessels will be minimal.

As stated in Section 6.8, adverse impacts on the shoreline or sensitive marine ecosystems in the event of a fuel spill from Offshore TGP inspection and maintenance vessels are highly unlikely due to: the size of vessels used; properties of hydrocarbons that could potentially be spilled; expected maximum spill volumes; high energy marine environment of Bass Strait; and the distance from the Offshore TGP to sensitive receptors (e.g. islands / shorelines).

Damage to the seabed as a result of Offshore TGP inspection and maintenance activities is only considered likely in the event of a dropped object from the vessel or ROV / AUV, as a result of emergency anchoring or repair activities such as jetting to remove high points, installation of concrete mattresses or grout bags.

As stated in Section 3.2, the substrate along the Offshore TGP route represents a largely homogenous habitat type, which is not significantly diverse from other regions within Bass Strait. Furthermore it is expected that recolonisation and recovery would occur relatively quickly following any disturbance resulting in no long term disturbance to the infauna communities (Dernie et al., 2003).

The occasional use of inspection equipment such as ROV / AUV and SSS may have potential for minor physical impacts as they pass through the survey area. However, the small size of the equipment and its position above the pipeline within the water column ensures no disruption to the seabed or epibenthos. Installing grout bags or concrete mattresses may cause some disturbance of the seabed and potentially impact associated benthic organisms. Any impact will be limited to the immediate vicinity of the pipeline and thus the extent is considered to be quite localised.

Inspection and maintenance vessels will avoid anchoring (unless in an emergency). In the event of inclement weather, the vessels will seek shelter nearer the coast or at a designated port in Victoria or Tasmania. In the highly unlikely event that vessels have to anchor, any impacts on the benthic marine environment will be localised.

6.2.3 Environmental Control Measures

The following controls and mitigation measures have been adopted to ensure appropriate environmental management of Offshore TGP inspection and maintenance activities in order to reduce the risk of impacts to the marine environment to ALARP.

- Inspection and maintenance vessels will avoid anchoring (unless in an emergency)
- Vessel lifting equipment will be operated in accordance with lifting procedures
- Vessel lifting equipment will be regularly maintained in accordance with the Planned Maintenance System schedule
- Maintenance and repair activities e.g. jetting, concrete mattress / grout bag installation will be conducted in accordance with approved procedures
- Securing and restraining of loads on-board the vessel to minimise potential for dropped objects
- For control measures related to waste management refer to Section 6.6.3
- For control measures related to chemical management refer to Section 6.7.3
- For control measures related to ballast water and biofouling management refer to Section 6.8.3
- For control measures related to fuel management and spill response refer to Sections 6.9.3

6.2.4 ERA Summary

The complete ERA for the offshore component of the TGP is provided in **Error! Reference source not found.**, however, the risk assessment associated with protection of the marine environment is summarised below.

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
Offshore TGP inspection or maintenance using vessels and equipment (e.g. ROV / AUV and SSS).	Chemical spills from vessels and inspection / maintenance equipment.	Refer to Section 6.7.4.	Section 6.7.4
	Vessel accidents / collisions leading to fuel spills.	Refer to Section 6.9.4.	Section 6.9.4
	Inappropriate management of vessel wastes.	Refer to Section 6.6.4.	Section 6.6.4
	Inappropriate ballast water and biofouling management.	Refer to Section 6.8.4	Section 6.8.4
	Dropped objects from vessels (including inspection and maintenance equipment) (ERA Ref No. 10).	Disturbance to sensitive benthic marine ecosystems.	Low
	Vessel anchors or inspection / maintenance equipment dragging along the seabed (ERA Ref No. 5).		
	Pipeline maintenance activities (e.g. span correction) (ERA Ref No. 20 – 24).		

6.2.5 Assessment of ALARP

Given the control measures listed above, and the infrequent nature, relatively small scale and short duration of Offshore TGP inspection and maintenance activities, the risk of disturbance to the marine environment is considered extremely low and therefore ALARP.

6.2.6 Demonstration of Acceptability

For this aspect the residual risk was assessed as low and therefore ALARP. As all relevant standards (TGPPL policy and Industry best practice) and Australian legislative requirements have been met and there were no stakeholder concerns, TGPPL considers the impacts and risk are acceptable in accordance with the criteria defined in Section 5.1.5.

The environmental performance outcomes and environmental performance standards for the controls above are given in Table 9.

6.3 Protection of Other Marine Users

6.3.1 Environmental Aspects and Potential Incidents

As detailed in Section 3.4, a wide range of human activities occur in the waters of Bass Strait, including commercial oil and gas fields, shipping, commercial and recreational fishing, and other recreational activities.

Due to the placement of the Offshore TGP on the seabed at water depths of up to approximately 80 m, there will be no impacts to other users of Bass Strait during normal day to day operation of the subsea pipeline.

Impacts to other users of the marine environment will only potentially occur during Offshore TGP inspection and maintenance activities. Activities and incidents associated with the Offshore TGP that could potentially result in impacts to other users of the marine environment include:

- Collision of inspection / maintenance vessels with other vessels (e.g. recreational vessels, fishing vessels and commercial shipping traffic) leading to fuel spills (refer to Section 6.8)
- Presence of inspection and maintenance vessels along the pipeline route; and
- Pipeline inspection / survey activities, e.g. vessel anchoring or towing of ROV / AUV or SSS equipment behind vessels

6.3.2 Potential Environmental Impacts

The key potential impacts to other users of the marine environment in proximity to the Offshore TGP during subsea pipeline inspection and maintenance activities are:

- Vessel collisions, leading to fuel spills and subsequent contamination of the local marine environment, oiling of coastal environments and visible pollution / reduction of visual amenity (refer to Section 6.8)
- Disruption to other marine users (e.g. recreational vessels, fishing vessels and commercial shipping traffic) through movement of inspection and maintenance vessels; and
- Interference to commercial fishing activities (including damage to fishing equipment) through vessel anchoring and towing of equipment (e.g. ROV / AUV or SSS) behind vessels

Inspection and maintenance vessels are expected to be required less than once every 2 years on average, with the maximum length of any one voyage likely to be less than 4 weeks. Any activities are localised, with no activity of long-term duration at any one location.

The use of inspection equipment such as ROV / AUV and SSS could potentially cause minor disturbance to user marine users (particularly commercial fishing activities), however, this is highly unlikely due to the very infrequent use, small size of the equipment and the fact that the equipment is towed in close proximity to the stern of the vessel.

Inspection and maintenance vessels will avoid anchoring (unless in an emergency) and, therefore, potential damage to commercial fishing equipment through dragging anchors is also highly unlikely.

6.3.3 Environmental Control Measures

The following controls and mitigation measures have been adopted to ensure appropriate environmental management of Offshore TGP inspection and maintenance activities in order to reduce the risk of impacts to other marine users to ALARP:

- Appropriately qualified / trained and experienced vessel personnel
- Vessels equipped with full complement of navigation equipment
- Inspection and maintenance vessels will avoid anchoring (unless in an emergency)
- Pre-start notifications prior to commencement of inspection and maintenance activities – AMSA (AUSCOAST warning) and AHS (Notice to Mariners)
- Relevant stakeholders notified of inspection and maintenance activities approximately four weeks and again one week prior to commencement

6.3.4 ERA Summary

The complete ERA for the offshore component of the TGP is provided in **Error! Reference source not found.**, however, the risk assessment associated with protection of other marine users is summarised below.

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
Offshore TGP inspection	Vessel movements (ERA	Disruption to other marine users such	Low

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
or maintenance using vessels	Ref No. 2).	as commercial fishing (including damage to fishing equipment).	
	Vessel anchoring (ERA Ref No. 6).		
	Towing of inspection / maintenance equipment (e.g. ROV / AUV and SSS) behind vessels (ERA Ref No. 16).		
	Vessel collision leading to fuel spill.	Refer to Section 6.9.4	Section 6.9.4

6.3.5 Assessment of ALARP

Given the control measures listed above, and the infrequent nature, relatively small scale and short duration of Offshore TGP inspection and maintenance activities, the risk of disturbance to other marine users is considered extremely low and therefore ALARP.

6.3.6 Demonstration of Acceptability

For this aspect the residual risk was assessed as low and therefore ALARP. As all relevant standards (TGPPL policy and Industry best practice) and Australian legislative requirements have been met and there were no stakeholder concerns, TGPPL considers the impacts and risk are acceptable in accordance with the criteria defined in Section 5.1.5.

The environmental performance outcomes and environmental performance standards for the controls above are given in Table 9.

6.4 Noise Management

6.4.1 Environmental Aspects and Potential Incidents

There are expected to be no noise impacts from the normal day to day operation of the Offshore TGP. Daily pipeline operations (i.e. continuous transport of gas) are completely internal to the pipeline, with minimal external effects during standard operating conditions.

The material of construction for the TGP and its wall thickness were selected, in part, to minimise any noise issues during pipeline operation. The omission of valves and other flow restriction points within the Offshore TGP also further reduces noise and vibration produced by the subsea pipeline, while the concrete coating provides an additional buffer from any internal pipeline noise.

During operation, inspection and maintenance of the Offshore TGP, the following activities and incidents could potentially result in noise impacts:

- Unsupported lengths of subsea pipeline ("spans") resulting in vortex induced vibration (VIV) along the pipeline
- Vessel movements / operation
- Offshore TGP inspection / survey activities, e.g. use of ROV / AUV or SSS; and
- Pipeline pigging

6.4.2 Potential Environmental Impacts

There is the potential for sediment movement around the subsea pipeline to lead to an unsupported length of pipeline or "span" that could in turn result in VIV. Evidence for such spans is one of the objectives of the ongoing Offshore TGP inspection surveys and, in the event that a span with potential to lead to VIV is located, it will be scheduled for correction during the next maintenance activity. The potential risk of disturbance to marine fauna from underwater noise impacts associated with VIV is considered not credible.

Pigging operations, to assess the internal condition of the pipeline, are planned to occur only every 10 years. Any underwater noise during this activity will be transitory and temporary as the pig moves through the pipeline and the potential risk of disturbance to marine fauna is considered not credible.

The potential for impacts as a result of noise are only likely to occur during vessel-based Offshore TGP inspection and maintenance activities. The key potential impacts from noise generation in proximity to the subsea pipeline are:

- Injury to marine megafauna (including listed species protected under State or Commonwealth legislation or International conventions) as a result of underwater noise exposure during Offshore TGP inspection activities (e.g. use of ROV / AUV or SSS)
- Disturbance to marine fauna (including altered feeding, nursing, mating or migrating behaviour) as a result of noise generated by the vessel movements or inspection / maintenance equipment; and
- Disturbance to other marine users due to noise generated by vessels or inspection / maintenance equipment

Offshore TGP inspection and maintenance activities are expected to be required less than once every 2 years on average, with the maximum length of any one voyage likely to be less than 4 weeks. Any activities are localised, with no activity of long-term duration at any one location.

The majority of Offshore TGP inspection and maintenance activities will be occurring in the open ocean and vessels appropriate to this environment will be contracted to perform the required work. No vertebrate fauna populations are known to inhabit the immediate area of the Offshore TGP outside the coastal zone, with inspection and maintenance activities confined to areas located at least 8 km from the nearest onshore breeding or home habitat. Therefore, noise impacts to seabirds and seal colonies are considered to be extremely unlikely.

Underwater noise has the potential to affect marine mammals (e.g. whales and dolphins) and other animal groups (e.g. fish and turtles). Underwater noise is influenced by a number of factors, including the frequency of the sound, absorption losses, the sound speed profile throughout the water column, the bathymetry of the area, water quality parameters (e.g. salinity, suspended solids / turbidity), the nature of the seabed (affects the reflection and absorption of noise), water depth, intervening landmasses (e.g. reefs, shoals and mudflats), and local weather conditions (e.g. thunderstorms with heavy precipitation). Potential impacts of underwater noise on marine fauna can include: physiological damage (injury) and death; temporary hearing damage; and adverse behavioural responses (e.g. altered feeding, nursing, mating or migrating behaviour).

As detailed in Section 3.2, there is the potential for some larger marine megafauna (cetaceans, pinnipeds, turtles, etc.) to traverse the Offshore TGP route when subsea pipeline inspection and maintenance activities are being undertaken. Therefore, there is the potential for marine megafauna to be affected by noise from vessels and inspection / maintenance equipment.

Anthropogenic noise including noise from vessels is referenced as a key threat in the Conservation Advice / Management Plans for Pygmy Blue Whale and Southern Right Whale. The OA overlaps Pygmy Blue Whale distribution and possible foraging habitat but is not within a recognised feeding area such as the Bonney Upwelling (DOEE, 2015c). The Southern Right Whale migration BIA overlaps the Victorian coastal section of the OA.

The OA is also within the breeding and distribution BIA for the White Shark, however sharks differ from bony fish in that they do not have accessory organs of hearing such as a swim bladder and are therefore unlikely to respond to acoustical pressure (Myrberg, 2001).

The level of noise generated by inspection and maintenance vessels will be similar to that of, or less than, commercial vessels expected in the area. Vessels used are generally smaller than most commercial shipping traffic, and activities at any one location will be temporary as the vessel proceeds along the Offshore TGP route. The size of vessels used and short duration of Offshore TGP inspection and maintenance activities is therefore unlikely to lead to any major noise and vibration impacts on marine megafauna or other marine users. Therefore, the risk of disturbance associated with vessel noise is considered extremely low.

The occasional use of survey equipment such as ROV / AUV and SSS could potentially have minor noise impacts on marine megafauna as they pass through the Offshore TGP inspection / maintenance work area. Due to the small size of the ROV / AUV equipment, the underwater noise generated is expected to be negligible in comparison to the vessel noise. However, underwater noise generated by SSS could potentially have more of an impact on marine megafauna.

SSS systems operate at high frequencies (typically 100-500 kHz), which are outside the hearing thresholds of cetaceans and well above the hearing level of other marine mammals and fish (Genesis, 2011). Although sound output levels for SSS can be relatively high (220-226 dB (rms) re 1µPa@1m), high frequency noise attenuates more quickly than lower frequency and, hence, sound levels will decrease rapidly away from the source (Genesis, 2011). SSS surveys do not use air-guns and are considered less intrusive than surveys for oil exploration where air gun penetration is expected to be in the range of 3 km to 4 km. SSS systems used in the geophysical surveys of the subsea pipeline typically penetrate the seabed only to 10 m and the source noise level of sub bottom profile equipment is only approximately 60-70 dB re 1µPa@1m (refer to Section 2.2.2.3).

The intermittent nature of SSS signals also results in lower noise doses than for continuous signals and, therefore, it is considered that there is a negligible risk of underwater noise from SSS causing injury to cetaceans (Genesis, 2011). As per recent subsea pipeline surveys, it is TGPPL's preference to use AUV / ROV for inspections rather than SSS.

A crew member will visually monitor for cetaceans within the vicinity of the vessel and report sightings within the caution zone to enable the Vessel Master to implement interaction management actions as practicable.

Maintenance works, such as the correction of unsupported subsea pipeline spans or coating repairs, do not generate significant noise levels either below or above the sea surface. The risk of underwater noise impacts on marine megafauna during Offshore TGP inspection and maintenance activities is therefore considered to be very low.

6.4.3 Environmental Control Measures

The following controls and mitigation measures have been adopted to ensure appropriate environmental management of Offshore TGP inspection and maintenance activities in order to reduce the risk of noise impacts to ALARP:

- Vessel Masters will be briefed on caution and 'no approach' zones and other vessel-marine megafauna interaction management controls
- Vessel Master or delegate will be on duty at all times
- Crew members on active duty will report observations of megafauna in the caution zone to the Vessel Master or delegate
- Vessel Crew have completed an environmental induction covering the requirements for vessel-marine fauna interaction management, including a requirement to notify the bridge if marine megafauna are sighted in the caution zone
- Management controls for interactions with cetaceans will be in accordance with Part 8 of the EPBC Regulations and Wildlife (Marine Mammals) Regulations 2009. The Vessel Master will ensure that inspection and maintenance vessels comply with following requirements in the event of cetacean encounters, where practicable to do so:
  - The no-approach and caution zones established for whales and dolphins will be adhered to
  - Operating speeds of 6 knots will apply within caution zones, and Vessel Master to avoid sudden changes in speed or direction
  - If the cetacean shows signs of being disturbed, the vessel will immediately move away from the caution zone at a constant speed of less than 6 knots
  - The vessel shall not restrict the path of, or pursue, the cetacean
- Although Offshore TGP inspection activities are not considered seismic in nature, any acoustic activity exceeding 140 dB may disturb cetacean navigation and behaviour. With respect to the possibility of cetacean encounters during SSS surveys, the following control measures are to be implemented, where applicable:
  - Observations for whales within a 3 km radius of the survey vessel should commence at least 90 minutes prior to the use of acoustic sources exceeding 140 dB
  - Discharge of acoustic services exceeding 140 dB are not to commence unless no whales are found within a minimum distance of 3 km of the survey vessel
  - Start-up procedures will be delayed if whales are encountered within the 3 km radius until they are observed to be travelling beyond this zone

6.4.4 ERA Summary

The complete ERA for the offshore component of the TGP is provided in **Error! Reference source not found.**, however, the risk assessment associated with noise management is summarised below.

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
Offshore TGP inspection or maintenance using vessels and equipment	Vessel movements / operation (ERA Ref No. 4).	Noise potentially resulting in disturbance to marine fauna (including altered feeding, nursing, mating or migrating behaviour).	Low

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
	Pipeline inspection - use of SSS (ERA Ref No. 18).	Underwater noise potentially causing injury or resulting in disturbance to marine fauna. (including altered feeding, nursing, mating or migrating behaviour).	Low

6.4.5 Assessment of ALARP

Given the control measures listed above, and the infrequent nature, relatively small scale and short duration of Offshore TGP inspection and maintenance activities, the risk of disturbance or injury related to noise is considered very low and therefore ALARP.

6.4.6 Demonstration of Acceptability

For this aspect the residual risk was assessed as low and therefore ALARP. As all relevant standards (TGPPL policy and Industry best practice) and Australian legislative requirements have been met and there were no stakeholder concerns, TGPPL considers the impacts and risk are acceptable in accordance with the criteria defined in Section 5.1.5.

The environmental performance outcomes and environmental performance standards for the controls above are given in Table 9.

6.5 Air Emissions

There has been no air quality monitoring by TGPPL (or the previous operators or owners of the TGP) in Bass Strait, although air quality has been monitored since 1976 by the Cape Grim Baseline Air Pollution Station in north-west Tasmania. Ambient air quality in the Bass Strait region is subject to occasional air pollutants from major urban and industrial areas of South Australia, Victoria and Tasmania due to wind patterns across Bass Strait. However, air quality is dominated by the transportation of unpolluted air by the Roaring Forties across the Southern Ocean.

6.5.1 Environmental Aspects and Potential Incidents

There will be no impacts from emissions to the atmosphere during the normal day to day operation of the Offshore TGP. Daily operations (i.e. continuous transport of gas) are completely internal to the pipeline with no offshore activities or external effects during standard operating conditions.

Environmental impacts related to air emissions will only potentially occur in the event of a rupture of the Offshore TGP (emergency / unplanned event) or during subsea pipeline inspection and maintenance activities. The key activity likely to generate air emissions is the operation of offshore support vessels and associated machinery. Activities and incidents associated with the Offshore TGP that could potentially result in air emissions include:

- Subsea pipeline rupture (refer to Section 6.10); and
- Vessel operations (engine exhaust emissions)

6.5.2 Potential Environmental Impacts

The key potential environmental impacts from air emissions during Offshore TGP inspection and maintenance activities are:

- Increased levels of atmospheric pollution (nitrogen oxides (NOx), sulphur oxides (SOx) and particulates) and greenhouse gases, leading to localised reduction in air quality;

- Reduced visual amenity (e.g. black smoke and particulates)

Offshore TGP inspection and maintenance activities are expected to be required no more than once every 2 years on average, with the maximum length of any one voyage likely to be less than 4 weeks. Any activities are temporary and localised, with no activity of long-term duration at any one location.

The engines of inspection and maintenance vessels generate air emissions of NOx, SOx and particulates. The volume and duration of these emissions is not expected to be significant as such emissions will occur intermittently and over dispersed locations. If not properly serviced and maintained, exhaust emissions from vessels could potentially generate black smoke.

MARPOL Annex VI, first adopted in 1997, limits the main air pollutants contained in ships' exhaust gas, including SOx and NOx, and prohibits deliberate emissions of ozone depleting substances. MARPOL Annex VI also regulates shipboard incineration, and the emissions of volatile organic compounds (VOCs) from tankers. Regulation 18 of Annex VI also regulates suppliers of marine fuel oil to control the quality of fuel used by vessels (particularly the sulphur content), hence reducing vessel exhaust emissions (particularly SOx).

Due to the small size of vessels used, the infrequent nature and short duration of activities, and compliance with MARPOL requirements, exhaust emissions from Offshore TGP inspection and maintenance vessels are expected to be insignificant in the overall context of shipping traffic in Bass Strait. Vessel exhaust emissions are therefore not expected to have any noticeable impacts on local air quality or visual amenity.

6.5.3 Environmental Control Measures

The following controls and mitigation measures have been adopted to ensure appropriate environmental management of Offshore TGP inspection and maintenance activities in order to reduce the environmental risks associated with air emissions to ALARP:

- Fuel combustion equipment in compliance with MARPOL Annex VI. Specifically:
- Vessels (as appropriate to class) hold valid International Air Pollution Prevention (IAPP) certification and operate in accordance with a Ship Energy Efficiency Management Plan
- Vessels with diesel engines >130kW hold valid Engine International Air Pollution Prevention certification for each engine and NOx emissions comply with MARPOL Annex VI Regulation 13
- Sulphur content of any fuel used on board does not exceed 3.5% m/m
- Vessels are required to adhere to a planned maintenance system that ensures engines and thrusters are maintained for optimum performance during inspection and maintenance activities

6.5.4 ERA Summary

The complete ERA for the offshore component of the TGP is provided in **Error! Reference source not found.**, however, the risk assessment related to air emissions is summarised below.

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
Offshore TGP inspection and maintenance using vessels	Vessel operations - engine exhaust emissions (ERA Ref No. 11).	Increased levels of atmospheric pollution (NOx, SOx and particulates) and greenhouse gases, leading to localised reduction in air quality. Reduced visual amenity (e.g. black smoke and particulates).	Low

6.5.5 Assessment of ALARP

Given the control measures listed above, and the infrequent nature, relatively small scale and short duration of Offshore TGP inspection and maintenance activities, the risk of adverse environmental impacts associated with air emissions is considered extremely low and therefore ALARP.

6.5.6 Demonstration of Acceptability

For this aspect the residual risk was assessed as low and therefore ALARP. As all relevant standards (TGPPL policy and Industry best practice) and Australian legislative requirements have been met and there were no stakeholder concerns, TGPPL considers the impacts and risk are acceptable in accordance with the criteria defined in Section 5.1.5.

The environmental performance outcomes and environmental performance standards for the controls above are given in Table 9.

6.6 Waste Management

6.6.1 Environmental Aspects and Potential Incidents

There will be no wastes generated during the normal day to day operation of the Offshore TGP. Daily operations (i.e. continuous transport of gas) are completely internal to the pipeline with no offshore activities or external effects during standard operating conditions.

Inspection and maintenance activities related to the Offshore TGP also produce minimal waste. However, the following activities and incidents associated with the Offshore TGP could potentially generate wastes:

- Pipeline maintenance activities (e.g. span correction, removal of dropped objects and replacement of sacrificial anodes)
- Pipeline inspection activities (e.g. pigging); and
- Vessel operations (e.g. sewage / grey water generation, food preparation, domestic waste generation, hazardous waste management / spill clean-up, deck drainage and bilge water management)

Wastes generated by pigging operations will be received and managed at TGP onshore facilities and will, therefore, not be considered further in this Offshore EP. Where required, wastes associated with Offshore TGP maintenance activities (e.g. waste grout and bags, old sacrificial anodes and dropped objects collected from the seabed) will be stored on the vessel and returned to shore for appropriate waste management. Such wastes are not expected to have any adverse impacts on the marine environment. Offshore TGP waste management procedures shall be based on the following principles, listed in order of priority:

- Avoid wastes
- Reduce wastes at the source
- Reuse materials where possible
- Recycle wastes where practicable; and
- Dispose of wastes appropriately and responsibly

Inspection and maintenance vessels could potentially release wastes to the marine environment, either through planned discharge (e.g. sewage / grey water and food scraps) or through inappropriate waste management practices (e.g. loss of containment or dumping of domestic wastes and hazardous wastes).

6.6.2 Potential Environmental Impacts

Potential environmental impacts related to waste management will only occur during Offshore TGP inspection and maintenance activities using vessels. The key potential environmental impacts related to inappropriate vessel waste management practices are:

- Very minor, localised, short-term contamination of the marine environment through uncontrolled or inappropriate disposal of liquid wastes (e.g. sewage, grey water, deck drainage, bilge water and hazardous / chemical wastes), no impact on marine ecosystems or marine fauna expected
- Injury to, or death of, marine fauna through entanglement in, or ingestion of, plastic and other solid wastes; and
- Visible pollution / reduction of visual amenity.

Offshore TGP inspection and maintenance activities are expected to be required no more than once every 2 years on average, with the maximum length of any one voyage likely to be less than 4 weeks. The short duration of these inspection and maintenance activities and size of the vessels used will limit the amount of waste generated and stored.

The majority of Offshore TGP inspection and maintenance activities will be occurring in open ocean and no marine megafauna populations are known to inhabit the immediate area of the Offshore TGP outside the coastal zone. Activities during Offshore TGP inspection and maintenance will be confined to areas located at least 8 km from the nearest onshore breeding or home habitat. Should an accidental discharge of waste occur, the risk of adverse environmental impact is considered extremely low given the small volume of wastes generated and stored, and rapid dispersion in the high energy, open ocean environment.

Works in near coastal environments at either end of the Offshore TGP are generally undertaken using smaller vessels than those used for open ocean work. Such operations are generally diver based operations and of smaller scale than the major open ocean surveys. Therefore, the volume of wastes generated during nearshore inspection and maintenance works and, hence the environmental risk, will be lower than during open ocean activities.

6.6.3 Environmental Control Measures

Vessel waste management practices will comply with all necessary regulatory requirements, with particular emphasis on MARPOL requirements. MARPOL V generally prohibits the discharge of all garbage into the sea, except as provided otherwise in Regulations 4, 5, and 6 of the Annex, which are related to food waste, cargo residues, cleaning agents and additives and animal carcasses. MARPOL Annex V provides strict management guidance for the discharge of other wastes (e.g. disposal of macerated organic wastes where the vessel is at least 12 NM from the nearest land).

Waste will be managed in accordance with an approved Vessel Waste (Garbage) Management Plan prepared in accordance with the requirements of MARPOL Annex V. The Waste Management Plan will include written procedures for minimising, collecting, storing, processing and disposing of waste, including the use of the equipment on board. Volumes of all wastes generated will be recorded and the disposal path tracked in a Vessel Waste (Garbage) Record Book.

In accordance with MARPOL Annex IV, the discharge of sewage into the sea is also prohibited, except when the vessel has an approved sewage treatment plant or when the vessel is discharging comminuted and disinfected sewage using an approved system at a distance of more than 3 NM from the nearest land. Sewage which is not comminuted or disinfected has to be discharged at a distance of more than 12 NM from the nearest land.

In accordance with MARPOL Annex I the discharge of oily water from the vessel deck or bilge is only permitted only if collected and processed through an appropriately maintained oily water separator (OWS). The oil in water (OIW) content of the discharge must not exceed 15 ppm and OIW detection instrumentation must be regularly calibrated and records maintained.

6.6.4 ERA Summary

The complete ERA for the offshore component of the TGP is provided in **Error! Reference source not found.**, however, the risk assessment associated with waste management is summarised below.

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
Offshore TGP inspection or maintenance using vessels	Uncontrolled or inappropriate disposal of liquid wastes (e.g. sewage / grey water (ERA Ref No. 12), deck drainage / bilge water (ERA Ref No. 9) and hazardous / chemical wastes (ERA Ref No. 13) from the vessel.	Very minor, localised, short-term contamination of the marine environment, no impact on marine ecosystems or marine fauna expected. Very minor, localised, short-term visible pollution / reduction of visual amenity.	Low
	Uncontrolled or inappropriate disposal of solid wastes (e.g. plastic) from the vessel (ERA Ref No. 13).	Injury to, or death of, marine fauna through entanglement in, or ingestion of, plastic and other solid wastes. Very minor, localised visible pollution / reduction of visual amenity.	Low

6.6.5 Assessment of ALARP

Given the control measures listed above, and the infrequent nature, relatively small scale and short duration of Offshore TGP inspection and maintenance activities, the risk of adverse environmental impacts associated with inappropriate management of waste streams is considered extremely low and therefore ALARP.

6.6.6 Demonstration of Acceptability

For this aspect the residual risk was assessed as low and therefore ALARP. As all relevant standards (TGPPL policy and Industry best practice) and Australian legislative requirements have been met and there were no stakeholder concerns, TGPPL considers the impacts and risk are acceptable in accordance with the criteria defined in Section 5.1.5.

The environmental performance outcomes and environmental performance standards for the controls above are given in Table 9.

6.7 Chemical Management

The handling, use and storage of hydraulic oils and chemicals on-board vessels can pose a threat to the environment and personnel if not managed properly. Management procedures must be put in place prior to the introduction of any chemical on board. Control of these substances from both an environmental and safety perspective, relies primarily on the selection of chemicals that pose the least risk to the safety of employees or the environment (based on a combination of biodegradability or non-persistence, low toxicity or low bioaccumulative potential). Emphasis is then placed on controlling any loss to the environment.

6.7.1 Environmental Aspects and Potential Incidents

There will be no environmental impacts associated with chemical management during the normal day to day operation of the Offshore TGP. Daily pipeline operations (i.e. continuous transport of gas) are completely internal to the pipeline, with no use of chemicals or liquid hydrocarbons.

Environmental impacts from chemicals can only potentially occur during Offshore TGP inspection and maintenance activities using vessels, however the range of chemicals used in the operation and maintenance of the Offshore TGP is expected to be relatively minor. The main chemicals used during subsea pipeline inspection and maintenance activities are:

- Hydraulic oils used in ROVs / AUVs and vehicle recovery equipment
- Minor, working volumes of miscellaneous chemicals on board the vessel; and
- Grout (concrete) used in subsea pipeline span correction

As described in Section 2.2.2.7, Offshore TGP maintenance activities may include span correction, in which supports are installed, in the form of grout-filled bags, underneath the centre of the span. Each bag is placed under the subsea pipeline using a ROV and inflated with grout (concrete) via a hose connection to the support vessel. Due to its chemical properties, infrequent use and small volumes used, grout used in Offshore TGP maintenance is not expected to have any adverse impacts on the marine environment. Loss of grout is expected to only be as a result of grout hose decoupling from grout bag, releasing residual grout entrained within the nozzle with negligible quantities. In the event of an unplanned release e.g. caused by a hose rupture the maximum volume released (conservatively, on the basis of a 2" hose in 70m of water) is 250kg. Also, grouting operations will be monitored by ROV / AUV and, therefore, any loss of grout during filling of bags will be easily identified and the pump stopped very quickly, hence all that is lost is the volume of the hose due to gravity.

The maximum volume of other liquid chemicals stored on-board vessels will be no greater than 75 L.

Shipboard chemical management (i.e. chemicals used in typical operation of all commercial vessels, such as biofouling materials, etc.) are generally covered in vessel maintenance manuals and are required to be provided as part of tender documentation for TGP projects.

Therefore, the only credible scenarios identified for the Offshore TGP that could potentially result in a chemical spill to the marine environment are:

- Rupture of, or leak from, a hydraulic hose on a ROV / AUV (maximum 100 L)
- Rupture of, or leak from, a grout hose (maximum 250kg); and
- Loss of containment of other liquid chemicals from the vessel deck (maximum 75 L)

6.7.2 Potential Environmental Impacts

The key potential environmental impacts related to loss of hydraulic oil from an ROV / AUV, accidental release of grout or spill of other liquid chemicals from the vessel deck during Offshore TGP inspection and maintenance activities are:

- Very minor, localised, short-term contamination of the local marine environment, no impact on marine ecosystems or marine fauna expected; and
- Very minor, localised, short-term visible pollution / reduction of visual amenity

Offshore TGP inspection and maintenance vessels are expected to be required no more than once every 2 years on average and only for a limited number of days. The short survey time and size of vessels will limit the amount of chemicals used or stored on board (other than fuels – refer to Section 6.9) during Offshore TGP inspection / maintenance activities.

The majority of inspection and maintenance activities will be occurring in open ocean and no marine megafauna populations are known to inhabit the immediate area of the Offshore TGP outside the coastal zone. Activities during Offshore TGP inspection and maintenance will be confined to areas located at least 8 km from the nearest onshore breeding or home habitat. Should a spill occur, the risk of adverse environmental impact is considered extremely low given the use of low impact chemicals, the small volume of chemicals stored and rapid dispersion of any spilled chemical in the high energy, open ocean environment.

Works in near coastal environments at either end of the Offshore TGP are generally undertaken using smaller vessels than those used for open ocean work. Such operations are generally diver based operations, of smaller scale than the major open ocean surveys and, therefore, the volume of chemicals used will be lower.

It is considered that the greatest risk associated with chemical use would be a leak from, or rupture of, a hydraulic line on survey equipment. However, risks associated with hydraulic oil spills are minimal due to the following factors:

- Controls currently in place (equipment checks, audits, ROV / AUV procedures, qualified personnel, weather windows of operation, etc.)
- Minimal volumes of hydraulic oil (maximum 100 L)
- Very rare deployment of an ROV / AUV; and
- Closed loop system with no planned discharge and use of internationally recognised low environmental impact hydraulic fluids

6.7.3 Environmental Control Measures

The following controls and mitigation measures have been adopted to ensure appropriate environmental management of contractor vessels along the Offshore TGP route and to reduce environmental risks and impacts associated with chemical management to ALARP:

- All Vessels will have a SOPEP (or equivalent appropriate to size and class) in accordance with MARPOL Annex I
- Appropriate spill response equipment, including spill kits equipment, available on-board and personnel trained in their use
- Regular spill response exercises will be conducted to test the effectiveness of the approved vessel SOPEP
- Works will be conducted in compliance with standard industry operating procedures and by appropriately qualified / trained and experienced vessel and ROV / AUV personnel (in accordance with IMCA R 004 ‘Code of Practice for the safe and efficient operation of Remotely Operated Vehicles’)
- Hydraulic oils, lubricants and chemicals stored and, where practicable, handled within containment facilities, designed in accordance with relevant Australian / international codes and standards, to prevent the release of spilled substances to the marine environment
- Grout used in bags for pipeline span rectification will be ‘gold’ or ‘silver’ rated according to the Chemical Hazard and Risk Management (CHARM) model as per the Onshore Chemical Notification Scheme (OCNS) administered by the UK Centre for Environment, Fisheries and Aquaculture Science (Cefas). Any non-CHARMable grout products will be selected from OCNS group ‘D’ or ‘E’. The latest OCNS list of notified and ranked products will be used
- Release of grout to the surrounding environment will be minimised through appropriate operating procedures and maintenance of topside and subsea grouting-specific equipment

6.7.4 ERA Summary

The complete ERA for the offshore component of the TGP is provided in **Error! Reference source not found.**, however, the risk assessment associated with chemical management is summarised below.

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
Offshore TGP inspection or maintenance using vessels	Release of grout during bag filling (maximum 250kg) (ERA Ref No. 21)	Very minor, localised, short-term contamination of the local marine environment, no impact on marine	Low

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
	Rupture of, or leak from, a hydraulic hose on a ROV / AUV (maximum 100 L) (ERA Ref No. 17).	ecosystems or marine fauna expected. Very minor, localised, short-term visible pollution / reduction of visual amenity.	Low
	Loss of containment of chemicals stored on the vessel (maximum total storage 75 L) (ERA Ref No. 14).		Low

6.7.5 Assessment of ALARP

Given the control measures listed above, and the infrequent nature, relatively small scale and short duration of Offshore TGP inspection and maintenance activities, the likelihood of a chemical / hydraulic oil spill to the environment is considered extremely low. The risk to the environment is therefore considered low and the risks associated with all chemical or hydraulic oil spill scenarios are considered to be ALARP.

6.7.6 Demonstration of Acceptability

For this aspect the residual risk was assessed as low and therefore ALARP. As all relevant standards (TGPPL policy and Industry best practice) and Australian legislative requirements have been met and there were no stakeholder concerns, TGPPL considers the impacts and risk are acceptable in accordance with the criteria defined in Section 5.1.5.

The environmental performance outcomes and environmental performance standards for the controls above are given in Table 9.

6.8 Ballast Water and Biofouling Management

6.8.1 Environmental Aspects and Potential Incidents

An invasive marine species (IMS) is a species occurring, as a result of human activities, beyond its accepted normal distribution and which threaten the environment, human health or economic values by the damage it causes (DoEE, 2019). Not all non-indigenous marine species introduced into new environments will cause demonstrable effects, some are relatively benign, and few have spread widely beyond ports and harbours. The following Offshore TGP maintenance and inspection activities and incidents have the potential to result in the introduction of IMS in the activity area:

- Discharge of ballast water from support vessels containing foreign species; and
- Translocation of foreign species through biofouling of support vessel hull and niches (e.g. sea chests, bilges, strainers)

6.8.2 Potential Environmental Impacts

Potential environmental impacts related to ballast water and biofouling management will only occur during Offshore TGP inspection and maintenance activities using vessels. The key potential environmental impacts related to inappropriate ballast water and biofouling practices are:

- Potential displacement of native species, altering ecosystem function and affecting biodiversity
- Successful IMS invasion requires the following three steps:
  - Colonisation and establishment of the marine pest on a vector (e.g., vessel hull) in a donor region (e.g., home port)

- Survival of the settled marine species on the vector during the voyage from the donor to the recipient region (e.g., project area)
- Colonisation (e.g., dislodgement or reproduction) of the marine species in the recipient region, followed by successful establishment of a viable new local population

It is estimated that there are more than 250 exotic species in the Australian marine environment and that about one in six to ten introduced marine species become 'pests' (i.e. the effects of the introduced organisms are sufficiently severe) (McDonald, 2008).

IMS are likely to have little or no natural competition or predators, thus potentially outcompeting native species for food or space, preying on native species, or changing the nature of the environment.

Marine pest species can also deplete fishing grounds and aquaculture stock, with between 10% and 40% of Australia's fishing industry being potentially vulnerable to marine pest incursion. For example, the introduction of the Northern Pacific seastar (*Asterias amurensis*) in Victorian and Tasmanian waters was linked to a decline in scallop fisheries. Similarly the New Zealand screw shell (*Maoricolpus roseus*), thought to have been introduced on dry ballast or through the live oyster trade, may threaten other mollusc species, including scallops. The New Zealand screw shell can densely blanket the sea floor with live and dead shells, and faecal pellets and therefore also smother other seafloor species (ABC Science, 2000).

Marine pests can also damage marine and industrial infrastructure, such as encrusting jetties and marinas or blocking industrial water intake pipes. By building up on vessel hulls, they can slow the vessels down and increase fuel consumption.

The benthic habitat within the operational area is characterised by a soft sediment and shell/rubble seabed, infauna communities, and epibiotic communities (typically sponges).

Once established, some pests can be difficult to eradicate (Hewitt, 2002) and therefore there is the potential for a long-term or persistent change in habitat structure. It has been found that highly disturbed environments (such as marinas) are more susceptible to colonisation than open-water environments, where the number of dilutions and the degree of dispersal are high (Paulay et al., 2002).

Compliance with regulatory requirements for the management of ballast water and ensuring all vessels are assessed as posing a low biofouling risk in accordance with national guidelines will significantly reduce the likelihood of translocation of an IMS. Successful colonisation in the recipient region would be difficult given the nature of the benthic habitats near the operational area (i.e. predominantly bare sands with patchy occurrences of hard substrate). If an IMS was introduced, and if it did colonise an area, it is expected that any colony would remain fragmented and isolated. Therefore, there is the potential for localised loss of ecological diversity.

The operational area does not present an environment conducive to IMS introduction or establishment, the risk is considered greatest in shallow coastal waters (BRS, 2007) in areas where large numbers of vessels are present and are stationary for an extended period. It is considered Highly Unlikely that this activity would result in the introduction of an IMS and any subsequent impact to receptors.

6.8.3 Environmental Control Measures

With respect to marine pests and biofouling, the following control measures are to be implemented, where applicable to the vessel used:

- Biofouling records maintained in accordance with IMO Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species. The Biofouling Guidelines recommend that a Biofouling Record Book be maintained for each ship, in which should be recorded the details of all inspections and biofouling management measures undertaken on the ship
- Biofouling risk assessment undertaken in accordance with the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (DAWR, 2009) and the Guidelines for the Control and Management of Ships' Biofouling to Minimise the

Transfer of Invasive Aquatic Species (Biofouling Guidelines) (IMO, 2011) shows low risk of introducing IMS. Biofouling risk will be assessed, and mitigated, in accordance with these Guidelines. This means biofouling risk will be assessed with:

  - In-water inspection by divers or inspection in dry dock undertaken if deemed necessary.
  - Cleaning of hull and internal seawater systems undertaken if deemed necessary.
  - Antifouling coating status taken into account, with antifouling renewal undertaken if deemed necessary

- During the performance of biofouling risk assessments, key factors to be considered include:
  - Vessel history and condition – previous biofouling performance, treatment, exposure to higher risk foreign and domestic ports, transit routes, directions and speeds
  - Adequacy of vessel in-water and dry dock cleaning and maintenance programs
  - Inspection records from cleaning programs
  - Review of vessel Biofouling Record Book
  - Receiving environment of the works area and transit routes to and from
  - Timing of risk assessment with respect to vessel movements prior to performing TGP survey works
  - Expertise of personnel involved in biofouling risk assessment
  - Inspection, maintenance and cleaning of immersible retrievable-equipment such as ROV's
- All immersible retrievable - equipment has been cleaned and / or inspected in accordance with National Biofouling Management Guidance for the Petroleum Production and Exploration Industry prior to commencement of the activity
- Approved Ballast Water Management Plan and Ballast Water Management Certificate in accordance with IMO Ballast Water Management Convention – Guidelines for Ballast Water Management and Development of Ballast Water Management Plans

The Ballast Water Management Convention requires signatory flag states to ensure that ships flagged by them comply with standards and procedures for the management and control of ships' ballast water and sediments. The Convention aims to prevent the spread of harmful aquatic organisms from one region to another and halt damage to the marine environment from ballast water discharge, by minimising the uptake and subsequent discharge of sediments and organisms.

The Convention requires all vessels designed to carry ballast water to implement a ballast water management plan and to carry out ballast water management procedures in accordance with approved methods. Specifically these are:

- Use of a ballast water management system
- Ballast water exchange in an acceptable area (at least 12NM from land and in at least 50 m water depth)
- Use of low risk ballast water
- Retention of high risk ballast water on board
- Discharge to an approved ballast water reception facility
- Compliance with the Australian Ballast Water Management Requirements (DAWR, 2016)
- Where applicable (if the vessel has mobilised from outside Australian waters), submission of detailed pre-arrival information to the DAWR, via the Maritime Arrivals Reporting System (MARS), no later than 12 hours prior to arrival in Australian waters. The vessel operator must comply with this requirement under Section 193 of the Biosecurity Act 2015
- Maintenance of ballast water record system in accordance with Regulation B-2 of the Annex to the IMO Ballast Water Management Convention including:

- start and finish coordinates
- actual pumping times
- residual volume remaining in the tank at the end the empty cycle prior to refill (empty refill method only)

6.8.4 ERA Summary

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
Offshore TGP inspection or maintenance using vessels	Inappropriate ballast water (ERA Ref No. 8) and biofouling (ERA Ref No. 7) management.	Introduction of exotic marine pests, potentially displacing native species, altering ecosystem function and affecting biodiversity.	Low

6.8.5 Assessment of ALARP

Given the control measures listed above, and the infrequent nature, relatively small scale and short duration of Offshore TGP inspection and maintenance activities, the risk of adverse environmental impacts associated with inappropriate management of ballast water and biofouling is considered low and therefore ALARP.

6.8.6 Demonstration of Acceptability

For this aspect the residual risk was assessed as low and therefore ALARP. As all relevant standards (TGPPL policy and Industry best practice) and Australian legislative requirements have been met and there were no stakeholder concerns, TGPPL considers the impacts and risk are acceptable in accordance with the criteria defined in Section 5.1.5.

The environmental performance outcomes and environmental performance standards for the controls above are given in Table 9.

6.9 Fuel Management

6.9.1 Environmental Aspects and Potential Incidents

There will be no environmental impacts associated with fuel during the normal day to day operation of the Offshore TGP. Daily pipeline operations (i.e. continuous transport of gas) are completely internal to the pipeline, with no use of fuel or other liquid hydrocarbons.

Environmental impacts from fuel can only potentially occur during Offshore TGP inspection and maintenance activities using vessels. Fuel used for vessel operation can pose a threat to the marine environment and vessel personnel if it is not managed appropriately and is allowed to escape to the environment.

While the size of vessels used in Offshore TGP inspection and maintenance activities may vary according to availability and scale of the required works, the type of fuel used for vessel operations is restricted to low sulphur Marine Diesel Oil (MDO) or Marine Gas Oil (MGO).

The only credible scenarios identified for the Offshore TGP that could potentially result in a fuel spill to the marine environment are:

- Fuel tank breach through vessel accidents (including grounding) during extreme weather events; and
- Fuel tank rupture due to collision between vessels

As stated in Section 2.2.2.1, the fuel capacity of vessels potentially used in Offshore TGP inspection and maintenance activities ranges from 48 m^3 to 530 m^3, and the fuel is spread between numerous tanks. However, based on AMSA (2012), the maximum credible fuel spill volume associated with inspection / maintenance vessels is 40,000 L, being the maximum fuel capacity of one fuel tank of the largest expected vessel.

6.9.2 Potential Environmental Impacts

The key potential environmental impacts from vessel fuel storage and use in proximity to the Offshore TGP are:

- Contamination of the local marine environment, leading to degradation of marine ecosystems and potential toxicity impacts on marine biota (e.g. death, injury)
- Oiling of marine animals and coastlines
- Disturbance to marine fauna including mammals, birds, reptiles and other organisms (i.e. altered feeding, nesting nursing, mating or migrating behaviour)
- Visible pollution / reduction of visual amenity; and
- Disruption to other marine users such as commercial fishing and recreational users

Offshore TGP inspection and maintenance activities are expected to be required less than once every 2 years on average, with the maximum length of any one voyage likely to be less than 4 weeks. Any activities are localised, with no activity of long-term duration at any one location.

The majority of inspection and maintenance activities will be occurring in the open ocean and no marine megafauna populations are known to inhabit the immediate area of the Offshore TGP outside the coastal zone. Activities during Offshore TGP inspection and maintenance will be confined to areas located at least 8 km from the nearest onshore breeding or home habitat.

On release to the marine environment, diesel would be distributed over time into the following components:

- surface
- (in-water) entrained (non-dissolved oil droplets that are physically entrained by wave action)
- (in-water) dissolved (principally the aromatic hydrocarbons)
- evaporated; and
- decayed

Of these components, surface hydrocarbons and in-water entrained hydrocarbons and dissolved aromatics have the most significant impact on the marine environment. These are discussed in further detail below.

As detailed in Section 2.2.2.1, oil spill trajectory modelling with a spill volume of 40,000 L of fuel oil was undertaken to determine the areas that may be impacted. The potential environmental impacts to receptors within the ZPI are discussed in Table 12.

Table 12: Consequence evaluation to receptors within the ZPI - sea surface, shoreline and in-water

Receptor	Exposure Evaluation	Consequence Evaluation
Plankton	Plankton are likely to be exposed to entrained hydrocarbons. Effects will be greatest in the upper layer of the water column and areas close to the spill source where hydrocarbon concentrations are likely to be highest.	Relatively low concentrations of hydrocarbon are toxic to both zooplankton and ichthyoplankton (fish eggs and larvae)] which risk exposure through ingestion, inhalation and dermal contact. Phytoplankton are typically not sensitive to the impacts of oil, though they do accumulate it rapidly (Hook *et al.*, 2016) due to their small size and high surface area to volume ratio. Phytoplankton exposed to hydrocarbons may affect their ability to photosynthesize. Plankton are numerous and widespread but do act as the basis for the marine food web, meaning that an oil spill in any one location is unlikely to have long-lasting impacts on plankton populations at a regional level. Once background water quality conditions have re-established, the plankton community may take weeks to months to recover (ITOPF, 2011).
Fish	Since fish and sharks do not generally break the sea surface, the exposure of surface hydrocarbons to fish and shark species are unlikely to occur. Near the sea surface, fish are able to detect and avoid contact with surface slicks meaning fish mortalities rarely occur in the event of a hydrocarbon spill in open waters (Volkman *et al.*, 2004). Entrained hydrocarbon droplets can physically affect fish exposed for an extended duration (weeks to months). Effects will be greatest in the upper layer of the water column and areas close to the spill source where hydrocarbon concentrations are likely to be highest. Several fish communities in these areas are demersal and therefore more prevalent towards the seabed, which is not likely to be exposed. Therefore, any impacts are expected to be highly localised. The Australian grayling spends most of its life in fresh water, with parts of the larval or juvenile stages spent in coastal marine waters, therefore it is not expected to be present in offshore waters in large numbers. There is a known foraging BIA for the White shark in the ZPI, however, it is not expected that this species spends a large amount of time close to the surface where concentrations may be highest. The White shark breeding BIA, adjacent to Ninety Mile Beach, is also within the ZPI.	Pelagic free-swimming fish and sharks are unlikely to suffer long-term damage from oil spill exposure because dissolved/entrained hydrocarbons in water are not expected to be sufficient to cause harm (ITOPF, 2011). Subsurface hydrocarbons could potentially result in acute exposure to marine biota such as juvenile fish, larvae, and planktonic organisms, although impacts are not expected to cause population-level impacts. Impacts on fish eggs and larvae entrained in the upper water column are not expected to be significant given the temporary nature of the resulting change in water quality, and the limited areal extent of the spill. As egg/larvae dispersal is widely distributed in the upper layers of the water column it is expected that current induced drift will rapidly replace any oil affected populations. Pelagic species of shark are at greatest risk because of their risk of consuming contaminated prey. White sharks are known to aggregate near Ninety Mile Beach and philopatric characteristics means they may return to the place of birth to breed even if habitats are contaminated. This species is widely distributed and thus unlikely to suffer ecologically important declines in abundance.
Benthic habitats – bare substrate, macroalgae, corals	The predominant benthic habitat in the ZPI is bare substrate. Suitable hard substrate for macroalgal beds including the threatened 'Giant Kelp' occur in surrounding the Kent Island Group. Corals are not a common habitat type in the ZPI however solitary soft corals may occur where suitable hard substrate, such as rocky reef or man-made structures, is present.	Exposure to in-water hydrocarbons will occur predominantly in the surface layer and therefore any potential impact to benthic habitats will only occur in shallower nearshore waters. Impact by direct contact of benthic species with hydrocarbon in the deeper areas of ZPI is not expected given the surface nature of any diesel spill. Benthic invertebrate species closer to shore may be affected. Filter-feeding benthic invertebrates such as sponges,

Receptor	Exposure Evaluation	Consequence Evaluation
		bryozoans, abalone and hydroids may be exposed to sub-lethal impacts however population level impacts are considered unlikely. Intertidal species of macroalgae are more prone to direct surface oil exposure than subtidal beds, however sub-lethal toxicity effects from in-water hydrocarbons may be observed. Sub-lethal toxicity effects on corals may result from direct contact with in-water hydrocarbons or indirectly through feeding on contaminated prey (plankton).
Birds	Several listed Threatened, Migratory and/or listed marine species have the potential to be rafting, resting, diving and feeding within the spill area. Migratory or resident shorebirds, such as terns and plovers, foraging in the intertidal zone, or roosting or nesting on beaches and dunes along the Gippland, Bass Strait island and northern Tasmanian coastlines may also be exposed to oil. There are several foraging BIAs that are present within the area potentially exposed to surface hydrocarbons for albatross, petrel, and shearwater species. However, foraging BIAs are typically large broad areas. The birds can feed via surface skimming or diving – both exposing the bird to any oil on the water surface. Within the ZPI, breeding BIAs have been identified for the Common Diving and White-faced Storm Petrel around the Kent Group and Furneaux Group respectively. Foraging and breeding BIAs have also been identified for the Little Penguin around both the Kent and Furneaux Island groups.	Seabirds and shorebirds are sensitive to the impacts of oiling, with their vulnerability arising from the fact that they cross the air-water interface to feed, while their shoreline habitats may also be oiled (Hook *et al.*, 2016). Species that raft together in large flocks on the sea surface are particularly at risk (ITOPF, 2011). Penguins may also be especially vulnerable to oil because they spend a high portion of their time in the water and readily lose insulation and buoyancy if their feathers are oiled (Hook *et al.*, 2016). When first released, diesel has higher toxicity due to the presence of volatile components. Individual birds making contact close to the spill source at the time of the spill may be impacted; however, it is unlikely that many birds will be affected as sea surface oil is only predicted for the first 12 hours. Seabirds rafting, resting, diving or feeding at sea have the potential to encounter areas where hydrocarbons concentrations are greater than 10 g/m^2 (Geraci & St Aubin, 1988) in the vicinity of the spill location and due to physical oiling may experience lethal surface concentrations. As such, acute or chronic toxicity impacts (death or long-term poor health) to birds are possible but unlikely for a diesel spill as the number of birds would be limited due to the small area and brief period of exposure above 10 g/m^2. Therefore, potential impact would be limited to individuals, with population impacts not anticipated. The populations of seabird and shorebird species have a wide geographic range, meaning that impacts to individuals or even a population at one location will not necessarily extend to populations at other un-impacted locations.
Marine reptiles	There may be marine turtles in the area predicted to be exposed to surface oil. However, there are no BIAs or habitat critical to the survival of the species within this area. There are no turtle nesting beaches within the ZPI, so impacts to turtles from possible shoreline oiling will not occur.	Marine turtles are vulnerable to the effects of oil at all life stages. Marine turtles can be exposed to surface oil externally (i.e. swimming through oil slicks) or internally (i.e. swallowing the oil). Ingested oil can harm internal organs and digestive function. Oil on their bodies can cause skin irritation and affect breathing. The number of marine turtles that may be

Receptor	Exposure Evaluation	Consequence Evaluation
		exposed to surface diesel is expected to be low as there are no BIAs or habitat critical to the survival of the species present; however, turtles may be transient within the ZPI. Sea surface oil is only predicted for the first 12 hours limiting the period when oiling may occur. Therefore, potential impact would be limited to individuals, with population impacts not anticipated.
Marine mammals (pinnipeds)	There may be pinnipeds in the area potentially exposed to surface or in water entrained hydrocarbons. Although, there are no BIAs within this area breeding colonies are present on a number of the Bass Strait islands within the ZPI.	Breeding colonies (used to birth and nurse until pups are weaned) are particularly sensitive to hydrocarbon spills. Oiling may occur on the shorelines of Judgement Rocks and Tenth Island where fur seal colonies are located. Pinnipeds are vulnerable to sea surface exposures given they spend much of their time on or near the surface of the water, as they need to surface every few minutes to breathe. Exposure to surface oil can result in skin and eye irritations and disruptions to thermal regulation. Fur seals are particularly vulnerable to hypothermia from oiling of their fur however the characteristics of diesel reduce this risk. The number of pinnipeds that may be exposed to surface diesel is expected to be low. Sea surface oil is only predicted for the first 12 hours limiting the period when oiling may occur. Therefore, potential impact would be limited to individuals, with population impacts not anticipated. Exposure to entrained hydrocarbons in the water column or consumption of prey affected by the oil may cause sub-lethal impacts to pinnipeds. However, due to the temporary and localised nature of the spill, rapid loss of the volatile components of diesel in choppy and windy seas (such as that of the ZPI), and their widespread nature, is it not anticipated to result in long-term population viability effects.
Marine mammals (cetaceans	Several threatened, migratory and/or listed marine cetacean species have the potential to be migrating through or foraging within the area potentially exposed to surface or in water entrained hydrocarbons. There is a distribution and possible foraging BIA for Pygmy blue whales and a distribution and migration BIA for Southern right whales within the ZPI. Cetacean exposure to entrained hydrocarbons can result in physical coating as well as ingestion (Geraci and St Aubin, 1988). Such impacts are associated with 'fresh' hydrocarbon; the risk of impact declines rapidly as the diesel weathers.	Physical contact by individual cetaceans with a surface diesel spill is unlikely to lead to any long term impacts. Given the mobility of cetaceans, only a small proportion of the population would surface in the affected areas, resulting in short-term and localised consequences. The potential for impacts to whales and dolphins would be limited to a relatively short period following the release and would need to coincide with pod foraging or migration to result in exposure to a large number of individuals. However, such exposure is not anticipated to result in long-term population viability effects.
Shoreline habitat - sandy	The surface life of the diesel spill is predicted to be approximately 12 hours and therefore minimal shoreline contact is expected within the ZPI. The Gippsland and northern Tasmanian coasts which could possibly be contacted are dominated by sandy beaches with small rocky outcrops.	Shoreline oiling may result in acute toxicity, and mortality, of invertebrate communities, especially as unweathered diesel will easily penetrate into sandy sediments. However, tidal action is expected to lead to rapid weathering of any hydrocarbons in the intertidal area and the populations of these communities would

Receptor	Exposure Evaluation	Consequence Evaluation
	Sandy beaches provide potential foraging and breeding habitat for numerous bird and pinniped species. These activities primarily occur above the high tide line, with exception of haul outs. Note, most of the oil on a sandy shore will be concentrated at, and below, the high tide mark. Sandy beaches are also inhabited by a diverse assemblage (although not always abundant) of infauna and macroinvertebrates.	be likely to rapidly recover.
- rocky	Rocky shores are more common on the islands of Bass Strait including the Hogan Island Group, Curtis Island Group, Kent Group, Bass Pyramid Group and Tenth Island which are located within the ZPI. Exposed rocky shores are typically less sensitive to oil spills, with the exception of when wildlife habitats or breeding grounds (see also potential impacts to pinnipeds above) are present. Because the rocks do not absorb much oil, the spilled material is mostly held offshore and any oil that is deposited remains on the rock surface where it is subject to weathering. The rate of such weathering is dependent on many factors, the wave exposure, weather conditions and the shore characteristics are most important (IPIECA, 1995). As the oil is weathered it becomes more viscous and less toxic, often leaving only a small residue of tar on upper shore rocks. This residue can remain as a unsightly stain but it is unlikely to cause any more ecological damage.	Oil is not normally retained on rocky shores in a form or quantity that causes long term impacts and also because most rocky shore species have a considerable potential for re-establishing populations (IPIECA, 1995).
Commercial fisheries	In-water exposure to entrained diesel may result in a reduction in commercially targeted marine species, resulting in impacts to commercial fishing and aquaculture. Actual, or perceptions of, contamination of seafood can affect commercial and recreational fishing and can impact seafood markets even after any actual risk to seafood from a spill has subsided (NOAA, 2002) which can have economic impacts to the industry. Several commercial fisheries overlap the ZPI.	Any acute impacts are expected to be limited to small numbers of juvenile fish, larvae, and planktonic organisms, which are not expected to affect population viability or recruitment. Impacts from entrained exposure are unlikely to manifest at a fish population viability level. Any exclusion zone established would be limited to the immediate vicinity of the release point, and due to the rapid weathering of diesel would only be in place 1-3 days after release, therefore physical displacement of vessels which excludes fishing effort is unlikely to be a significant impact.
Recreation and tourism	The surface life of the diesel spill is predicted to be approximately 12 hours and the modelling predicts surface oil extending into nearshore Victorian waters (including Ninety Mile Beach Marine National Park) and to the nearshore waters along the Ninety Mile Beach (part of which is in the Gippsland Lakes Coastal Park). Oil is predicted to contact the Kent Group Marine Reserve and the shorelines of Bass Strait islands including the Hogan and Kent Groups which offer opportunities for bird-watching, diving and recreational fishing.	Tourism and recreation is also linked to the presence of marine fauna (e.g. whales, seals, birdwatching), particular habitats and locations for diving / swimming, boating or recreational fishing (see also sections on fish, birds, pinnipeds, cetaceans and coastal habitats above). Short-term impacts to nature-based tourism and other human uses of beaches or marinas (and nearshore waters) with resultant socio-economic consequences in local communities may occur as a result of temporary closures to protect human health or due to aesthetic factors and perceptions of a polluted environment that is not desirable to visit. However, given the short duration and limited extent of predicted exposure only short term, minor public impacts are expected.

Receptor	Exposure Evaluation	Consequence Evaluation
Cultural heritage - Indigenous and historic	Surface oil is predicted to encroach upon nearshore waters in the vicinity of the Gunai Kurnai Native Title Determination Area and a number of historic shipwrecks.	Visible sheen has the potential to reduce the visual amenity of cultural heritage sites such as indigenous or historic (e.g. shipwreck) protected areas. However, given the relatively short duration and limited extent of predicted exposure only short term, minor public impacts are expected.
AMP	The ZPI overlaps the Beagle Australian Marine Park.	Potential impacts to sensitive receptors related to the Beagle AMP such as plankton and other marine fauna, are discussed in the appropriate sections above.
National Parks and Reserves	A number of areas adjacent to or within Victorian and Tasmanian waters have been declared as National Parks or Marine Protected Areas. The surface life of the diesel spill is predicted to be approximately 12 hours and the modelling predicts surface oil contacting Ninety Mile Beach Marine National Park and the coastal waters along the Gippsland Lakes Coastal Park. Oil is predicted to contact the Kent Group Marine Reserve and the coastal waters of Bass Strait islands including the Kent Group National Park.	Potential impacts to sensitive receptors related to the shorelines of terrestrial National Parks and Reserves, such as shoreline habitats and birds, are discussed in the appropriate sections above. Potential impacts to the sensitive receptors related Marine National Parks and Marine Sanctuaries, such as fish and other marine fauna, are discussed in the appropriate sections above.
KEF	The diesel plume may encroach upon the western-most part of the KEF: Upwelling East of Eden.	Potential impacts to sensitive receptors related to the KEF: Upwelling East of Eden such as plankton and other marine fauna, are discussed in the appropriate sections above. While a spill would not affect the upwelling itself, if the spill occurs at the time of an upwelling event, it may result in krill being exposed to in-water phase hydrocarbons. Pygmy blue whales feeding at this time may suffer from reduced availability of prey however these impacts are expected to be localised and temporary.

6.9.3 Environmental Control Measures

The following controls and mitigation measures have been adopted to ensure appropriate environmental management of vessels along the Offshore TGP route and to reduce environmental risks and impacts associated with vessel fuel storage to ALARP:

- Vessels will meet the crew competency, navigation equipment, watchkeeping and radar requirements of AMSA Marine Order Part 3 (Seagoing qualifications) and Part 30 (Prevention of collisions)
- Vessel operations to occur only in appropriate weather windows. The maximum distance a vessel working near the Offshore TGP could be from a safe mainland harbour is only 160 km. Consequently, if weather conditions are predicted to deteriorate, vessels will terminate activities and seek refuge
- All vessels will have a SOPEP (or equivalent appropriate to size and class) in accordance with MARPOL Annex I
- Appropriate spill response equipment, including spill kits equipment, available on-board and personnel trained in their use
- TGP Offshore OPEP (Section 9.4 of this EP) to be implemented in the event of a vessel fuel spill

- Regular spill response exercises will be conducted to test the effectiveness of the approved SOPEP and TGP Offshore OPEP (Section 9.4 of this EP)

6.9.4 ERA Summary

The complete ERA for the offshore component of the TGP is provided in **Error! Reference source not found.**, however, the risk assessment associated with fuel management is summarised below.

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
Offshore TGP inspection or maintenance using vessels	Vessel accident during extreme weather events or vessel collision leading to fuel tank rupture and fuel spill (ERA Ref No. 15).	Contamination of the local marine environment leading to degradation of marine ecosystems and potential toxicity impacts on marine biota (e.g. death, injury). Oiling of marine animals and coastlines. Disturbance to marine fauna including mammals, birds, reptiles and other organisms (i.e. altered feeding, nursing, mating or migrating behaviour). Visible pollution / reduction of visual amenity. Disruption to other marine users such as commercial fishing and recreational users.	Low

6.9.5 Assessment of ALARP

As stated in Section 2.3.2, adverse impacts on the shoreline or sensitive marine ecosystems in the event of a spill from Offshore TGP inspection and maintenance vessels are highly unlikely due to: the size of vessels used; properties of hydrocarbons that could potentially be spilled; expected maximum spill volumes; high energy marine environment of Bass Strait; and the distance from the Offshore TGP to sensitive receptors (e.g. islands / shorelines).

The potential risk is further reduced by the control measures listed above, and the infrequent nature, relatively small scale and short duration of Offshore TGP inspection and maintenance activities. Therefore, the environmental risk associated with fuel management is considered to be ALARP.

6.9.6 Demonstration of Acceptability

For this aspect the residual risk was assessed as low and therefore ALARP. As all relevant standards (TGPPL policy and Industry best practice) and Australian legislative requirements have been met and there were no stakeholder concerns, TGPPL considers the impacts and risk are acceptable in accordance with the criteria defined in Section 5.1.5.

The environmental performance outcomes and environmental performance standards for the controls above are given in Table 9.

6.10 Pipeline Integrity Management

6.10.1 Environmental Aspects and Potential Incidents

There will be no environmental impacts associated with the normal day to day operation of the Offshore TGP, as daily pipeline operations (i.e. continuous transport of gas) are completely internal to the pipeline.

However, loss of pipeline integrity could result in accidental release of gas from the Offshore TGP to the marine environment. Although highly unlikely, loss of subsea pipeline integrity could potentially result from:

- Physical damage (e.g. dropped objects, dropped / dragged anchors, grounding / sinking ships, dragged fishing equipment or intentional damage);
- Fatigue damage (free spans) due VIV or subsea currents / natural events (e.g. major storm or seismic activity);
- Internal corrosion of the pipeline.

6.10.2 Potential Environmental Impacts

The key potential environmental impacts associated with a gas release from the Offshore TGP are:

- Injury to, or death of, marine fauna in the immediate vicinity of the release
- Disturbance to marine fauna including mammals, reptiles and other organisms (i.e. altered feeding, nursing, mating or migrating behaviour)
- Scouring / physical damage to benthic communities
- Generation of a sediment plume in the water column, potentially leading to smothering of, or reduced light penetration to, benthic communities; and
- Temporary and localised change in water quality

For further details of safety issues related to a subsea release of gas from the Offshore TGP (i.e. a flash fire or loss of vessel buoyancy) refer to Section 3 of the *TGP Offshore Safety Case (TGP-698-RP-AU-003).*

Natural gas exhibits negligible solubility in water and hence, in event of a subsea gas leak, the impact on water quality is likely to be insignificant (Nord Stream, 2009). Due to the depth of the Offshore TGP along the most of its route, any gas release is most likely to be gradual and evidenced by bubbles rising to the surface. Any explosive rupture would be buffered by the density of the water and would only affect the immediate vicinity of the pipeline. Impacts would therefore depend on the depth at which the failure occurred.

A short-term thermal impact (i.e. temperature drop due to the Joule-Thomson gas expansion effect) may occur in the surrounding water in the immediate vicinity of the subsea gas release. A subsea gas release could also potentially cause an updraft of bottom waters, resulting in sediment suspension in the water column. This could potentially lead to smothering of, and a short-term localised reduction in light penetration to, benthic flora and fauna. An updraft could also cause mixing of bottom and surface waters, potentially causing short-term changes to salinity, water temperature and dissolved oxygen (Nord Stream, 2009). However, as detailed in Sections 3.2, 6.1 and 6.2, there are no significant benthic communities in the vicinity of the Offshore TGP.

Modelling of a potential leak of gas as a result of a breach of the Offshore TGP was undertaken to determine the area that may be impacted. The potential gas leak scenarios modelled ranged from a hole of 5 mm to a full bore rupture (Cardno, 2013). Due to its low molecular weight, any gas escape from the Offshore TGP is expected to rise rapidly through the water column to the sea surface where it will dissipate to atmosphere. For the purposes of the model, it was assumed that gas will rise from the seabed as bubbles and reach the sea surface in an area represented by a circle with a radius dependent on the water depth and the rate of leakage. With this initial source on the surface, standard atmospheric dispersion was used to compute the gas concentration in

the atmosphere as a function of the distance downwind (Cardno, 2013). Results of the modelling indicated that:

- Concentration of gas in the plume above the sea surface will drop rapidly to below the LEL within 5 km of the source
- Sea level gas concentrations are very much lower and, due to the plume rise, are well below the required limit beyond about 100 m from the source

The environmental impacts of a subsea gas leak would largely be due to its physical presence as it passes through the water column and into the atmosphere. Some of this gas may dissolve in the water column but is not generally considered toxic to marine biota. The main potential impacts are only likely to occur from the extreme cases of explosion, flammability or asphyxiation where it may accumulate in sufficient quantities. The open marine environment of the Offshore TGP is extremely unlikely to lead to this condition.

Potential exposure of marine fauna to gas hydrocarbons from a subsea pipeline rupture would require the coincident occurrence of fauna, such as marine mammals or birds, within the area of a recent leak. Although some of the islands in the vicinity of the Offshore TGP route are known breeding colonies for seals and seabirds, there are no recognised aggregation areas for protected whales or dolphins within the area.

In the open water offshore environment, the nearest land mass is located 10 km from the Offshore TGP and is unlikely to be impacted by gas escape from a subsea pipeline rupture.

For a gas leak in a nearshore environment, adverse effects could involve potential hazards associated with concentration of gas in air near the LEL, however atmospheric conditions prevailing at the time, and presence of ignition sources, will determine if there is any impact to the environment.

6.10.3 Environmental Control Measures

Measures to ensure the integrity of the Offshore TGP is maintained are fully discussed in the *TGP Offshore Safety Case (TGP-698-RP-AU-003)*. The prime means by which pipeline integrity is maintained lies in the original design of the Offshore TGP (Section 2.4 of the TGP Offshore Safety Case) including the physical construction of the pipeline, which was devised to maintain the highest safety standards possible, and its selected route.

The following controls and mitigation measures have been adopted to ensure appropriate environmental management along the Offshore TGP route and to reduce environmental risks and impacts associated with pipeline integrity management to ALARP:

- The TGP Offshore Safety Case (TGP-698-RP-AU-003) describes the implementation of the safety management system which controls risks arising from major incidents and achieves safe operation of the pipeline.

6.10.4 ERA Summary

The complete ERA for the offshore component of the TGP is provided in **Error! Reference source not found.**, however, the risk assessment associated with pipeline integrity management is summarised below.

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
Offshore TGP operation	Subsea gas release due to loss of pipeline integrity (ERA Ref No. 19) as a result of: Physical damage (e.g. dropped objects, dropped / dragged anchors, sinking / grounding ships, dragged	Injury to, or death of, marine fauna in the immediate vicinity of the release.	Low
		Disturbance to marine fauna including mammals, reptiles and other organisms (i.e. altered feeding, nursing, mating or	Low

Activity	Potential incident / hazard	Potential environmental impacts	Residual risk
	fishing equipment or intentional damage); Fatigue damage (free spans) due VIV or subsea currents / natural events (e.g. major storm or seismic activity); Internal corrosion of the pipeline.	migrating behaviour).	
		Scouring / physical damage to benthic communities; and generation of a sediment plume in the water column, potentially leading to smothering of, or reduced light penetration to, benthic communities.	Low
		Temporary and localised change in water quality.	Low

6.10.5 Assessment of ALARP

Loss of Offshore TGP integrity resulting in a subsea gas release is a potential, but extremely unlikely, risk. The potential risk is further reduced by the control measures listed above, particularly the pipeline design (material selection, wall thickness and concrete coating), route selection and continuous monitoring of the TGP through a SCADA system in the Control Room. The TGP has also been externally inspected at regular intervals over the past 12 years and was internally inspected in 2010. No evidence exists that the integrity of the Offshore TGP is compromised and is currently at more than 25% of its 40 year design life. The Offshore TGP has also been designed to withstand a 1 in 100 storm event and any seismic activity expected in the Bass Strait region.

The main potential impacts are only likely to occur in the extreme cases of explosion / flammability or asphyxiation. However, due to the open, high energy marine environment of Bass Strait, any gas cloud is expected to disperse rapidly and not accumulate. It must also be noted that there are no recognised aggregation areas for protected whales or dolphins within the area, and there are also no significant benthic communities within the vicinity of the Offshore TGP. Therefore, the environmental risk associated with loss of Offshore TGP integrity is considered extremely low and therefore ALARP.

6.10.6 Demonstration of Acceptability

For this aspect the residual risk was assessed as low and therefore ALARP. As all relevant standards (TGPPL policy and Industry best practice) and Australian legislative requirements have been met and there were no stakeholder concerns, TGPPL considers the impacts and risk are acceptable in accordance with the criteria defined in Section 5.1.5.

The environmental performance outcomes and environmental performance standards for the controls above are given in Table 9.

7. ENVIRONMENTAL PERFORMANCE OUTCOMES, STANDARDS AND MEASUREMENT CRITERIA

The following section summarises the environmental performance outcomes, performance standards and measurement criteria that have been developed by TGPPL as part of a systematic approach to environmental risk management for the Offshore TGP.

Table 13 provides details of specific performance outcomes, performance standards and measurement criteria for Offshore TGP operation, inspection and maintenance activities. TGPPL accepts and is committed to implementation of these environmental requirements. The performance outcomes, performance standards and documentation provided in Table 13 are used to assess TGPPL's overall environmental performance against stated environmental performance outcomes.

7.1 Environmental Performance Outcomes

As defined in NOPSEMA Guidance Note GN 1344, an environmental performance outcome is a measurable level of performance required for the management of environmental aspects of an activity to ensure that the environmental impacts and risks will be of an acceptable level. Environmental performance outcomes ensure that ongoing environmental performance will meet, or be better than, the acceptable levels defined in the Offshore EP.

Environmental performance outcomes set the level at which an incident becomes a 'recordable incident' (i.e. a breach of an environmental performance outcome) and are also be used as a basis for environmental performance reporting required by Regulation 26C of the Offshore Petroleum and Greenhouse Storage (Environment) Regulations 2009.

The performance outcomes listed in Table 13 are directly linked to the identified hazards, risks, and impacts from the ERA (refer to Section 5) and the controls and mitigation measures implemented to reduce risks and impacts to ALARP (refer to Section 6 and **Error! Reference source not found.**). TGPPL will conduct audits of the performance standards and measurement criteria outlined in Table 13, both prior to and during Offshore TGP inspection and maintenance activities to verify the responsibilities and commitments of this Offshore EP are carried out.

7.2 Performance Standards

In accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009, an environmental performance standard is a "statement of performance required of a control measure", which is a system, an item of equipment, a person or a procedure that is used as a basis for managing environmental impacts and risks for the duration of the activity . Performance standards are the parameters against which control measures are assessed to ensure that they consistently perform to reduce impact or risk to ALARP and to an acceptable level, and are used to determine whether TGPPL is meeting its environmental performance outcomes.

It must be noted that a breach of an environmental performance outcome or performance standard constitutes a recordable incident, which must be reported in accordance with Section 8.7.4 of this Offshore EP.

Performance Standards related to Offshore TGP integrity and safety are provided in the *TGP Offshore Safety Case (TGP-698-RP-AU-003)* and are also referenced in Section 6.10.3 above. The following Offshore Performance Standards have been developed by TGPPL to ensure the integrity of the Offshore TGP:

- *SCADA System / Control Room (TGP-698-ST-RA-001)*
- *Mainline Valves MLV1 & MLV2 (TGP-698-ST-RA-002)*
- *Subsea Pipeline Free Spans & Stability (TGP-698-ST-RA-003)*
- *Corrosion Protection (TGP-698-ST-RA-004)*
- *Subsea Pipeline Wall Thickness (TGP-698-ST-RA-005)*
- *Gas Quality (TGP-698-ST-RA-006).*

7.3 Measurement Criteria and Records

In accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009, Table 13 includes measurement criteria that have been developed by TGPPL to assess whether defined environmental performance outcomes and performance standards have been met.

Table 13 also includes reference to relevant documentation and records required to show whether performance standards for Offshore TGP operation, inspection and maintenance activities have been met.

Table 13: Environment Performance Outcomes, Performance Standards and Measurement Criteria

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
Physical interaction with marine fauna	No injury or death of marine megafauna resulting from vessel strike.	Vessel Master	Vessel Masters briefed on caution and 'no-approach' zones and other interaction management actions as defined in the EPBC Regulations 2000 (Part 8, Division 8.1) and Wildlife (Marine Mammals) Regulations 2009 (Part 3(9)).	Training records confirm that Vessel Masters have been briefed on caution and 'no approach' zones and interaction management actions as defined in the EPBC Regulations 2000 (Part 8, Division 8.1) and Wildlife (Marine Mammals) Regulations 2009 (Part 3(9)).
			A Vessel Master or delegate will be on duty at all times	Bridge watch records confirm a Vessel master or delegate on duty at all times.
		Fauna interaction management actions	Vessels adhere to the distances and vessel management practices of EPBC Regulations 2000 (Part 8, Division 8.1) and Wildlife (Marine Mammals) Regulations 2009 (Part 3(9)) where practicable to do so: • The no-approach and caution zones established for cetaceans will be adhered to; • Operating speeds of 6 knots will apply within caution zones, and Vessel Master to avoid sudden changes in speed or direction; • If the cetacean shows signs of being disturbed, the vessel will immediately move away from the caution zone at a constant	Daily Operations Reports note when cetaceans were sighted in the caution zone, interaction management actions implemented, and the reasoning for lack of action if none was taken.

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
			speed of less than 6 knots; • The vessel will not restrict the path of, or pursue, the cetacean; • During seal pupping season (November to December), interaction with seals will be avoided and vessel speeds will be reduced to less than 10 knots within 200 m of a seal colony and 5 knots within 100 m of a colony; • During seal pupping season, vessels will not pass closer than 100 m of the seal colony; • At all other times of the year, vessels are to travel no closer than 50 m to a seal colony.	
		Fauna observation	Crew members on active duty report observations of megafauna located within the caution zone to the Vessel Master (or their delegate) and TGPPL representatives, as soon as it is safe to do so.	Daily Operations Reports note when cetaceans were sighted in the caution zone.
			All crew members have completed an environmental induction covering the requirements for marine mammal/vessel interaction consistent with EPBC Regulations (Part 8) and Wildlife (Marine Mammals) Regulations 2009 (Part 3(9)) – and are familiar with the requirements. This includes a requirement to notify the bridge and TGPPL representatives if marine mammals are sighted.	Induction records verify that all crew members have completed an environmental induction.

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
Physical disturbance of marine environment	No disturbance to benthic habitats from anchoring.	No anchoring	No anchoring (unless in an emergency)	Vessel logs / anchoring records show no anchoring (unless in an emergency).
	No disturbance to benthic habitats due to dropped objects	Lifting procedures	Lifting procedures are in place and implemented by crane operators (and others such as dogmen).	Completed lifting procedure checklist, PTWs and/or risk assessments verify that procedures are implemented prior to each lift.
		Maintenance and repair procedures	Maintenance and repair activities e.g. jetting, concrete mattress / grout bag installation will be conducted in accordance with approved procedures.	Daily Operations Report verifies maintenance and repair activities conducted in accordance with procedures.
		Compliance with weather limitations during inspection and maintenance activities and vessel to seek shelter in the event of extreme weather	Weather conditions reviewed for acceptability prior to inspection and maintenance activities commencing.	Daily Operations Reports show weather conditions recorded and reviewed against weather limitation and task duration criteria prior to inspection and maintenance activities commencing and on a regular basis during the execution of the works. Daily Operations Report shows criteria applied in accordance with outcome of weather conditions review, and records weather downtime.
		Planned Maintenance System (PMS)	Visual inspection of lifting gear is undertaken every quarter by a qualified competent person (e.g. maritime officer) and lifting gear is tested regularly in line with the PMS.	PMS records and Lifting Register verifies that inspections and testing have been conducted to schedule.
		Cargo Securing	All cargo securely fastened or stored during	A completed pre-departure inspection

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
		Manual	transport in accordance with approved Cargo Securing Manual.	checklist verifies cargo is securely sea-fastened.
		Procedure to recover dropped objects	Lost equipment will be recovered where safe and practicable to do so.	Daily Operations Report shows attempts to recover dropped objects were undertaken where safe and practicable to do so.
Physical interaction with other marine users	Marine users are informed prior to commencement of inspection and maintenance activities such that they are able to plan their activities to avoid unexpected disturbance.	Pre-start notifications	AMSA JRCC notified before operations commence to enable AMSA to distribute an AUSCOAST warning.	Records confirm that information to distribute an AUSCOAST warning was provided to the JRCC before operations commenced. Issued AUSCOAST warning dated prior to, or on the date operations commenced.
			AHS notified before operations commence to allow generation of navigation warnings (including Notice to Mariners).	Issued Notice to Mariners dated prior to, or on the date operations commenced.

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
			Relevant stakeholders are notified of activities approximately four weeks and again one week prior to commencement.	Stakeholder consultation records confirm that information was distributed to relevant stakeholders in required timeframes.
		Navigation charts	Pipeline route shown on marine navigation charts.	Marine navigation charts show TGP route.
Noise	Prevent injury to, or disturbance of, cetaceans due to noise generated during inspection and maintenance activities.	Vessel Master	Vessel Master will adhere to the distances and vessel management practices of EPBC Regulations (Part 8) and Wildlife (Marine Mammals) Regulations 2009 (Part 3(9)) where practicable to do so.	Daily Operations Reports note when cetaceans were sighted in the caution zone, interaction management actions implemented, and the reasoning for lack of action if none was taken.
		Acoustic Survey Procedures	• Observations for whales within a 3 km radius of the survey vessel should commence at least 90 minutes prior to the use of acoustic sources exceeding 140 dB. • Discharge of acoustic sources exceeding 140 dB are not to commence unless no whales are found within a minimum distance of 3km from the vessel; and • Survey start-up procedures will be delayed if whales are encountered within	Daily Operations Reports confirm Acoustic Survey Procedures including cetacean observations, and if required delayed start-up, implemented for acoustic sources exceeding 140 dB.

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
			the 3km radius until they are observed to be travelling beyond this zone.	
Air emissions	Vessel combustion systems operate in accordance with MARPOL Annex VI (Prevention of Air pollution from Ships) requirements.	Compliance with MARPOL Annex IV.	Vessels (as appropriate to class) hold IAPP and operate in accordance with Ship Energy Efficiency Management Plan.	Certification documentation.
			Sulphur content of fuel complies with Regulation 14 (i.e. is no higher than 3.5% m/m).	Manifests for fuel transfers verify use of low sulphur fuel.
			All combustion equipment maintained in accordance with planned maintenance system (PMS)	PMS records verify that combustion equipment is maintained according to schedule.
			Vessels with diesel engines >130kW hold valid EIAPP certification and NOx emission levels comply with Regulation 13.	Certification documentation and records verify compliance with Regulation 13.

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
Wastes – sewage, food waste, treated bilge, deck-drainage, solid waste (garbage) and hazardous wastes	Sewage discharges comply with MARPOL Annex IV (Prevention of Pollution by Sewage from Ships)	Sewage Treatment Plant (STP)	Sewage treated in MARPOL-compliant STP.	International Sewage Pollution Prevention (ISPP) certification.
		Criteria for approved discharge	Discharge of comminuted and disinfected sewage using a MARPOL-compliant STP at a distance of no less than 3NM from nearest land. Discharge of untreated sewage at a distance of no less than 12 NM from nearest land.	Daily Operations Report to confirm availability of STP. Daily Operations Report to confirm treated or untreated sewage discharged no less than 3NM or 12NM distant from nearest land, respectively.
		Planned maintenance system (PMS)	STP maintained in accordance with the PMS schedule.	PMS records verify STP maintained in accordance with schedule.
	Food waste discharges comply with MARPOL Annex V (Prevention of Pollution by Garbage from Ships)	Food waste macerated	Food waste macerated to ≤25 mm (using an onboard macerator) before discharge	Garbage Record Book shows that putrescible waste is macerated before discharge

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
		Criteria for approved discharge	Macerated putrescible waste is only discharged overboard when the vessel is greater than 3 NM from the coastline and while proceeding en-route. Un-macerated putrescible waste is only discharged overboard when the vessel is more than 12 NM from the coastline and while proceeding en-route.	Discharge log verifies location of vessel is >3 NM from the coast (if waste is macerated) or >12 NM (and not within offshore platform PSZ) at time of discharge (if waste is not macerated).
		Planned maintenance system (PMS)	Macerator maintained in accordance with the PMS schedule.	PMS records verify macerator maintained in accordance with schedule.
	Bilge/deck drainage discharges from vessels comply with MARPOL Annex I (Prevention of Pollution by Oil)	Oily water separation equipment	Vessel oily water treated in MARPOL – compliant oily water separator (OWS) (as appropriate to class).	International Oil Pollution Prevention (IOPP) certificate or equivalent appropriate to vessel class.

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
		Criteria for approved discharge	For vessels (as appropriate to class), treated oily water discharge permitted if: Vessel is proceeding en-route Treatment is via a MARPOL-compliant OWS; The discharged oil-in-water (OIW) content is < 15 ppm; Oil Detection Monitoring Equipment (ODME) and control equipment are operating.	Certification documentation Daily Operational Report confirms availability of OWS and ODME. Vessel Oil Record Book verifies all discharges meet <15 ppm OIW Planned Maintenance System (PMS) records confirm OWS and ODME are routinely maintained and calibrated in accordance with PMS schedule. Vessel Oil Record Book verifies residual oil transferred to shore.
	No unplanned overboard release of solid waste or hazardous waste overboard.	Garbage Management Plan.	A Garbage Management Plan in accordance with MARPOL Annex V.	Review of the Garbage Management Plan confirms it is in place and maintained.
		Garbage Record Book	A Garbage Record Book / log in accordance with MARPOL Annex V.	Review of the Garbage Record Book confirms it is in place and maintained
		Waste handling and storage procedures	Handling of solid and hazardous wastes on-board will comply with the requirements of MARPOL Annex V including measures such as; • All solid and hazardous wastes generated at sea during the activity will be retained on the vessel and disposed of onshore (excluding bilge water / deck drainage, foodwaste and sewage). • All waste material that could reasonably be lost overboard is stored securely (e.g. lidded bins).	Garbage Record Book verifies solid and hazardous waste transferred to shore for disposal Inspection verifies that waste is stored and handled according to its waste classification and waste receptacles are properly located, sized, labelled, covered and secured for the waste they hold.

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
			• All wastes including hazardous wastes and chemicals will be segregated into clearly marked containers. • Any liquid waste storage on deck must have at least one barrier (i.e. bunding) to prevent leakage or spillage entering the marine environment.	
Chemical / hydraulic oil spills	No unplanned overboard release of chemicals or hydraulic oil.	ROV operating procedures	ROV operations conducted in accordance with IMCA R 004 'Code of Practice for the safe and efficient operation of Remotely Operated Vehicles'.	Daily operational reports verify ROV operations in accordance with operating procedures.
		Planned maintenance system (PMS)	Maintenance of ROV hydraulic hoses and grout hoses in accordance with PMS schedule.	PMS records verify ROV hydraulic hoses and grout hoses maintained in accordance with schedule.
		Chemical storage and handling procedures	Liquid chemicals stored, and where practicable handled, within secondary containment.	Inspection records confirm liquid chemicals stored within secondary containment.
		Maintenance and repair procedures	Maintenance and repair activities including grout bag filling and installation will be conducted in accordance with approved procedures.	Daily Operations Report verifies maintenance and repair activities conducted in accordance with procedures.

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
		SOPEP (or equivalent)	Spill kits available and maintained in accordance with the SOPEP (or equivalent).	Inspection records show spill kits available and maintained.
			Spill training undertaken in accordance with SOPEP (or equivalent).	Records confirm spill training undertaken.
	Minimise the impact on the environment from a grout release	Chemical selection process	All grout products are rated CHARM silver or gold or non-CHARMable D or E	Chemical inventory records show all grout products are rated CHARM silver or gold or non-CHARMable D or E

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
Ballast water and biofouling management	No introduction and establishment of IMS	Ballast Water Management Plan (BWMP) and Certificate (BWMC)	Ballast Water Management Plan approved in accordance with IMO Ballast Water Management Convention - Guidelines for Ballast Water Management and Development of Ballast Water Management Plans Ballast Water Management Certificate approved in accordance with Regulation E-1 of the Ballast Water Convention	Approved BWMP and BWMC
		Ballast Water Record System	A Ballast Water Record System will be maintained in accordance with Regulation B-2 of the Annex to the IMO Ballast Water Management Convention including: • start and finish coordinates • actual pumping times • residual volume remaining in the tank at the end the empty cycle prior to refill (empty refill method only)	Ballast water records.

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
		Vessel Master	Vessel Master to obtain DAWR clearance to enter Australian territory through pre-arrival information reported through Maritime Arrivals Reporting System (MARS).	Records confirm DAWR clearance obtained if vessel is arriving in Australian territory from a foreign port or is under biosecurity control.
			Vessel Master to adhere to ABWM requirements for ballast water exchange.	Ballast water records show location of ballast water uptake and discharge.
		Biofouling records	Biofouling records maintained in accordance with IMO Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species (IMO Biofouling Guidelines).	Biofouling records collected in order to conduct biofouling risk assessment confirm these are maintained.
		IMS Risk Assessment process	Biofouling risk assessment conducted in accordance with National Biofouling Management Guidance for the Petroleum Production and Exploration Industry and IMO Biofouling Guidelines shows low risk.	Biofouling risk assessment record confirms vessel poses low risk of introducing IMS

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
		Immersible Retrievable - Equipment Cleaning	All immersible retrievable - equipment has been cleaned and / or inspected in accordance with National Biofouling Management Guidance for the Petroleum Production and Exploration Industry prior to commencement of the activity.	Records document cleaning and / or inspection of immersible retrievable - equipment.
Vessel fuel spills	No unplanned release of fuel from vessels to the marine environment.	Vessel crew and navigational equipment	Vessels will meet the crew competency, navigation equipment, watchkeeping and radar requirements of AMSA Marine Order Part 3 (Seagoing qualifications) and Part 30 (Prevention of collisions).	Vessel class certifications are current.

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
		Pre-start notifications	AMSA JRCC notified before operations commence to enable AMSA to distribute an AUSCOAST warning.	Records confirm that information to distribute an AUSCOAST warning was provided to the JRCC before operations commenced. Issued AUSCOAST warning dated prior to, or on the date operations commenced.
			AHS notified before operations commence to allow generation of navigation warnings (including Notice to Mariners).	Issued Notice to Mariners dated prior to, or on the date operations commenced.
			Relevant stakeholders are notified of activities approximately four weeks and again one week prior to commencement.	Stakeholder consultation records confirm that information was distributed to relevant stakeholders in required timeframes.
		Navigation charts	Pipeline route shown on marine navigation charts.	Marine navigation charts show TGP route.
	Minimise the impact on the environment from a fuel spill	SOPEP (or equivalent)	Spill kits available and maintained in accordance with the SOPEP (or equivalent).	Inspection records show spill kits available and maintained.
			Spill training exercises undertaken in accordance with SOPEP (or equivalent).	Records confirm spill training exercises undertaken.

Environmental issue	Performance Outcomes	Controls	Performance Standards	Measurement Criteria
		OPEP	Emergency response activities will be implemented in accordance with the OPEP.	Records confirm that emergency response activities have been implemented in accordance with the OPEP.
		OSMP	Operational and scientific monitoring will be implemented in accordance with the OSMP	Records confirm that operational and scientific monitoring have been implemented in accordance with the OSMP.
Loss of pipeline integrity – hydrocarbon gas leak	No unplanned release of gas from the pipeline.	TGP pipeline operations safety case	A NOPSEMA-accepted safety case is in place for the pipeline operations.	Records confirm a NOPSEMA-accepted safety case is in place for the pipeline operations.

8. IMPLEMENTATION STRATEGY FOR THE ENVIRONMENT PLAN

TGPPL, as facility operator of the TGP, has engaged experienced contractors to undertake inspection and maintenance activities along the Offshore TGP. TGPPL and its contractors are committed to responsible environmental management during TGP operations. Palisade Integrated Management Services (PIMS) / TGPPL has formalised this commitment in their Environment Policy (refer to Appendix C).

All employees and contractors working on the TGP are required to work in line with these policies, their HSEMS and requirements of the TGP Offshore EP. All Offshore TGP activities will be conducted in accordance with the approved Offshore EP as well as relevant International, Commonwealth and State legislation, regulations, conventions and guidelines.

8.1 Introduction

TPG's implementation strategy for this EP has been developed to comply with the requirements of Regulation 14(1) of the OPGGS(E) Regulations and describes the specific measures and arrangements that will be implemented for the duration of the activity to ensure that:

- All environmental impacts and risks of the activity will be continually identified and reduced to a level that is ALARP
- Control measures detailed in the EP are effective in reducing the environmental impacts and risks of the activity to ALARP and acceptable levels
- Environmental performance outcomes and standards set out in the EP are met
- Arrangements are in place to respond to, and monitor impacts of, oil pollution emergencies
- Stakeholder consultation is maintained throughout the activity as appropriate

8.2 Safety Management System

The TGP Safety Management System (SMS) has been developed and maintained to meet the requirements of AS/NZS ISO 9001: 2008, AS/NZS ISO 14001: 2016 and AS/NZS 4801: 2001 and the applicable legislative and regulatory requirements. The following graphical representation of the HSEMS includes the System Requirements and their respective Elements.

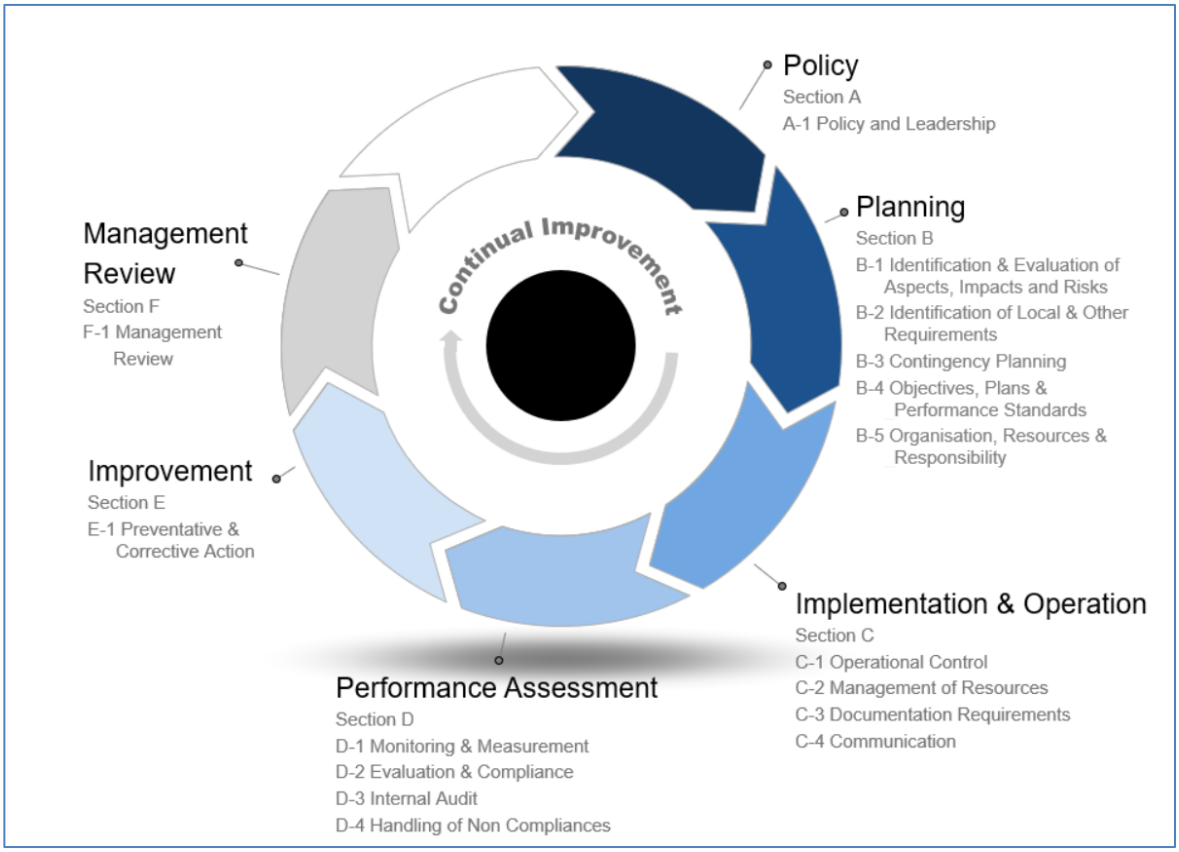


Figure 15: HSE Management System Framework

This framework provides a systematic approach that can both assist with meeting legislative compliance and lead to sustained improvement in HSE performance. This approach will be universally applied across all areas of operation of the TGP. The TGP SMS provides full integration across System Requirements, System Elements, Works Procedures and all other relevant documentation.

All TGP contractors must operate under the TGP SMS or have their own management system that is compatible with the TGP SMS and has been approved by TGPPL.

8.2.1 Management of Change

The TGP *Change Management Plan (TGP-698-PA-CM-001)* details the process by which improvements or changes to plant, systems and documentation are controlled from initiation through to completion. Effective change management ensures continuous improvement within the business. The TGP Change Management Plan applies to all TGPPL assets, both onshore (in Victoria and Tasmania) and offshore in the Bass Strait.

Changes within TGPPL's business can occur in two ways:

- Change imposed on the business from external influences. These changes typically involve changes in legislative requirements or changes in the applicable codes and standards which govern the construction, operations and maintenance activities carried out on the TGP assets
- Changes instigated within the business. These changes typically involve modifications to the assets, modifications to the procedures used to construct, operate and maintain or abandon the asset or changes to the personnel and organizational structures imposed as a result of promotion of personnel, resignations or company restructures

Both internally instigated and externally imposed changes related to the TGP assets need to be managed effectively through the following key steps:

- Notification – either by an internal request for change or an external notification of change

- Assessment – use of a suitable risk assessment tool whereby the threats to the business are identified and control measures put in place, or modified, to mitigate the risks of that change to tolerable levels
- Communication – use of appropriate methods of information dissemination to get the results of the risk assessment to all areas of the business that are affected
- Implementation – the monitoring and review of the Action Plan emanating from the risk assessment to ensure that the actions required to mitigate the risks from the change are effectively carried out
- Documentation – ensuring that the change management process is well documented and that any management plans or procedures that are required to be revised as a result of the change are actioned in a timely manner and approved
- Close out – ensuring that the change management process is completely closed out
- More specifically, the TGP Change Management process will ensure that:
  - Change is a controlled process, fully documented and compliant with the relevant codes, standards and statutory requirements
  - The proposed improvements or changes are technically sound and commercially justifiable
  - All improvements or changes to TGP assets are assessed and approved by competent people
  - All hazards associated with the change are identified and managed to ensure that environmental impacts and risks are managed to ALARP and an acceptable level
  - All documentation, including drawings and procedures, that are affected as a result of the change are updated to reflect the implemented change
  - Operations and Maintenance Management Systems, Emergency Response Systems, Hazard Registers, Equipment Registers and other relevant documents are revised to reflect the change both within TGP and also where applicable within any service provider systems

The TGP Change Management Plan provides details of the following aspects:

- Changes requiring application of the Change Management process and those that do not
- Drawing Change Management
- Change Management Procedure:
  - Change initiation
  - Change Request Form
  - Registering the change
  - Change Control Team / Engineering Meetings
  - Engineering assessment for Change Request
  - Implementation of change
  - Close-out
- Technical Queries; and
- Audit of the Change Management process

Section 8.6.5 addresses change which would result this EP being revised for resubmission.

8.3 Environmental Responsibilities

Overall responsibility for environmental management of the TGP rests with TGPPL. The General Manager TGPPL is responsible for implementation of this Offshore EP and conducting operational,

inspection and maintenance activities in line with Offshore EP requirements; including coordination of contractors offshore.

External contractors are engaged for all Offshore TGP operations, inspection and maintenance activities. Contractor supervisors manage on the ground activities, with the TGPPL Asset Engineer providing direct environmental management support for Offshore TGP inspection, maintenance and operations.

As described previously in Section 1.2, the Control Room is now managed by TWPS. The Control Room Manager, TWPS reports to TGPPL for all environmental matters.

Environmental support is provided by the corporate HSE and technical compliance groups in TGPPL, as well as specialised environmental consultants engaged by TGPPL. All personnel are responsible for ensuring their work complies with this Offshore EP. Figure 8 shows the organisational relationships and roles between all TGP parties. Specific Environmental Responsibilities are listed in Table 14.

All personnel associated with activities on the Offshore TGP are required to be aware of the environmental responsibilities described in this Offshore EP and all other requirements related to working on and around the Offshore TGP. The Offshore EP is included as part of all contractual documents for works on the Offshore TGP and all contractors are required to comply.

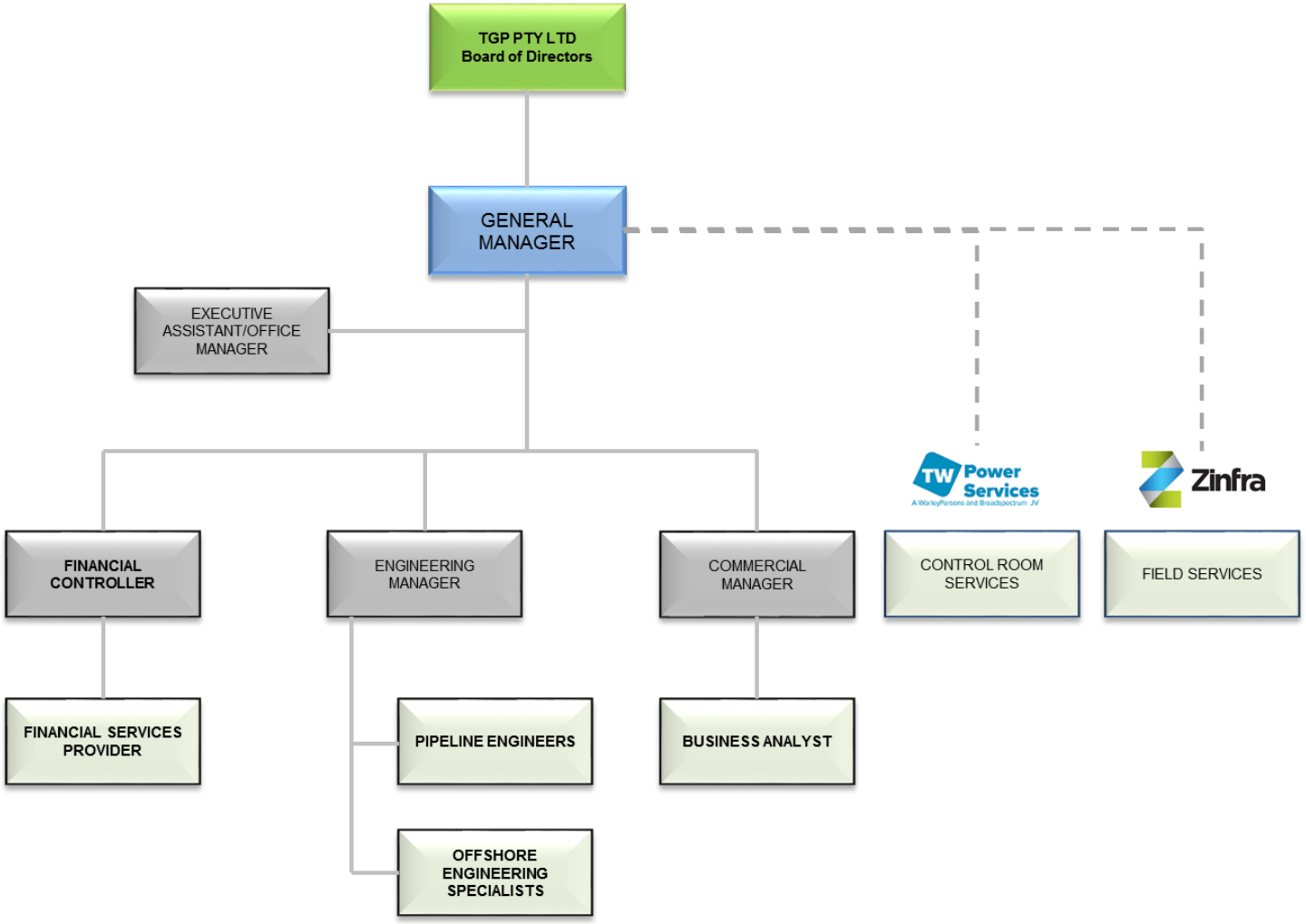


Figure 16: TGP Organisational Structure

Table 14: Environmental Responsibilities

Position Title	Environmental Responsibilities
General Manager TGPPL	Ensure the activity is undertaken as per the performance outcomes of the EP; Ensures that sufficient resources are provided for the implementation of the Offshore EP; Maintenance of the Compliance Calendar; Maintenance of the TGP Offshore ERA / Environmental Aspects and Impacts Register (**Error! Reference source not found.**); Management of the Incident Management System (IMS); Preparation of Training Plans based on Training Needs Analysis for management, staff and contractors; Primary contact for all consultation with relevant stakeholders related to environmental issues associated with the Offshore TGP; Maintenance of all records that monitor performance and demonstration of compliance with TGP Offshore EP and other relevant TGP documentation; Maintenance of a schedule of compliance audits in accordance with the TGP Audit Management Plan (QR4-009PA-AMP). Ensure audits are documented, all corrective actions are implemented and review the effectiveness of the corrective actions; Report environmental incidents in accordance with regulatory requirements; Management of emergency response for the Offshore TGP; Review the EP as necessary and manage change requests (as described in Section 8.2.1).
Engineering Manager TGPPL	Arranges for approval by TGPPL and is responsible for implementation of the EP; Preparation, submission and revision of the EP with input by TGPPL staff and external consultants as required; Manages regulatory relationships and reports to regulatory authorities on environmental matters in accordance with legislative requirements; Coordinates offshore operations and maintenance activities; Manages relationships with contractors. Ensures environmental induction and training program is developed and implemented; Ensures requirements of the Offshore EP are undertaken by TGPPL personnel and contractors; Coordinates the environmental inspection and monitoring program; Monitors environmental performance against KPIs; Emergency Coordinator for the TGP; Ensure environmental incidents are reported and input to the Incident Management System; Contacts senior management and Palisade in the event of a major incident; Maintain liaison with Emergency Services as required; Ensure timely resolution of all environmental issues requiring corrective action as set out in work orders; Participate in emergency exercises and environmental risk assessments.
TGPPL Team, Melbourne	Document control; Record management; Analysing results of major inspections and surveys to determine appropriate additional measures as required; Ensuring adherence to codes, standards and regulations; Monitoring activity on the pipeline by its contractors and providing technical guidance on day-to-day operations; Contributing to planning and providing support for emergency simulation training exercises;

Position Title	Environmental Responsibilities
	Engaging suitable competent and qualified personnel; Undertake audits to ensure Offshore EP compliance.
TGPPL Asset Engineer	Manages relationships with offshore contractors; Provides environmental support to offshore contractors; Management of legislation monitoring.
Emergency Management Team (EMT), TGPPL	Assist the General Manager TGPPL to develop and integrate the TGP Emergency Response Management Plan (ERMP); and Co-ordinate externally-provided emergency training and exercises.
Contractor Supervisor	Implementation of the Offshore EP; Implement the TGP ERMP in the event of an emergency; Ensure monitoring is undertaken as per this EP; Orders STOP WORK for any environmental breaches and reports incident to General Manager TGPPL; Production of monthly reports for the General Manager TGPPL Reports to General Manager TGPPL on all environmental matters, including public complaints, any field based non-compliance; Ensure contractor personnel receive environmental induction.
Control Room Manager, TWPS	Implementation of the Offshore EP; Manage Control Room activities; Ensure environmental responsibilities and due diligence are met; Ensure responsibilities in relation to Offshore EP requirements are adequately resourced; Provide environmental management induction to personnel.
Vessel Master (contractor)	Overall responsibility for HSE management aboard the vessel; Ensure safe execution for all operations of the vessel; Ensure vessel operations are being conducted in accordance with the legislative requirements and this EP, including waste management and emergency/oil spill response; Ensure vessel audits, inspections, emergency drills, training and inductions are undertaken; Communicates hazards and risks to the workforce and the importance of following good work practices. Maintains the site / vessel in a state of preparedness for emergency response. Implement the vessel's SOPEP in the event of an oil spill, including first response to an incident using the resources immediately available to the vessel; Immediately notify the Contractor Supervisor of any incidents/activities arising from vessel operations that are likely to have a negative impact on the performance outcomes detailed in this EP; Reports environmental incidents within the operational area to the Contractor Supervisor; Establish and maintain radio contact with other vessels in the operational area and adjacent waters; Notify AMSA and the General Manager TGPPL in the event of a notifiable oil spill.
Offshore operations / maintenance personnel or contractors	Assist with inspection and maintenance of the Offshore TGP; Adhere to the requirements of the Offshore EP; Undertake Offshore TGP inspection / maintenance activities in accordance with procedures; Participate in environmental induction and emergency response exercises;

Position Title	Environmental Responsibilities
	Report environmental incidents to Vessel Master and TGPPL Asset Engineer in a timely manner commensurate with the severity of incident and regulatory requirements; Participate in risk assessment programs in their designated area of responsibility.

8.4 Environmental Training and Communication

Personnel directly involved in TGP operations are required to be familiar with Offshore EP requirements and their statutory / regulatory obligations. Effective environmental training and communication is achieved through a number of means including:

- Competency checks
- Environmental Induction and Job Specific Training
- SCADA system
- Risk assessment workshops; and
- Electronically including via the Intranet, in newsletters and on noticeboards

8.4.1 Competency of Personnel

All Offshore TGP works are to be undertaken by suitably qualified and competent persons.

Almost all of the works undertaken on the Offshore TGP are performed by contractors. The TGP *Offshore Pipeline Training Competency and Support Plan (TGP-600-PA-HSE-001)* details the skills and abilities that TGPPL will require either in-house or sourced externally using contract organisations.

Skills and aptitudes that are assessed as part of the qualification process include:

- Awareness and knowledge of the existence and requirements of the relevant regulations
- Experience in similar operations
- Familiarity with good industry practice for each of the activities
- Technical competency to approve and monitor the application of engineering solutions during the conduct of the operation

Employee selection, induction, competencies, training requirements, performance review, and training records for TGPPL personnel and contractors working on the TGP (onshore and offshore) are detailed in the TGP *Competency and Training Register (TGP-698-TR-GEN-001).* The primary objective of this Training Program is to ensure appropriately experienced and skilled staff are employed on the TGP to ensure that no harm comes to any persons undertaking activities on the TGP and that all activities are carried out in a safe and efficient manner.

Specific training and competency requirements for TGPPL personnel are listed in the TGP *Competency Register*.

8.4.2 Environmental Induction Training

Each TGP team member, including contractors, must undergo a TGP Induction prior to, or on commencement of, work. Offshore activity specific inductions are given prior to commencement of work campaigns.

This includes an induction to all relevant TGPPL systems and procedures including the Offshore EP, the *Offshore Pipeline Training Competency and Support Plan (TGP-600-PA-HSE-001)* and a field induction covering conditions for operation and maintenance including environment management. The Induction has a particular reference to regulatory requirements and emergency response.

TGPPL will direct all employees and contractors to follow all permit conditions, environmental regulations and to meet the commitments made in this Offshore EP.

All TGGPL personnel and contractors involved in offshore inspection and maintenance campaigns will undergo environmental awareness training prior to the activities commencing as part of their induction.

The environmental awareness component of the induction will include the following:

- Environmental regulatory requirements
- Description of the environmental sensitivities and conservation values of the operational area and surrounding waters
- Roles and environmental responsibilities of key positions as defined in the EP
- Overview of marine fauna interaction management actions consistent with the EPBC Regulations – Part 8 Division 8.1 and Wildlife (Marine Mammals) Regulations 2009
- Overview of the waste management requirements
- Overview of housekeeping and spill prevention
- Procedures for reporting reportable and recordable environmental incidents
- Overview of emergency response and spill management procedures

It is the responsibility of the Contractor Supervisor to ensure that all personnel receive this induction prior to the commencement of inspection and maintenance campaign activities. All induction attendees will sign an attendance sheet to confirm their participation in, and understanding of, the induction which is retained in accordance with the TGP *Records Management Plan* (TGP-698-PA-DM-001).

8.4.3 Job Specific Environmental Training

TGPPL conduct in-house training for management, staff and contractors to provide information and raise awareness of their environmental duties and obligations addressed in this Offshore EP. For each person, a training plan is prepared by the General Manager TGPPL and implemented after conducting a training needs analysis.

Records of training and assessment are maintained to demonstrate individual attainment of skills and appropriate authority to complete work activities.

Contractors are responsible for the delivery of adequate training programs and organising all necessary formal safety and environmental training sessions for their employees in accordance with the TGP *Offshore Pipeline Training Competency and Support Plan (TGP-600-PA-HSE-001).*

8.5 Environmental Consultation

8.5.1 Ongoing Stakeholder Consultation

As per Regulation 11A of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009, in the course of preparing an EP or a revision of an EP, the titleholder must consult each of the following (a “relevant person”):

- Each Department or agency of the Commonwealth to which the activities to be carried out under the EP may be relevant
- Each Department or agency of a State or Territory to which the activities to be carried out under the EP may be relevant
- The Department of the responsible State or Territory Minister
- A person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the EP
- Any other person or organisation that the titleholder considers relevant

Consultation with the community and key stakeholders has been a feature of the TGP from its inception and will continue for the duration of the life of the TGP. Initial consultation prior to construction and during pipeline operations from 1999 to 2012 were undertaken by the previous TGP operator, Tas Gas Networks. During this period most stakeholders indicated they did not have major concerns during construction or operation of the TGP and no issues were recorded.

As the TGP operator, TGPPL undertakes environmental consultation on an as-needs basis. TGPPL has developed the TGP *Consultation Plan (TGP-698-PA-GEN-001)* to regularly assess stakeholder expectations and answer enquiries as they arise. The TGP Consultation Plan outlines the key resources, issues, messages and strategies for communication with those individuals and groups (stakeholders) who have a vested interest in the TGP.

The purpose of the TGP Consultation Plan is to:

- Keep key stakeholders up to date with TGP activities
- Ensure timely response to stakeholder issues; and
- Maintain dialogue with regulatory authorities

A diverse range of stakeholders has been identified as having potential interest in the management of operations along the TGP. Table 15 identifies the relevant stakeholders that have been consulted in the past with respect to the TGP and groups them into broad categories reflecting the Regulations and their differing interests.

Table 15: Relevant Stakeholders

Stakeholder	Group Description
Commonwealth Department or Agency	Department of Agriculture and Water Resources (DAWR) Department of the Environment and Energy - Director of National Parks Australian Maritime Safety Authority (AMSA) Australian Fisheries Management Authority (AFMA) Department of Defence
State or Territory Department or Agency	Victorian Fisheries Authority Department of Environment, Land, Water and Planning (DELWP) (Victoria) Department of Transport (DOT) (Victoria) Environment Protection Authority (Victoria) Transport Safety Victoria – Maritime Safety Parks Victoria Victorian Ports Corporation Heritage Victoria Department of Primary Industries, Parks, Water and Environment (DPIPWE) (Tasmania) Parks and Wildlife Service (Tasmania) Environment Protection Authority (Tasmania) Marine and Safety Tasmania Tasmanian Ports Corporation
Department of the Responsible State Minister	Department of Jobs, Precincts and Regions (DJPR) – Earth Resources Regulator (Victoria) Department of State Growth – Mineral Resources Tasmania (MRT)
Other Relevant Persons or Organisations:	Shire of Wellington Council (Victoria) George Town Council (Tasmania) Lakes Entrance Fishermen's Cooperative Limited (LEFCOL) South East Trawl Fishing Industry Association (SETFIA) Seafood Industry Victoria Sustainable Shark Fishing Association Victorian Scallop Fishermans Association Scallop Fishermen's Association of Tasmania Tasmanian Seafood Industry Council Commonwealth Fisheries Association Southern Shark Industry Alliance Victorian Rock Lobster Association EastRock Southern Rocklobster Limited Tasmanian Rock Lobster Fishermans Association Abalone Council Australia Victorian Abalone Council Tasmanian Abalone Council Gippsland Ports Esso Australia Resources Pty Ltd Seven Group Holdings

Stakeholder	Group Description
	Bass Oil CarbonNet Cooper Energy Basslink Indigo Cable Gunai-Kurnai Land Council Mirimbiak Nations Aboriginal Corporation Tasmanian Aboriginal Land Council

The General Manager TGPPL is the primary contact for all consultation with relevant stakeholders related to environmental issues associated with the Offshore TGP. All communications with stakeholders pertaining to environmental matters to date has been recorded in an Environmental Correspondence Log (as required under Section 11A of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009, Section 19(b) of the Victorian Offshore Petroleum and Greenhouse Gas Storage Regulations 2011 and Section 22(b) of the Tasmanian Petroleum (Submerged Lands) (Management of the Environment) Regulations 2012 (refer to **Error! Reference source not found.** for a summary of all correspondence with relevant stakeholders).

Prior to any inspection and maintenance activities associated with the Offshore TGP, TGPPL will inform the relevant regulatory authorities, government agencies and other stakeholders. Appropriate consultation and effective liaison will be maintained, which will be recorded in a consultation log.

TGPPL also provides printed awareness documents such as 'Beware the Pipeline – It's a Gas One' to commercial fisheries (e.g. SETFIA) to warn them of the dangers of towing fishing gear (e.g. trawl boards) in the vicinity of the Offshore TGP.

To date, no stakeholders have lodged objections to Offshore TGP activities or enquired about current Offshore TGP operations or inspection and maintenance activities. The low level of comments received is generally attributed to the location of the Offshore TGP on the seabed and the unobtrusive, infrequent nature of Offshore TGP operations, inspections and maintenance activities.

If any enquiries or issues are to arise, TGPPL will provide stakeholders with an appropriate response in line with the TGP *Consultation Plan (TGP-698-PA-GEN-001).*

8.6 Performance Monitoring and Review

The General Manager TGPPL is responsible for maintaining all records that monitor performance and demonstrate compliance with the requirements of the TGP Offshore EP and other relevant TGP documentation.

TGPPL's operations, systems and processes are monitored and, where required, measured to ensure the effectiveness of the TGP Offshore EP and compliance with relevant legal and other requirements.

Details of specific reporting requirements with respect to environmental performance are provided in Section 8.7.

8.6.1 Monitoring of Legislation

TGPPL is required to identify changes to codes and standards, review applicable procedures and ensure the knowledge is transferred to the relevant areas. The TGPPL Asset Manager is responsible for ensuring that this monitoring occurs.

As detailed in the TGP *Compliance Plan (QR4-004PA-CP),* TGPPL regularly reviews legislation (Acts and Regulations) to ensure that TGP policies, plans and procedures are current and legally

compliant. TGPPL is also responsible for maintaining legislative compliance knowledge in the business and for updating the Compliance Register. These functions are achieved by:

- Subscribing to Standards Australia and Lawlex
- Assigning responsibilities for monitoring changes to standards, codes and legislation
- Ensuring that changes are communicated to all parts of the business in an effective manner
- Regular reviews of critical legislation, codes and standards; and
- Participation on industry and government committees and workshops on proposed changes

Up-to-date compliance requirements are listed in the TGP *Compliance Plan (TGP-698-PA-RA-001).* Upon the receipt of a notification of a change in legislation relevant to the business, the change management procedure is followed in accordance with the TGP *Change Management Plan (TGP-698-PA-CM-001).* This includes a risk assessment process which may result in the addition of compliance measures to the Compliance Plan.

Changes to legislation are to be communicated to all relevant TGPPL personnel and contractors.

8.6.2 Regulatory Audits

Regulatory audits will be conducted as required by regulatory authorities. Generally, this is anticipated to be annually by NOPSEMA. All regulatory audit schedules are subject to change based on the requirement of the authority and the occurrence of environmental incidents.

8.6.3 Audits, Assessments and Inspections

Environmental performance assurance of the TGP operations activities will be undertaken in a number of ways. Performance assurance is undertaken to ensure that:

- Controls are implemented in accordance with EPSs to achieve the EPOs
- Non-compliances and opportunities for improvement are identified; and
- Environmental monitoring and reporting requirements are met

8.6.3.1 Support Vessel Activities

A due-diligence pre-activity inspection / audit of support vessels will be carried out prior to inspection and maintenance work commencing (after contract award) to verify that procedures and equipment for managing routine discharges and emissions are in place (as described in pre-qualification material) to enable compliance with the TGP Offshore EP.

8.6.3.2 Compliance Audits – Implementation Strategy

TGPPL will conduct audits of TGP performance outcomes, standards and measurement criteria outlined in Table 13 during Offshore TGP inspection and maintenance activities (and as scheduled for all other activities) to verify the responsibilities and commitments of this TGP Offshore EP are carried out.

TGPPL will ensure that:

- All activities are managed in accordance with the TGP Environmental Policy and relevant TGPPL procedures
- All activities comply with regulatory requirements
- Vessels carry all relevant certificates, procedures, logs, training records and equipment as outlined in this TGP Offshore EP
- All maintenance and repair activities are carried out consistent with Maintenance schedules and Work programs

- Vessel Emergency Response Plans (ERPs) are current and all emergency drills have been undertaken and recorded
- All personnel are aware of their environmental obligations and have received appropriate inductions and training; and
- All reporting requirements and schedules are met with adequate records kept

8.6.3.3 Compliance Audits - EP

The General Manager TGPPL maintains a schedule of compliance audits for the Offshore TGP in accordance with the TGP *Audit Management Plan (TGP-698-PA-AU-001)*. Compliance audits of this Offshore EP are to be completed annually to ensure that it continues to conform to relevant legislative requirements. The TGP AMP outlines the requirements for compliance audits.

The TGP AMP covers all the activities involved in the maintenance and operation of the onshore and offshore sections of the TGP and describes the types of audits and the activities and resources necessary for planning, organising and conducting audits. The Audit Management Plan lists the types of audits and the specific activities and resources required to conduct the audits effectively and efficiently within the specified timeframes for the program, and also describes the methodology to be used in conducting audits.

The General Manager TGPPL has ultimate responsibility for the TGP AMP. The General Manager TGPPL will ensure the establishment, implementation, monitoring, review and improvement of the AMP every 12 months and also ensure that the resources necessary to conduct the Audit Program are identified and provided. The General Manager TGPPL is also responsible for:

- Ensuring Offshore EP compliance audits are scheduled and performed
- Undertaking the ERAs as required
- Ensuring the results of audits are fully documented and maintained
- Ensuring that corrective actions are implemented for any non-compliances / non-conformances identified; and
- Reviewing the effectiveness of the corrective actions once completed

Copies of the results of these compliance audits will be made available to the appropriate regulatory authorities upon request.

The work that contractors perform to maintain the Offshore TGP will be audited in line with the TGP AMP to ensure appropriate standards are met on routine and project works. This is anticipated to be on an annual basis. In addition, each major inspection and maintenance contractor will be visited at least annually for an end-to-end audit of their management systems and processes. Where shortfalls exist, corrective action requests will be raised and the close out of these items will be monitored through contractor management meetings.

For further details regarding TGP audits and the management of associated non-conformances, recommendations / corrective and preventative actions, refer to Sections 4.5.3, 4.5.4 and 4.6.2 of the *TGP Offshore Safety Case (TGP-698-RP-AU-003).*

8.6.4 Monitoring of Emissions and Discharges

Table 16 provides a summary of the environmental monitoring requirements. The Contractor Supervisor is responsible for ensuring the monitoring is undertaken as per this EP.

Table 16: Environmental Monitoring

Aspect	Criteria	Reporting
Accidental release of solid or hazardous waste	Waste type, volume	Incident report Annual Environmental Performance Report

Aspect	Criteria	Reporting
Accidental release of hydraulic fluid or other liquid chemical	Chemical type, volume	Incident report Annual Environmental Performance Report
Accidental fuel spill	Volume	Incident report Annual Environmental Performance Report
Anchoring	Occurrence	Incident Report Annual Environmental Performance Report
Unrecovered dropped object	Object type, location	Incident report Annual Environmental Performance Report
Interactions with marine megafauna	Interaction type, management actions taken, if any, and reason for no action	If incident breaches relevant EPO or EPS – incident report Annual Environmental Performance Report
Oily water (bilge) discharge	Volume, compliance with MARPOL (oil-in-water concentration, vessel moving or stationary)	If incident breaches relevant EPO or EPS – incident report Annual Environmental Performance Report
Putrescible waste discharge	Volume, compliance with MARPOL (macerated or unmacerated, vessel moving or stationary, distance from nearest land)	If incident breaches relevant EPO or EPS – incident report Annual Environmental Performance Report
Sewage discharge	Volume, compliance with MARPOL (treated or untreated, vessel moving or stationary, distance from nearest land)	If incident breaches relevant EPO or EPS – incident report Annual Environmental Performance Report
Ballast water uptake / discharge	Exchanged volume, distance from nearest land	If incident breaches relevant EPO or EPS – incident report Annual Environmental Performance Report
Waste to shore	Type, volume	Annual Environmental Performance Report

8.6.5 Review of the Offshore EP

The Offshore EP shall be reviewed and resubmitted for approval by the Regulatory Authority (NOPSEMA) in the following circumstances:

- Every five (5) years from the date of last acceptance, as required under Section 19 of the Commonwealth Offshore Petroleum and Greenhouse Gas Storage Regulations (Environment) 2009

- In the event that a new or increased environmental risk is identified
- In the event that there is any change or proposed change in circumstances or operations that results in a significant additional or modified risk not provided for in the existing EP (refer to Section 8.2.1 for Change Management process); and
- When requested by NOPSEMA

Other examples of changes that may require the Offshore EP to be revised and resubmitted include:

- Change in permit title holder or operator in relation to an activity
- Significant change in timing or location
- Introduction of a new stage of an existing activity, new facilities or activities or modification of existing facilities or activities that fall outside the accepted EP; and
- Following an event which highlights that environmental impacts or risks of an activity are greater than those predicted and agreed to in the accepted EP (e.g. chemical spill)
- New stakeholders raise new issues which after evaluation have the potential to significantly increase the risk of interference with the stakeholder interests beyond that addressed in the accepted EP

The EP revision shall include a re-evaluation of the ERA, environmental performance outcomes and implementation strategy.

8.7 Environmental Reporting

8.7.1 Internal Reporting

Regular contact is maintained between TGPPL and its contractors. Monthly reports are distributed to the General Manager TGPPL by Contractor Supervisors. These reports provide details of TGP operations and include number of environmental incidents reported, number of environmental issues identified and number of environmental issues rectified. Contractors are also required to provide TGPPL with regular reports on the results of inspections. Reports may be immediate or at intervals dependent upon their nature. Verbal or emailed advice is followed up by a formal report.

All reports are kept in accordance with the TGP *Records Management Plan (TGP-698-PA-DM-002).*

8.7.2 Reporting to Regulatory Authorities

Regular contact will be maintained between TGPPL and Regulatory Authorities, with meetings held and reports prepared as required. A report shall be submitted by TGPPL to NOPSEMA on an annual basis to describe environmental performance of the Offshore TGP in accordance with the Offshore EP. The report shall provide sufficient information on the monitoring program to enable authorities to determine if the Offshore TGP environmental performance outcomes and standards have been met, and shall include:

- Description of inspection and maintenance activities completed and those planned within the next reporting period
- Outcomes of inspection and maintenance activities completed
- Performance against environmental performance outcomes and standards identified in the Offshore EP
- A summary and analysis of non-conformances and corrective action requests where they relate to the Offshore EP
- A summary and analysis of reportable and recordable environmental incidents occurring within the report period (refer to Sections 8.7.4 to 8.7.5 below)
- Trends in emissions and discharges

- A summary of complaints received from the public and any actions taken to rectify the identified issues
- Findings of any internal compliance audits conducted during the reporting period
- A summary of any environmental studies associated with the facility, technical improvements, consultation undertaken and any other relevant environmental information; and
- Opportunities for future improvements

An annual report is also submitted to the Tasmanian Department of State Growth (Mineral Resources Tasmania (MRT)) and Victorian Department of Jobs, Precincts and Regions (DJPR).

Where applicable, TGPPL is responsible for submitting an emissions report to the National Pollutant Inventory (NPI), a section of the Commonwealth Department of the Environment and Energy (DoEE). This occurs annually if the defined thresholds for any of the 93 listed NPI substances are exceeded.

8.7.3 Environmental Incident Reporting

'Incidents' are defined as unplanned events with undesirable consequences. The consequences of such incidents may result in environmental damage or asset loss.

If an environmental incident occurs with the potential for serious environmental harm, all personnel will take all reasonable actions to minimise any adverse environmental impacts. All environmental incidents shall be recorded and managed according to the TGP *Incident Reporting and Investigation Procedure (TGP-698-PR-HSE-002).*

All environmental incidents and near misses associated with Offshore TGP activities must be reported to the General Manager TGPPL, in particular:

- All loss of containment or releases of liquids, solid, or gas
- Any dangerous goods or hazardous substance spills (any volume or weight);
- Complaints by stakeholders
- Regulatory Breaches – Fines, Prosecutions, Improvement Notices, Breaches of licence conditions
- Property damage or loss
- Loss or damage to marine flora or fauna of significance

Reporting shall occur as soon as possible after the incident has occurred to ensure that TGPPL and its contractors meet their regulatory obligations. In some cases, reporting to the Regulatory Authority is required within 2 hours of the incident (refer to Table 17). The General Manager TGPPL shall ultimately determine whether the incident should be reported to the regulatory authorities.

Information recorded for all Offshore TGP incidents shall include:

- Initial Report & Notification detailing facts about the incident
- The classification of the incident including 'environment', 'injury / illness', 'damage (property / equipment, etc.)'
- For environmental incidents, the type of environmental impact including water, air, land, noise, flora / fauna, cultural heritage or waste management
- Whether the incident relates to a contaminant spill or release
- Specific details and sources if relating to fires
- Risk assessment based on TGP risk matrix
- Whether the incident resulted in Regulatory Non-compliance
- Whether the incident resulted in security breaches

- Investigation of the incident; and
- Actions for resolution

All Offshore TGP incidents are to be reported immediately and recorded on Part 1 of the TGP *Incident Report and Investigation Form* using the instructions provided in the form. An incident involving a contractor or service provider undertaking work on TGPPL's behalf must be reported to TGPPL immediately and may be recorded on a contractor incident report form, if approved by TGPPL.

The TGP *Incident Report and Investigation Form,* with Part 1 completed, is sent to the General Manager TGPPL, or suitably qualified delegate, who will decide whether the incident is reportable or not. Environmental incidents requiring reporting to regulatory authorities and other government agencies are outlined in Section 8.7.5 below.

8.7.4 Recordable Environmental Incidents

A recordable incident is any breach of an environmental performance outcome or performance standard identified in this TGP Offshore EP, that is not a reportable incident. Performance outcomes and performance standards are listed in Table 13 of Section 7, as part of the Implementation Strategy for the Offshore EP.

Monthly reports of recordable incidents are submitted to NOPSEMA, DJPR and MRT at the end of each calendar month and contain details of:

- All recordable incidents that occurred during the month
- The material facts and circumstances relating to recordable incidents that the operator knows of or is able, by reasonable search and enquiry to find out;
- Any action taken to avoid or mitigate any adverse environmental impacts of the incident; and
- The corrective / preventative action that has been taken, or is proposed to be taken, to prevent similar incidents

8.7.5 Reportable Environmental Incidents

Reportable environmental incidents are those that:

- have caused moderate to significant environmental damage; or
- have the potential to cause moderate to significant environmental damage

This includes but is not limited to those identified through the risk assessment as having a consequence ranking of I or II, or at a minimum the following incidents:

- An uncontrolled release of hydrocarbons or hazardous chemicals >80 L to the environment
- An uncontrollable gaseous release to atmosphere of >300 kg; and
- Disturbance to a particular sensitivity associated with an activity, e.g. injury or death of a species of conservation value or damage to habitat of importance to those species

Commonwealth and State regulatory requirements for reporting environmental incidents are summarised in Table 17. Reports to all Regulatory Authorities shall, as a minimum, cover the following:

- All material facts and circumstances concerning the incident that the operator knows of, or is able, by reasonable research or enquiry, to find out
- Any action taken to avoid or mitigate any adverse environmental impacts of the incident; and
- The corrective / preventative action that has been taken, or is proposed to be taken, to prevent similar incidents

Table 17: Environmental Reporting Obligations

Legislation	Reference	Obligation	Regulatory Authority	Frequency
Commonwealth				
Environment Protection and Biodiversity Conservation Act 1999	Section 199	**Notify** – Death or injury to listed threatened species or listed ecological community	DoEE	Notify the secretary within 7 days of becoming aware of the action, by telephone or by any other electronic equipment.
	Section 214	**Notify** – Death or injury to listed migratory species		
	Section 256	**Notify** – Death or injury to marine wildlife		
-	-	**Notify – Cetacean vessel strike**	DoEE	Within 3 days
Offshore Petroleum and Greenhouse Storage (Environment) Regulations 2009	Regulation 26	**Notify** – Reportable environmental incidents	NOPSEMA	NOPSEMA must be notified of all reportable environmental incidents as soon as practicable, but no later than 2 hours after the incident occurs or 2 hours after the operator becomes aware of the incident. The operator must, as soon as practicable, but not later than 3 days after the occurrence of a reportable environmental incident, submit a written report to NOPSEMA. Ph: (08)6461 7090 Email:submissions@nopsema.gov.au The written incident report must also be provided to the National Offshore Petroleum Titles Authority (NOPTA). Email:info@nopta.gov.au
	Regulation 26A	**Report** – Reportable environmental incidents		
	Regulation 26B	**Report** – monthly reporting of recordable incidents	NOPSEMA	End of each calendar month (before 15th day of following calendar month) if there has been an incident in that month. A nil incident report will not be submitted.
	Regulation 19	**Submit** – Revised Offshore Environment Plan (EP)	NOPSEMA	Every 5 years
Protection of the Sea	-	**Notify – Oil spill only**	AMSA	AMSA must be notified within 1 hour.

Legislation	Reference	Obligation	Regulatory Authority	Frequency
(Prevention of Pollution by Ships) Act 1983				Ph: 1800 641 792 Email: mdo@amsa.gov.au
Navigation Act 2012	Marine Order 91 (Marine pollution prevention – oil) 2014 Marine Order 93 (Marine pollution prevention – noxious liquid substances) 2014 Marine Order 94 (Marine pollution prevention – packaged harmful substances) 2009	**Notify** - Vessel Master to notify AMSA about a pollution incident involving: •a discharge (or probable discharge) of oil or noxious liquid substances in excess of permitted MARPOL discharge levels, quantities or rates, for whatever reason, including those for the purpose of securing the safety of the ship or for saving life at sea •a discharge (or probable discharge) of harmful substances in packaged form, including those in freight containers, portable tanks, road and rail vehicles and shipborne barges. **Report** - If AMSA asks for a written MARPOL report. Report to include: •name of ship/s involved •time, type and location of incident •quantity and type of harmful substance •assistance and salvage measures •any other relevant information	AMSA	Verbally without delay. If requested a written report must be provided within 24 hours after AMSA asks for the report.
Victoria				
Offshore Petroleum and Greenhouse Storage Regulations 2011	Regulation 22	**Submit** – Revised Offshore Environment Plan (EP)	DJPR	Every 5 years
	Regulation 29	**Notify** – Reportable environmental incidents	DJPR	DJPR must be notified of all reportable environmental incidents as soon as practicable, but no later than 2 hours after the incident occurs or 2 hours after the operator becomes aware of the incident. The operator must, as soon as practicable, but not later
	Regulation 30	**Report** – Reportable environmental incidents		

Legislation	Reference	Obligation	Regulatory Authority	Frequency
				than 3 days after the occurrence of a reportable environmental incident, submit a written report to DJPR.
	Regulation 31	**Report** – monthly reporting of recordable incidents	DJPR	End of each calendar month
Marine (Drug, Alcohol and Pollution Control) Act 1988	Victorian Marine Pollution Contingency Plan	**Notify** – Incident that causes or may cause environmental harm	DJPR/DoT	Notify DEDJTR (State Duty Officer) as soon as possible by phone followed by an email. Ph: 0409 858 715 Email: sccvic.sdo.dedjtr@scc.vic.gov.au
-	-	**Notify** – Oiled wildlife	DJPR	Immediately
-	-	**Notify** – Wildlife emergency	DELWP	Immediately
-	Report a pest (as per marinepests.gov.au website):	**Notify** – Suspected or known introduction of IMS	DELWP	Immediately
Tasmania				
Environmental Management and Pollution Control Act 1994	Schedule 3	**Report** – Incident causing threatening environmental nuisance or serious or material environmental harm from pollution	Director, EPA Tasmania	By phone as soon as reasonably practicable, but not later than 24 hours. By hand or by fax, not later than 24 hours.
	Section 32(3)	**Notify** – Incident that causes or may cause environmental harm	Director, EPA Tasmania	By phone as soon as reasonably practicable, but not later than 24 hours. By hand or by fax, not later than 24 hours. Report the incident directly to EPA's Hotline: 1800 005 171.
Petroleum (Submerged Lands) (Management of Environment) Regulations 2012	Regulation 25	**Revise and Submit** – Environmental Management Plan	MRT	Every 5 years
	Regulation 32 Regulation 33	**Revise and Submit** – Environmental Management Plan	MRT	Every 5 years

Legislation	Reference	Obligation	Regulatory Authority	Frequency
	Regulation 32 Regulation 33	**Report** – environmental incidents	MRT	MRT must be notified of all reportable environmental incidents as soon as practicable, but no later than 2 hours after the incident occurs or 2 hours after the operator becomes aware of the incident. The operator must, as soon as practicable, but not later than 3 days after the occurrence of a reportable environmental incident, submit a written report to MRT.
	Regulation 34	**Report** – monthly reporting of recordable incidents	MRT	End of each calendar month
-	-	**Notify** – Wildlife emergency	Parks and Wildlife Service	Immediately

8.7.6 Complaints Procedure

In the event of an environment-related complaint from the public regarding noise, waste, air emission or a general pipeline operational issue, the Contractor Supervisor should notify the General Manager TGPPL, who will document responses and actions to manage the complaint. However, it must be noted that public complaints related to the Offshore TGP and associated inspection and maintenance activities are highly unlikely due to the fact that it is a subsea pipeline located at water depths of up to 80 m.

If required, the General Manager TGPPL will contact the relevant authorities in accordance with statutory/regulatory requirements.

8.7.7 Corrective / Preventative Actions

Any corrective / preventative actions resulting from environmental incidents, audits, monitoring or site inspections will be documented using the TGP Incident Management System. When an environmental incident occurs or personnel identify a potential incident, an improvement request is raised and appropriate controls and corrective / preventative actions are developed and implemented to resolve any issues.

All incidents and associated corrective / preventative actions are recorded and maintained by the General Manager TGPPL and communicated to all relevant TGP personnel.

8.7.8 Reporting Responsibilities

The General Manager TGPPL is responsible for the initial reporting of significant non-compliances with this Offshore EP or relevant legislation to TGPPL senior management and to the relevant regulatory authorities in accordance with legislative requirements.

The Contractor Supervisor is responsible for reporting any field based non-compliances to the General Manager TGPPL.

The General Manager TGPPL is the primary contact for government environmental agency officers with regard to environmental issues. Other environmental responsibilities are described in Section 8.3.

8.7.9 Incident Investigation and Corrective Actions

Where reportable incidents must be investigated, a recognised investigation tool, such as Incident Cause Analysis Method (ICAM) or Root Cause Analysis (RCA) shall be used. In the event of a major incident, the General Manager (TGPPL) may consider involving external or independent expert(s) in the incident investigation process.

Once the incident investigation has been completed, the investigator and the General Manager (TGPPL) shall identify any corrective and preventive actions required. Corrective and preventative actions arising from the incident investigation are recorded on the TGP Incident Report and Investigation Form and action registers. Once the actions have been completed and signed off, the incident can be closed out.

Lessons learned from incident investigations are communicated to all TGP personnel and relevant contractors / service providers through regular meetings and other methods of communication. Where appropriate, an incident review alert will be posted to all team members by the General Manager (TGPPL) following completion of the incident investigation.

All incident reports, investigation records, including documents such as interview notes, JHAs, written notifications, sketches, are to be kept for a minimum 7 years after occurrence. If, as a result of an incident, health monitoring is required, then these records are kept for a minimum of 30 years.

8.8 Environmental Records and Document Control

8.8.1 Records

Retention of records is an integral part of environmental management of the Offshore TGP, as evidence of compliance with applicable legislation and Offshore EP requirements. All environmental management documentation is securely stored and managed according to the TGP *Records Management Plan (TGP-698-PA-DM-001)*.

In accordance with relevant regulations, documents to be stored shall include, but not be limited to:

- The Environment Plan (EP) in force for the activity
- Revisions of the EP
- Written reports (including inspection, monitoring, audit and review reports) about environmental performance or about the implementation strategy under the EP
- Records of calibration and equipment maintenance used in accordance with the EP
- Records and copies of report relating to reportable incidents and recordable incidents (refer to Section 8.7)
- Corrective action reports
- Environmental induction records
- Emission and discharge reports
- Waste log forms

All records shall be stored and retained for specific periods as outlined in the TGP *Records Management Plan (TGP-698-PA-DM-001).* This plan provides guidance on what information requires collecting and storing and timelines. Generally, legislation requires an operator to store and maintain records for a minimum period of 5 years.

8.8.2 Document Control

All TGP documents, including design, construction, commissioning and operational documentation, are securely stored in electronic format on a SharePoint document management system, which is available to TGP personnel via a secure login only. The server itself is housed in an offsite data centre and there are daily backups of data. TGP documents are managed in accordance with the TGP *Records Management Plan (TGP-698-PA-DM-001)*.

All TGP documents are controlled within the TGP SharePoint System to ensure that only the latest versions of documents are available to TGP personnel at all times. Printed or downloaded copies of TGP documents are deemed to be uncontrolled.

The TGPPL Engineering Manager is responsible for administration of the TGP SharePoint System. The Document Controller is responsible for ensuring that the document management processes for TGP documents and records are applied. Hard copy records are also stored offsite at a Recall facility, with registers and catalogues available for each box in storage. Offsite records can generally be retrieved within 24 hours.

Hard copy manuals containing specific drawings and procedures are also located in the Control Room, Zinfra field offices and at each Onshore station. All field staff are responsible for ensuring the hard copy manual is kept up-to-date with latest versions of drawings and procedures.

9. EMERGENCY PREPAREDNESS AND RESPONSE

9.1 Overview

The overall responsibility for management of emergency response for the Offshore TGP lies with the General Manager TGPPL. The General Manager TGPPL is accountable for ensuring that TGP emergency response arrangements are developed and implemented to facilitate coordinated and timely responses, and ensure that risks associated with possible emergencies are reduced to be ALARP. Accordingly, TGPPL maintains an *Emergency Response Management Plan (ERMP) (TGP-698-PA-EM-001),* which outlines TGPPL's response management procedures in the event of emergencies occurring during the operation, inspection and maintenance of the TGP.

All major emergencies are coordinated primarily through the General Manager TGPPL. The General Manager TGPPL, or the manager's delegate, is accountable for leading the Emergency Response Team (ERT). At all times, adequate numbers of key personnel are available to respond to an emergency and to minimise its effects on personnel, the community, the environment, customers and the TGP.

In the event of an emergency, TGPPL will institute an emergency response structure as described in the TGP ERMP and subordinate documentation, as well as involving key TGPPL staff and managers in their relevant areas of expertise and roles.

Responsibility for Offshore TGP emergency field response lies with TGPPL. TGPPL may enlist the support of Zinfra if required, particularly in the event that isolation of the offshore section is required. If instructed to do so by TGPPL, Zinfra will close the MLVs through the Control Room. Zinfra maintains its own Emergency Response Plans which are integrated with the TGP ERMP. The Zinfra plans provide a common approach for Zinfra with a link back to TGPPL in the management of a major event involving the TGP pipeline. Notwithstanding the use of Zinfra plans, the co-ordination of emergencies involving TGP assets is primarily through the General Manager TGPPL or the manager's delegate.

Details of the emergency response organisational structures are documented in the TGP *Emergency Response Management Plan (TGP-698-PA-EM-001)* and the accompanying TGP *Emergency Response Action Plan (TGP-698-PA-EM-003).* These emergency response documents are outlined in Section 9.2 below.

Where the incident is deemed to be, or has the potential to escalate to, a crisis level then senior executives within TGPPL will be engaged as part of the Crisis Management Team (CMT).

9.2 Emergency Management Documentation

A comprehensive suite of emergency management documentation is in place which describes emergency management protocols and provides alignment between TGPPL, Zinfra and key contractors and stakeholders. The documents address high level strategic issues through to field based tactical response methods. The primary documents related to emergency response for the TGP are listed below:

TGP *Emergency Response Management Plan (TGP-698-PA-EM-001)* (ERMP) is the overarching emergency response document comprising:

- Incident escalation and notification structure
- Emergency response – command and control structure
- Roles and responsibilities
- Details of support facilities; and
- Contact details

The ERMP is supported by a suite of subordinate plans and procedures related to TGP emergency management, including:

- *TGP Offshore Emergency Response Action Plan (TGP-698-PA-EM-003)*
- *Offshore Oil Pollution Emergency Plan (OPEP) (Section 9.4 of this EP)*
- *Offshore Repair Manual (TGP-600-PA-EM-002)*
- *Storage and Maintenance Plan for Offshore Repair Equipment (TGP-600-PA-EM-006)*

In the event of an emergency, the relevant emergency response documents are to be actioned and the General Manager TGPPL immediately notified.

For further details of emergency response documents related to the Offshore TGP, refer to Section 2.13.3 of the *TGP Offshore Safety Case (TGP-698-RP-AU-003).*

9.3 Emergency Response Training

Personnel working on the TGP participate in regular training exercises that cover emergency response and pipeline isolation procedures, repair procedures and equipment mobilisation. All new staff receive emergency response induction training.

Exercises are held approximately two times per year and are designed and controlled by TGPPL.

For further details regarding emergency response training related to the Offshore TGP, refer to Section 2.13.9 of the *TGP Offshore Safety Case (TGP-698-RP-AU-003).*

9.4 Oil Pollution Emergency Plan

The development of an Oil Pollution Emergency Plan (OPEP) is required by Regulation 14(8) of the OPGGS(E) Regulations.

This OPEP comprises relevant components of the inspection and maintenance vessel's SOPEP and the National Plan for Maritime Environmental Emergencies (NATPLAN) (AMSA 2014). Once contracting has been finalised, the SOPEP for the vessel selected for the inspection and maintenance activity will be incorporated into the OPEP arrangements for this EP. The vessel's SOPEP and response arrangements will be tested prior to the commencement of the inspection and maintenance activities, and in line with Section 9.4.7.

NATPLAN applies to all spills from vessels in Commonwealth waters. The SOPEP recognises the divisions of responsibility to provide effective response to marine pollution incidents, as defined under NATPLAN. The SOPEP is the principal response document that will be implemented in the event of a marine oil spill, which provides specifics and provision for guiding management response to mitigate oil spills from vessels. Examples of emergency procedures that are defined in SOPEPs include steps to control:

- Collision
- Hull damage
- Tank failure
- Vapour release
- Fire and explosion
- Bunkering spills
- Sinking

9.4.1 First points of contact following a spill

9.4.1.1 AMSA

In the event of a hydrocarbon release, the first point of contact is the Australian Maritime Safety Authority (AMSA) Rescue Co-ordination Centre via;

24 hour helpline: 1800 641 792

+61 2 6230 6811

Website: http://www.amsa.gov.au/contact-us/

Email: mdo@amsa.gov.au

Relay the key known facts about the spill – location, source, size and type – as well as incident factors causing the spill, and current assessed spill level.

If the spill is in State waters, or likely to move into State waters, the spill must be reported using the contact details below. If the spill occurs outside port jurisdictions, relevant port authorities will be notified as defined in the relevant State response plan.

9.4.1.2 Victoria

Control Agency: In the case of a Level 1 release within the Gippsland Ports jurisdiction (state waters from SE point of Wilson's Promontory to New South Wales Border), Gippsland Ports will be the Control Agency.

Website: https://www.Gippslandports.vic.gov.au/contact-us/report-an-incident/

Gippsland Ports' Assistant Harbour Master:

Phone: 0429 174 606.

Alternative phone: 0437 002 707

Wherever possible the following information should be provided with the report, including any photographs of the incident:

- name and contact details
- where and when the pollution occurred
- the type of discharge or a description of the pollutant
- the extent or size of the area where the pollution is visible
- the source of pollution including vessel registration numbers if known.

Control Agency: For a Level 2 or 3 spill, or where a spill originates in Commonwealth waters and is likely to enter State waters (and where AMSA hand over Control Agency role), Department of Transport (DoT) will be the Control Agency. Following the Machinery of Government (MoG) changes that came into effect 1 January 2019, the former DEDJTR was split into two departments: Department of Transport (DoT) and the Department of Jobs, Precincts and Regions (DJPR). The Marine Pollution Team has been transferred to DoT, effective 1 July 2019. Interim arrangements for the DEDJTR State Duty Officer (SDO) continue to provide a shared service to DJPR and DoT until further notice. As such, any emergency notifications to the state should still go to the DEDJTR SDO

Phone: 0409 858 715

Email: sccvic.sdo.dedjtr@scc.vic.gov.au

Any incident notifications including POLREPS and SITREPS should also go to the

Email: semdincidentroom@ecodev.vic.gov.au

9.4.1.3 Tasmania

Control Agency: In the case of a Level 1, 2 or 3 spill, or where a spill originates in Commonwealth waters and is likely to enter State waters (and where AMSA hand over Control Agency role), the Tasmanian Environment Protection Authority (EPA) Tasmanian Marine Pollution Controller (TMPC) will be the Control Agency.

Telephone: +61 3 6165 4599 or 1800 005 171

The initial verbal notification must be followed up by an email containing a more detailed Pollution Incident Report to incidentresponse@epa.tas.gov.au

Table 18: Summary of the Jurisdictional Authorities and Control Agencies for an oil spill associated with the TGP activities

Location of response[2]	Spill Source	Jurisdictional Authority	Control Agency		Relevant documentation
			Level 1	Level 2/3	
Commonwealth waters	Vessel[1] (when undertaking petroleum activities)	NOPSEMA	AMSA		OPEP Vessel SOPEP NATPLAN
Victorian waters	Vessel[1]	DoT	Gippsland Ports (state waters from SE point of Wilson's Promontory to New South Wales Border)	DoT	Vessel SOPEP Victorian State Maritime Emergencies (non-search and rescue) Plan
Tasmanian waters	Vessel[1]	EPA	EPA		Tasmanian Marine Oil Spill Contingency Plan

[1] Vessels are defined by Australian Government Coordination Arrangements for Maritime Environmental Emergencies as a seismic vessel, supply or support vessel, or offtake tanker.

[2] Where an oil spill impacts both Commonwealth and State waters, there may be two control agencies depending on the location of the response operations.

9.4.2 NATPLAN

NATPLAN is the framework that integrates Commonwealth and State Government(s) response, facilitating an effective response to marine pollution incidents via Australian Emergency Management Arrangements. AMSA manages NATPLAN and is the Control Agency for vessel spills in Commonwealth waters. As such, AMSA works with State Governments, emergency services and relevant industries (shipping, oil and gas, exploration and chemical industries) to maximise Australia's response capability.

NATPLAN applies to Commonwealth waters seaward of the boundary of State Waters (3 NM offshore) and integrates with State response plans. NATPLAN identifies a number of the roles that are fulfilled by State agencies as defined in the relevant State contingency plan:

- Jurisdictional Authority (JA): a statutory responsibility required to ensure that an adequate spill response plan has been prepared. In the event of a spill, the JA also ensures that a satisfactory response can be implemented by the Control Agency. In Commonwealth waters, the JA for petroleum activities is NOPSEMA, and AMSA for vessel spills (not associated with petroleum activities)
- Control Agency (CA): is responsible for operational control and response to an oil spill in the marine environment. The Commonwealth waters CA for Offshore TGP inspection and maintenance vessels is AMSA. AMSA may request that State CAs assume the lead CA role, even where the spill has occurred in Commonwealth waters (but where there is a likelihood that spilled hydrocarbons may impact State resources/shorelines)

National Plan response equipment and resources are managed and controlled by AMSA's Marine Environment Protection (MEP) Division, and include:

- Maritime Emergency Response Commander (MERCOM)
- Oil spill response equipment managed via the Marine Oil Spill Equipment System (MOSES)
- Oil Spill Response Atlas (OSRA) which identified sensitive receptors (e.g. marine and shoreline ecosystems and biological resources)
- Oil Spill Trajectory Modelling (OSTM)

9.4.3 State Waters

If a hydrocarbon release occurs in State waters (or if it is likely to move into State waters), the following relevant State oil spill contingency plans will apply:

- The Victoria State plan is the State Maritime Emergencies (non-search and rescue) Plan (Emergency Management Victoria 2016). The State Jurisdictional Authority (JA) and Control Agency (CA) is the Department of Transport (DoT)
- The Tasmania State plan is the Tasmanian Marine Oil Spill Contingency Plan (TASPLAN) (DPIPWE 2011). The State JA is the Department of Primary Industries, Parks, Water and Environment (DPIPWE), and the State CA is the Tasmanian Environment Protection Authority (EPA) Tasmanian Marine Pollution Controller (TMPC)

The deployment of State resources in Commonwealth waters will be requested and coordinated by AMSA.

9.4.4 Roles and responsibilities

AMSA is the Control Agency and hence responsible for managing response to all oil spills in Commonwealth waters under NATPLAN. Both MARPOL and the vessel's SOPEP require the vessel master to report to the nearest State whenever there is an incident involving actual or probably discharge. The vessel SOPEP is implemented to initiate clean up resources and control discharges.

The following roles will also provide key support:

- The Vessel Master will be responsible for notifications and reporting all spills to the sea to the AMSA JRCC, via a POLREP form included in the vessel SOPEP. Further reports will be sent at regular intervals to inform relevant stakeholders and agencies (AMSA, NOPSEMA, TGPPL, inspection and maintenance contractors, etc.)
- The TGPPL representative on board the vessel is responsible for reporting directly to TGPPL. The General Manager TGPPL is then responsible for notifying NOPSEMA of any spills in Commonwealth waters

AMSA will appoint the MERCOM, who is supported by statutory powers under the Protection of the Sea (Powers of Intervention) Act 1981. The responsibilities of the MERCOM include the management of emergency intervention issues during a response to maritime casualty incidents where there is a real (or even potential) risk of significant pollution.

AMSA do not require title holders to consult on EPs for offshore petroleum activities and have produced an advisory note https://www.amsa.gov.au/safety-navigation/navigating-coastalwaters/offshore-activities/offshore-petroleum-industry-advisory.

9.4.5 Assessment of spill scenarios

The level of hydrocarbon release is used to identify the level of resources required to respond to the spill. This approach allows scaling of response in line with the evolving nature and scale of the incident. Incident classification (Levels 1 to 3) are defined in NATPLAN as follows:

- Level 1 incidents with a release of 0 to 10 m3, and where sensitive species or habitats are not at risk. These incidents are generally resolved through a First Strike response (i.e. local or initial resources only)
- Level 2 (10 to 1000 m3) incidents may require deployment of jurisdictional resources supplementary to the initial response due to the more complex size/duration/resource management/risks involved. A Level 1 release may be escalated to a Level 2 where sensitive environmental/socio-economic receptors may be at risk
- Level 3 incidents (>1,000 m3) may require national and international resources, and where the incident controller must delegate all management functions and focus on strategic leadership and response coordination. A Level 2 release may be escalated to a Level 3 where sensitive environmental/socio-economic receptors may be at risk

The following spill scenarios have been identified in Section 2.3.2:

- Level 1 (<100 L): Minor hydraulic oil spills (from an ROV /AUV)
- Level 2 (40 000 L (approx. 40 m3) MDO): Complete loss of inventory from the largest fuel tank of the largest anticipated inspection and maintenance vessel resulting from collision or grounding

9.4.5.1 Zone of Potential Impact (ZPI)

The Zone of Potential Impact (ZPI) is the sea surface area, water column, sea bed and any relevant shorelines that could be impacted by oil spilled from a petroleum activity.

The ZPI for a Level 1 minor hydraulic oil spill incident is expected to be limited to the immediate vicinity of the release point due to rapid spreading, evaporation and dilution of the spilled hydraulic oil and the actions taken under the vessel SOPEP.

The ZPI for a Level 2 spill is based on the outcomes of the spill modelling for 40m^3 fuel spill (see Section 2.3.2.2 for further details).

9.4.5.2 Protection priorities within the ZPI

The NATPLAN protection priority hierarchy has been used to define protection priorities and response objectives within the ZPI:

- PRIORITY 1: protection of human health and safety
  - remove marine users and any potential casualties from areas considered to be a safety hazard
- PRIORITY 2: protection of habitat and cultural resources
- PRIORITY 3: protection of rare and/or endangered fauna
  - prevention of oil exposure to threatened fauna that are or may be present in (or in close proximity to) the operational area
- PRIORITY 4: protection of commercial resources
  - prevent exposure to commercial fisheries in (or in close proximity to) the operational area.

9.4.6 Spill response preparedness

Prior to commencement of inspection and maintenance activities:

- the Vessel Master will ensure that all relevant personnel have
  - undergone relevant inductions
  - are familiar with the SOPEP (and oil spill response arrangements therein)
  - are appropriately trained to undertake their responsibilities under the SOPEP
- the General Manager TGPPL and Vessel Master will ensure that notifications have been made to relevant stakeholders and agencies

9.4.7 OPEP testing arrangements

The OPEP will be tested prior to commencing inspection and maintenance activities. The schedule for testing of response arrangements will include:

- testing when response arrangements are introduced
- testing if/when response arrangements are significantly amended
- testing not later than 12 months after the most recent test
- testing for any new location(s) for the activity as soon as practicable after they have been added to the EP (if added after the most recent test, and before the next test is conducted)

Regulation (8A) requires testing of the objectives to ensure that they are appropriate to the nature and scale of the activity and that the response arrangements can be effectively implemented. Following testing, TGPPL will review the outcome of the test, identify any non-conformances and opportunities for improvement, and track corrective actions to completion using TGP *Incident Reporting and Investigation Procedure (TGP-698-PR-HSE-002)*. TGPPL will carry any non-conformances identified during the vessel activities forward for consideration in future activities as part of a continuous improvement in control measures and performance standards.

When the vessel for inspections and maintenance has been confirmed, TGPPL will make arrangements for testing of the vessel's SOPEP (including response arrangements) prior to the commencement of the offshore activities. All personnel on board the vessel will be trained and inducted in the application of the vessel's SOPEP and in compliance with MARPOL Annex 1, as appropriate to class. Regular drills and exercises will be carried out to maintain the crew's currency in response equipment use and in incident response procedures, as dictated by the SOPEP. These drills will include (but will not be limited to):

- spill response
- collision
- fire and explosion

All drills will be documented, debriefings undertaken, and corrective actions identified (including any revisions to the SOPEP) and tracked to completion by the Vessel Master.

9.4.8 Oil spill resources

Typical oil spill resources expected to be carried onboard the vessel are listed in the vessel's SOPEP. The vessel will carry spill containment and recovery kits with sufficient absorbent booms and materials to contain small to medium-scale deck spills. The Vessel Master will be responsible for ensuring that these kits are serviced and in-date (where relevant), and appropriately stocked at all times. Minor spills will be managed through good housekeeping practices and the use of absorbent materials. Deck spills will not be discharged into the ocean. Spill clean-up materials will be retained on board the survey vessel and stored in covered containers for subsequent disposal at an appropriate onshore facility.

9.4.9 Proposed spill response strategies

Spill response strategies and tactics were considered for the credible scenarios identified in Section 9.4.5 (maximum 100 L hydraulic oil and 40 m^3 MDO) are presented in Table 15. In the unlikely event of a spill, the potential use of each spill response strategy/tactic would be assessed for feasibility/practicability and human health and safety, with the recommended responses subject to Net Environmental Benefit Analysis (NEBA).

For Level 1 fuel spills in Commonwealth waters, initial actions will be undertaken by the vessel in accordance with the vessel SOPEP, with subsequent actions determined in consultation with AMSA (under NATPLAN). In such situations, the Vessel Master (or delegate) will monitor the spill and notify AMSA of the situation status. AMSA will monitor and continue to assess this level of spill.

For Level 2 spills, the Vessel Master will notify AMSA (Section 9.4.1). AMSA is the responsible CA for oil spills from vessels within the Commonwealth jurisdiction and will respond in accordance with its Marine Pollution Response Plan, as approved by the AMSA Executive. Upon notification of an incident, AMSA will assume control of the incident. TGPPL will support the response as required. After ensuring the safety of the crew and fire prevention (and notifying AMSA), the Vessel Master will implement the SOPEP and consider relevant 'source control' actions (e.g. tank lightering) to reduce the fuel volume released to the environment. AMSA will determine the appropriate response strategies depending upon the protection priorities at risk within the ZPI. AMSA will determine the potential need for trajectory modelling and possible sea/aerial surveillance to confirm/inform trajectory predictions, depending on the location, prevailing weather conditions, available vessel responses and volume released. All selected response strategies will be in accordance with NATPLAN. Recognising that there is potential for impacts associated with spill response activities, these risks would be assessed as part of any NEBA coordinated by AMSA, to which TGPPL would contribute if requested by AMSA.

The NEBA process requires a number of data and information inputs to allow a robust and transparent assessment. AMSA will require TGPPL to provide this information in a timely manner. Data/information requirements will comprise:

- information from the activity-specific EP, including available modelling
- data/information obtained immediately prior to and following the spill, such as any monitoring to support situational awareness and capability/logistical information to support spill response
- any available baseline data.

Where hydrocarbons from the spill are likely to cross from Commonwealth to State waters, AMSA will undertake the NEBA in conjunction with representatives from the relevant State CAs.

The Vessel Master will continue to provide situation reports (SITREPs) throughout the response activity, at the direction of AMSA. AMSA will maintain the response until relevant termination criteria are achieved.

Priority actions in the event of a large fuel spill are to make the area safe (protect human life) and to stop the leak to prevent further spillage, for example by transferring fuel to another tank.

If AMSA identify that an oiled wildlife response is required in Commonwealth waters, this will be based on NATPLAN oiled wildlife response. Responses in State waters will be implemented by or under the direction of State CAs and align with current State oiled wildlife response plans. The accumulation of hydrocarbons on shorelines is considered unlikely based on the modelling and the credible scenarios; however, to allow for an adaptable response, consideration will be given to migratory shorebird feeding and roosting sites/nesting colonies and any seal colonies in and adjacent to the ZPI. In addition, species protected under Part 3 of the EPBC Act will be given particular attention, with consideration of information provided in relevant plans, guidelines and policies

For spills in Commonwealth waters, initial actions will be undertaken by the vessel in accordance with its SOPEP and the TGP Offshore OPEP. Under the OPEP, Type 1 operational monitoring will be carried out, which would be coordinated by AMSA and TGPPL as required. Type II scientific monitoring would be led by TGPPL if contact with sensitive receptors is expected (see Section 9.4.10 for further information).

Given the low risk of adverse environmental impacts from a fuel spill in the operational area, and the low risk of shoreline contact meaning that active response and clean-up are unlikely to be required, there is unlikely to be environmental benefit to be gained from implementing additional strategies beyond ‘monitor and evaluate’ as assessed and recommended in Table 19. A fuel spill requiring active clean-up response is not considered a credible scenario and it is unlikely that sensitive receptors will be impacted in the short time during which concentrations of hydrocarbons are present at potentially ecotoxic levels around the spill location. The vessel’s SOPEP and the OPEP would be implemented, and the residual risk is considered to be low. A NEBA would be undertaken shortly after the time of the spill to ensure environmental impacts arising from the response strategy are minimised. Full recovery of water quality and any affected biological assemblages or areas of shallow rocky reef is expected. TGPPL therefore considers the risk of potential impacts from the spill response to be ALARP and of an acceptable level.

Table 19 Spill Response Strategies

Monitor and evaluate	Mechanical dispersion	Containment and recovery	Shoreline protection	Shoreline clean-up	Chemical dispersion
Relevance: Relevant to all spills. **Mobilisation**: Visual observation is the most likely practicable option available for Level 1. Potential need for OSTM and additional sea/aerial surveillance to confirm/inform trajectory predictions, depending on the location, prevailing weather conditions, available vessel responses and volume released. **Efficacy**: Information gathering for spills is critical for situational awareness and supporting a coordinated spill response for all spills **Issues**: Visual observations of surface hydrocarbons are limited to daylight. Understanding of entrained or dissolved hydrocarbon distribution is limited to spot-point water column sampling. **Summary**: **Recommended**. This	**Relevance**: Can be considered for use on surface hydrocarbons **Mobilisation**: Undamaged vessel(s) in area may be used for this purpose if available (e.g. not undertaking other response operations, such as transfer of personnel or fuel from ruptured tanks, or securing damaged vessel) **Efficacy**: Limited and localised entrainment via propeller wash or through use of vessel's fire suppression hoses **Issues**: Potential human health and safety risks from e.g. VOCs. Optimal weathering will occur at the surface – entrainment increases persistence of hydrocarbons in the environment **Summary:** Not likely to reduce risk, therefore **not recommended** at this stage.	**Relevance**: Can be considered for use on surface hydrocarbons **Mobilisation**: No surface booms/equipment will be on vessel (only sufficient for small- to medium-scale deck spills). Vessels would not be mobilised from port for this scenario as most hydrocarbon would have weathered and spread too thin during period to allow an effective response **Efficacy**: Unlikely to be effective due to hydrocarbon type and thickness of slick. Limited effectiveness in offshore environments due to limitations of use (wind/sea conditions) **Issues:** Potential human health risks from VOCs **Summary**: Unlikely to be effective or practicable, therefore **not recommended** at this stage	**Relevance**: Low risk of shoreline exposure **Mobilisation**: Unlikely **Efficacy**: Not considered effective for fuel spills that are likely to have undergone substantial weathering or for thin surface films – such as offshore spills of this nature **Issues**: Potential for causing localised damage to shallow subtidal sensitive habitats (e.g. seagrasses, macroalgal communities, sponge beds) from anchoring of protection booms **Summary**: **Not recommended** at this stage as unlikely to be effective and shorelines are not predicted to be sufficiently exposed to spilled hydrocarbons	**Relevance:** Low risk of shoreline exposure **Mobilisation**: Unlikely **Efficacy**: N/A **Issues**: The impacts of shoreline clean-up are related to the method(s) used. For example, mechanical clean-up involves removal of large volumes of contaminated beach sediment, which can affect shoreline profiles/coastal processes and remove feeding habitat of shorebirds; chemical clean-up involves use of chemical dispersants and control agents to remove hydrocarbons in situ, which can then wash into adjacent (potentially sensitive) environments; cropping removes saltmarsh foliage, which can for example impact saltmarsh recovery and disturb/damage/destroy nesting areas **Summary**: **Not recommended** at this stage as shorelines are	**Relevance**: Can be considered for use on surface (or subsurface) releases **Mobilisation**: Vessel-based (localised) dispersant application only if dispersants are on vessel. Airborne dispersant application would not be mobilised. **Efficacy**: Most of the spill will be removed by natural degradation (weathering) before a response could be implemented. Remaining hydrocarbon may not be amenable to dispersants (e.g. spread thinly or with a patchy surface distribution). Additionally, optimal weathering occurs at the surface, so entrainment will increase persistence. **Issues**: Dispersants can have a certain inherent toxicity. The increased water accommodated fraction of dispersed hydrocarbons can be more toxic than either dispersants or hydrocarbons alone, and

Monitor and evaluate	Mechanical dispersion	Containment and recovery	Shoreline protection	Shoreline clean-up	Chemical dispersion
response will be implemented, with the scale of response appropriate to the nature and scale of the spill				unlikely to be sufficiently exposed to spilled hydrocarbons and hence response may cause more impacts than spill exposure	so this response poses a potential increase in environmental risk. **Summary**: **Not recommended** at this stage

9.4.10 Operational and scientific monitoring plan (OSMP)

The specific operational and scientific monitoring program undertaken following an oil spill would be developed based on the following information:

- location of the spill
- nature and scale of the spill, and likely evolution
- types of values and assets within the ZPI
- potential for impact upon sensitive resources
- review of available baseline data. An assessment of gaps in available baseline data and potential/requirements for post-spill/pre-exposure baseline data collection will be considerations in the monitoring design.

TGPPL will provide immediate on-site first strike response and AMSA as the CA will direct and lead any ongoing spill response arrangements and monitoring requirements in the event of an oil spill, supported by TGPPL.

All monitoring personnel will be suitably experienced and qualified for their role. A pre-mobilisation assessment of experience and certifications will be used to allocate specific roles to personnel. Multiple personnel will be allocated to monitoring roles to allow for shift rotations (where multiple shifts per day are required) or maintenance / inspection programme rotations (where staff are rotated from the field as part of effective fatigue management planning). The availability of personnel with in-date certificates (e.g. offshore medical, BOSIET and MSIC) will then identify which personnel will support immediate mobilisation or comprise the second rotation.

In the event of an oil spill, the primary response will be to 'Monitor and Evaluate' as detailed in Section 9.4.9. This will involve oil spill tracking and quantification using a vessel and/or aerial surveillance to track the movement of the spill and determine the potential risk to people and sensitive receptors. If required, trajectory modelling and fate assessment will also be undertaken. Adverse impacts on the shoreline or sensitive marine ecosystems in the event of a spill from Offshore TGP inspection and maintenance vessels are highly unlikely due to: the size of vessels used; properties of hydrocarbons that could potentially be spilled; expected maximum spill volumes; high energy marine environment of Bass Strait; and the distance from the Offshore TGP to sensitive receptors (e.g. islands / shorelines).

9.4.10.1 Operational monitoring (Type I)

In the event of a hydrocarbon release, TGPPL would implement Operational (Type I) Monitoring in consultation with AMSA, and where appropriate, relevant State agencies. This monitoring will be implemented to;

- determine the extent and character of a spill
- track the movement and trajectory of surface hydrocarbon slicks
- identify areas/ resources potentially affected by surface slicks
- determine sea conditions/ other constraints
- identify the efficacy and potential impacts of spill response strategies and tactics (to inform any remediation activities and any subsequent NEBA assessments)

Oil Spill Trajectory Modelling (OSTM), used in conjunction with water quality monitoring, will help determine the potential extent and direction of travel of the plume of entrained hydrocarbon, and to determine the risk of hydrocarbon toxicity impacts to sensitive receptor locations.

This monitoring instigated by AMSA, will enable TGPPL to provide the necessary information to AMSA, to assist in planning appropriate response actions under NATPLAN.

Specific monitoring and data collection would include aspects of the following, as agreed with AMSA:

Immediate monitoring (approximately 0 to 6 hours):

- estimate of sea state
- estimates of wind direction and speed
- characteristics of the surface hydrocarbon slick (thickness and areal extent)
- GIS mapping
- OSTM triggered for a Level 2+ spills

Modelling if triggered, will be used in conjunction with other field observation/monitoring data to identify the likely direction, spread and potential speed of the slick. This will be used as a guide to support the planning for other operational monitoring scopes (e.g. water quality, sampling and fluorometers). This information will allow initial identification sites for sampling, which may also provide information on the subsurface distribution of hydrocarbons via vertical profiling of the water column (should sufficient levels of hydrocarbons remain to be detectable). Water column profiling data will be used to identify the sites and depths at which water samples will then be taken for laboratory analysis. Water sampling for hydrocarbons should be undertaken using suitable equipment by personnel trained in the relevant procedures. “Improvised” approaches will not be used as the samples obtained may result in inaccurate results or a failure or a delay in confirming the credible source of the spill.

To be mobilised (>6 hours):

- aerial surveillance for Level 2+ spills (if aircraft available offshore)
- GPS tracking using satellite drifter buoys (if available)
- measuring concentrations of entrained hydrocarbons through the water column (e.g. from water samples or using fluorometers)
- stochastic modelling predictions for Level 2+ spills.
- For potential additional consideration:
    - remote sensing (e.g. satellite-based optical imagery and Synthetic-Aperture Radar (SAR)) where available and practicable

Field-based operational monitoring will be restricted to daylight hours only, when surface slicks will be visible from either vessels or via aerial surveillance. Where available and practicable, remote sensing (e.g. using satellite-mounted optical imagery and Synthetic Aperture Radar (SAR)) may be used to provide situational awareness of the spatial distribution of the surface slick(s) during daylight, at night, or during overcast days.

The information gathered from this monitoring will be passed on to AMSA, but also via ongoing SITREP reports following the initial spill notification to JRCC Australia.

Should there be the need to implement field response activities using external parties, a response logistics plan would be developed and initiated immediately on notification of the spill. The plan would detail logistics, equipment personnel and detailed OSMP Implementation Plans.

TGPPL will implement, assist with, or contribute to (including funding if required) any other operational or scientific monitoring as directed by AMSA or outlined in this EP.

9.4.10.2 Scientific monitoring (Type II)

Scientific (Type II) Monitoring would be triggered and implemented if there is a reasonable expectation that there may be adverse impacts to marine biota or habitats in the area. The key receptors for which scientific monitoring studies (SMP1 – SMP5) would be considered are;

- benthic sediments (particularly soft sediments able to retain hydrocarbons, infauna)

- subtidal marine benthos (filter-feeders, macroalgae)
- seabird populations (foraging individuals)
- non-avian marine wildlife (cetaceans, marine reptiles and fish)

To allow for a flexible and adaptable scientific monitoring approach, additional receptors may also be considered should the nature and scale of the actual spill result in potential hydrocarbon exposure to shorelines or fisheries (SMP6 – SMP7):

- intertidal sediments and habitats
- fisheries and aquaculture operations.

9.4.10.2.1. Initiation of scientific monitoring

After the Vessel Master provides notification to AMSA, TGPPL would implement scientific monitoring in the event of a Level 2 spill (or greater), in accordance with initiation criteria described in Table 20. A detailed OSMP Implementation Plan based on commonly-used, scientifically-robust and easily-accessible methods would be developed to ensure an efficient and technically-defensible response. This approach builds time efficiencies into development of the OSMP as existing TGPPL documentation (e.g. Health and Safety Plans) can be adapted to meet the requirements of the OSMP. Potential suppliers of available survey equipment would be identified as a priority, with a preference for those with existing contracts.

Relevant permit applications (e.g. for sediment/biota sampling) will be identified and submitted as soon as reasonably practicable. This approach does not work from the base assumption that permit requirements will be waived by relevant authorities in order to minimise potential delays in mobilisation and permit approval should permit requirements not be waived.

The OSMP Implementation Plan would detail the equipment required for each study, travel and freight arrangements, notifications, vessel support, HSE planning, and the sampling and analysis plan. Within 12 hours, a teleconference will be held between the TGPPL, AMSA, the nominated scientific personnel and the Vessel Master to finalise the requirements for implementation. Scientific teams can be on site within 48 to 72 hours of the implementation plan and budget being approved (and where permits are not required or have been approved). It is recognised that the spilled hydrocarbon is only likely to remain measurable on the water surface for a few days, and that realistically a response team would not be on site until it had dispersed. Given the extremely low probability of a catastrophic spill and hydrocarbon subsequently contacting sensitive biota, and the rapid weathering and likely dispersal of spilled hydrocarbons before a response team could be mobilised, TGPPL considers the costs associated with pre-emptive development of the Implementation Plan and full assembly and preparation of the response team to be grossly disproportionate to the benefit of a more rapid response; therefore this control has not been adopted.

The area of potential impact to be targeted in the scientific monitoring plan would be based on observations of the slick trajectory, water quality data collected during the operational phase, and available modelling. Due to the nature of the spill, potential for spread/dispersion, constrained spatial area of the ZPI, and likely field team mobilisation period, it is considered that post-spill pre-impact baseline data collection will likely not be feasible (but will remain a consideration for planning purposes).

Scientific monitoring would focus on determining potential short and long-term environmental impacts of the spill and response actions, and subsequent recovery). Scientific monitoring may continue for some time following the termination of the operational monitoring response.

9.4.10.2.2. Scientific monitoring team

In the event of the requirement to undertake scientific monitoring, TGPPL would engage a specialist subcontractor to rapidly finalise response plans and to deploy the required resources to undertake the monitoring activities. Primary scientific monitoring studies could include some, or all, of the elements described in Table 20 depending on the size, timing and location of the spill.

An adaptable scientific monitoring response must allow for the potential for operational monitoring or situational awareness obtained during a spill to indicate exposure to additional sensitive receptor types, depending on the nature and scale of the actual release.

Table 20 Scientific Monitoring Study Objectives, Key Receptors and Initiation and Termination Triggers

Scientific monitoring study objective	Key receptors	Initiation triggers	Termination triggers
SMP1: Monitoring for Hydrocarbons in Benthic Sediments **Aim:** To understand the characteristics, persistence and fate of hydrocarbons in sediments to provide data for the assessment of potential impacts on sea bed sediments. To understand the effect of hydrocarbon concentrations on infaunal macrobiota. **Objectives:** quantify hydrocarbon concentrations at locations within the ZPI quantify change in sediment hydrocarbon concentrations at sampling locations over time (considering seasonal and inter-annual change) provide sediment hydrocarbon data to support determination of potential cause-effect relationships between spill hydrocarbons and changes in benthic communities identify potential areas of benthic impact based on sediment hydrocarbon concentrations and impacts to benthic macroinfaunal assemblages.	Subtidal sediments within the ZPI, with particular focus on sensitive locations	Level 2 spill or greater **and** where modelling and/or operational monitoring (e.g. water quality) indicates likely exposure to benthic sediments	The results of the monitoring tasks achieved the objectives **and** appropriate, meaningful and scientifically-defensible results have been achieved **and** sediment contamination results showed recovery to a point where hydrocarbon concentrations are no longer demonstrated to be a primary driver of infauna assemblage composition
SMP2: Monitoring and Surveys of Shoreline and Intertidal Benthos to Determine Impacts of Oil Spill and Recovery **Aim**: To determine and monitor the impact of the spill, dispersants or response activities and potential subsequent recovery for intertidal benthos at both individual (species) and community (habitat) levels. **Objectives:** the monitoring of the spill and spill management operations on intertidal marine coastal habitats (like tidal seagrass, tidal mud flats, mangroves, intertidal saltmarsh and saltpans) monitoring associated organisms (like fishes, crustaceans, arboreal mangrove biota, microphytobenthos, macroalgae, mangrove/saltmarsh plants, seagrass) establish necessary responses quantify the biological and ecological effects of the spill and response activities.	Invertebrates, Intertidal habitats, Seagrasses, Mangroves, Shorelines	Level 2 spill or greater **and** If modelling predicts possible shoreline/intertidal contact. **or** Any reports of shoreline/intertidal contact	Appropriate, meaningful and defensible scientific monitoring results for intertidal benthos have been achieved **and** All reasonable and practical measures have been taken to assess the impact of the spill on intertidal benthos **and** Affected intertidal benthos has returned to baseline (or reference site) conditions **and** Oil pollution impacts on critical intertidal benthos species and taxa are no longer identifiable.
SMP3: Monitoring of Subtidal Marine Benthos to Determine Impacts of Oil Spill and Recovery **Aim:** To enable assessment of impacts and potential for subsequent recovery of benthic marine habitats (soft and hard substrate habitats) and associated macro-epibenthic organisms (e.g. macroalgae, seagrass, sponges and other filter feeders, motile invertebrates and associated fishes) in response to a spill event and associated response activities. Monitoring to document recovery of affected biota and habitats. **Objectives:** characterise and quantify habitat composition and coverage/abundance of macro-epibenthic organisms and site-associated demersal fish allow comparison with historical (baseline) data and seasonal/inter-annual surveys define recovery in macro-benthic and demersal populations and recovery/change in habitat type.	Filter feeders, benthic primary producers, demersal fishes, invertebrates (e.g. commercially important rock lobsters, scallops) – with particular focus on sensitive locations	Level 2 spill or greater **and** where modelling and/or operational monitoring (e.g. water quality) indicates likely exposure to benthic habitats **or** any reports of contact	Reasonable and practicable scientifically-robust measures have been taken to assess the effects or impact of the spill on benthic habitats / communities and oil pollution effects / impacts on benthos are no longer detectable, or impacts shown to be within accepted protection limits (to be defined in Sampling and Analysis Plan) and when a trend towards post-impact recovery or alternate developmental trajectory has been demonstrated (in comparison with control/reference sites) at sites that were exposed to elevated concentrations of hydrocarbons
SMP4: Undertaking Wildlife Surveys to Determine Impact of Oil Spill on Seabird and Shorebird Populations and Recovery **Aim:** To assess any short-term or longer-term environmental effects on seabird and shorebird populations within the study area that may have resulted from the oil	Foraging seabird and coastal shorebird populations	Level 2 spill or greater **and** where post-spill observations indicate	The extent of damage and rate of recovery of key seabird/shorebird behaviour and breeding activities has been quantified using scientifically-robust methods **and**

Scientific monitoring study objective	Key receptors	Initiation triggers	Termination triggers
spill (i.e. damage extent and recovery). Monitoring to document recovery of affected biota and habitats. **Objectives:** quantify foraging seabird and shorebird populations quantify foraging, nesting or breeding shorebird populations quantify records of oiled birds and bird mortalities allow comparison of changes in populations over time (seasonal and inter-annual)		possible contact with foraging seabird populations **and/or** any reports of oiled or dead seabirds **and/or** shoreline oil indicates possible contact with shoreline bird habitats or populations	The affected environment or natural resource has returned to baseline conditions (taking into account natural variability) in terms of breeding population (for seabirds) or counts (for shorebirds), with regard to reference sites and/or baseline data **and** oil pollution effects/impacts on critical species and taxa are no longer detectable
SMP5: Desk study and survey: Occurrences of Oiled/Mortalities of Non-Avian Marine Wildlife to Determine Impacts of Oil Spill and Recovery **Aim:** To assess any short-term or longer-term environmental effects on non-avian marine wildlife that may have resulted from the oil spill (i.e. damage extent and recovery). Monitoring to document recovery of affected biota and habitats. **Objectives** quantify records of sightings of dead or oiled marine wildlife allow seasonal or inter-annual comparison of records of dead or oiled wildlife	Marine mammals, sharks, rays, bony fishes, marine turtles	Level 2 spill or greater **and** where modelling indicates possible contact with populations **and/or** any reports of oiled or dead non-avian marine wildlife	Reasonable and practical measures have been taken to assess the effects or impact of the spill on non-avian marine wildlife **and** restoration or resumption of key biological processes (e.g. abundance, distribution, breeding) necessary to ensure post-impact recovery have been identified **and** oil pollution impacts on non-avian marine wildlife are no longer detectable
SMP6: Monitoring of Intertidal Receptors to Determine Impacts of Spill Hydrocarbons and Recovery **Aim:** To understand the behaviour, persistence and fate of hydrocarbons in intertidal sediments, and enable assessment of potential impacts and recovery to intertidal habitats. To identify the potential implications of changes in intertidal communities to other biota (e.g. shorebirds). **Objectives:** quantify hydrocarbon concentrations at locations within the ZPI characterise and quantify habitat composition and coverage/abundance of epibenthic and infaunal organisms quantify change at sampling locations over time (considering seasonal and inter-annual change) define recovery/change in habitat type and epibenthic and infaunal organisms provide sediment hydrocarbon data to support determination of potential cause-effect relationships between spill hydrocarbons and changes in benthic communities.	Intertidal sediments, infaunal communities and epibiota, with particular focus on shorelines that have been observed to be, or are predicted to have been, exposed to spill hydrocarbons	Level 2 spill or greater **and** where modelling and/or operational monitoring indicates likely exposure to intertidal habitats.	The results of the monitoring tasks achieved the objectives **and** appropriate, meaningful and defensible scientific monitoring results have been achieved **and** sediment contamination results have shown recovery to a point where hydrocarbon concentrations are no longer demonstrated to be a primary driver of habitat composition.
SMP7: Impacts to Fisheries and Aquaculture **Aim:** To understand the potential short and long-term impacts and recovery of fisheries (should they be closed), and aquaculture facility/operation that have been exposed to spill hydrocarbons **Objectives:** quantify hydrocarbons in tissue of organisms targeted by fisheries or aquaculture determine potential effects on population size/structure identify potential impacts to organism health determine potential risks to human health.	Target areas or species of Fisheries or Aquaculture interest, with particular focus on shorelines that have been observed to be, or are predicted to have been, exposed to spill hydrocarbons	Level 2 spill or greater **and** where fisheries have been closed in response to a hydrocarbon spill **and/or** where modelling and/or operational monitoring indicates likely exposure to aquaculture operations or key broodstock collection locations.	he results of the monitoring tasks achieved the objectives **and** appropriate, meaningful and defensible scientific monitoring results have been achieved **and** sediment contamination results have shown recovery to a point where risks to human health are understood **and** data on population structure have shown that recovery is possible through retention of sexually-mature adults and demonstrated recruitment of juveniles.

For each SMP described in Table 20 a detailed study template would be developed following initiation. This is summarised in Table 21.

Table 21 Scientific monitoring studies template

Study Heading	Description
Monitoring Objective and Rationale	Details the monitoring objectives for the study to focus sampling design
Natural Resource Description and/or Importance	Provides background information relevant to the context of the study; distribution, temporal patterns, life-stages present, critical habitats and processes
Activation Trigger for Monitoring Tasks	Criteria to initiate the scientific monitoring study, based on likely exposure to harmful concentrations (acute and/or chronic)
Potential Sensitivity to Spilled Hydrocarbon at Exposure Levels	General context of possible impacts associated with the spill, exposure pathways and effects concentrations. Range of measurable responses
Spatial awareness	Outcomes of operational monitoring that support survey design
Monitoring methods / sampling and analysis plan	
Overview of the Monitoring Method	Provides a scientific and practical context for the monitoring methods to be used. Includes consideration of statistical methods and sampling effort required to achieve the monitoring objectives
Details of the Survey Design, Methods, Standards and Techniques to be Utilised	Provides the information required to collect samples in a defined geographic area (based on operational monitoring data) as part of a robust scientific study program. Includes relevant specifications, standards and requirements of the study
Permits	Details any permit requirements and/or exemptions
Data Collection, Analysis and Reporting Requirements	Provides details on the necessary data requirements including baseline information, analytical parameters and detection limits, and metadata. Details the deliverables from the study
Personnel Resourcing Requirements, Qualifications and Skills	Provides minimum skill/experience, qualifications/certifications and resourcing requirements to deliver the study safely and robustly Considers shifts and survey rotations for effective fatigue management Includes contingency resource planning
Field Equipment, Survey Platforms and Logistics	Details equipment and logistics requirements to fulfil the study requirements
Recommended Procedures for Data Collection, Sampling, Storage, Transport and Analysis	Provides the necessary sampling and analytical techniques, and standards to ensure data quality and ensure consistency throughout the study (including Chain of Custody (CoC) forms)
Risk Assessment, Occupational Health and Safety Considerations	Describes the risks and mitigation controls associated with undertaking the study
Data Management, QA/QC, Transmittal and Archiving	Provides QA / QC requirements for all data obtained as part of the study
Supporting Documents,	Identifies the relevant guidelines and high-level references

Standards and References	required to implement the study
Reporting Requirements	Provides description of reporting of the scientific outcomes of the survey(s), including identification and qualification/quantification of potential impacts and subsequent recovery Each survey report identifies the need for any further scientific monitoring based on the survey outcomes
Termination criteria	
Criteria for the Terminating the Monitoring Activity	Completion criteria to be met to demonstrate that study objectives have been achieved to terminate the study

10. REFERENCES

ABC Science, 2000. Kiwi shellfish smother Australian seabeds reported on ABC Science website at http://www.abc.net.au/science/articles/2000/11/06/207775.htm

Australian Maritime Safety Authority (AMSA) (2012). Interim Technical Guideline for the *Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities,* AMSA, Braddon, ACT, Australia.

Australian Petroleum Production and Exploration Association (APPEA) (2008). *Environmental Code of Practice.* APPEA, Canberra, ACT.

Bannister, J.L., Kemper, C.M. and R.M. Warneke (1996). The Action Plan for Australian Cetaceans. Canberra: Australian Nature Conservation Agency.

BRS 2007. Designated Exchange Areas Project – Providing Informed Decision on the Discharge of Ballast Water in Australia (Phase II). By Emma Knight, Simon Barry, Rupert Summerson, Scott Cameron and Rebecca Darbyshire. Australian Bureau of Rural Sciences.

Bureau of Meteorology (BOM) (2012). Climate Statistics for Australian Locations - Deal Island 099001. Australian Government Bureau of Meteorology, viewed September, 2012, http://www.bom.gov.au/climate/averages/tables/cw_099001.shtml

Cardno (2013). Technical Memorandum on Oil Spill and Gas Leak Fate for Tasmanian Gas Pipeline, 01-1410-02-P-7-006 (Memo from Cardno to Wood Group Kenny), 22 November 2013.

DAWR, 2009. National biofouling management guidelines for the petroleum production and exploration industry. Accessed at https://www.marinepests.gov.au/sites/default/files/Documents/petroleum-exploration-biofouling-guidelines.pdf

DAWR, 2017. Australian Ballast Water Management Requirements, Version 7. Accessed at http://www.agriculture.gov.au/biosecurity/avm/vessels/ballast/australian-ballast-water-management-requirements

Dernie, K.M., Kaiser, M.J., Richardson, E.A. and Warwick, R.M., 2003. Recovery of soft sediment communities and habitats following physical disturbance. Journal of Experimental Marine Biology and Ecology, 285–286, pp. 415–434.

Department of Energy and Environment (DoEE) (2019) Criteria for identifying Wetlands of International Importance. Available at https://www.environment.gov.au/water/wetlands/ramsar/criteria-identifying-wetlands

DoEE (2017a) *Balaenoptera physalus* — Fin Whale. Species Profile and Threats Database. Available from: http://www.environment.gov.au/sprat

DoEE (2017b) Australian Wetlands Database – Ramsar wetlands, Gippsland Lakes. Available at http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=21.

DoEE (2017c) Australian Wetlands Database – Ramsar wetlands, Corner Inlet. Available at http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=13.

DoEE (2015a) Biologically Important Areas of Regionally Significant Marine Species.

DoEE (2015b) South-east marine region profile: A description of the ecosystems, conservation values and uses of the South-east Marine Region.

DoEE (2015c). Conservation management plan for the Blue Whale. Available at https://www.environment.gov.au/system/files/resources/9c058c02-afd1-4e5d-abff-11cac2ebc486/files/blue-whale-conservation-management-plan.pdf

Department of Environment and primary Industries (DoE&PI) (2014). Littoral Rainforests of East Gippsland: Priorities for Action 2014-2019

Department of Sustainability and the Environment (DSE) (2012). Victoria - Marine Pests. DSE, viewed October 2012, http://www.dse.vic.gov.au/coasts-and-marine/marine/marine-pests

DSE (2008). National Recovery Plan for Australian Grayling *Prototroctes maraena*. Viewed September 2019, http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-australian-grayling-prototroctes-maraena.

Department of Sustainability, Environment, Water, Populations and Communities (DSEWPAC) (2012). Giant Kelp Marine Forests of South East Australia – SPRAT Profile, DSEWPAC, viewed October 2012, http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=107

DSEWPAC 2011 Corner Inlet Ramsar site Ecological Character Description.

DSEWPAC 2010 Gippsland Lakes Ramsar site Ecological Character Description.

Department of Premier and Cabinet (DPMC) (2019) Indigenous Protected Areas. Available at https://www.pmc.gov.au/indigenous-affairs/environment/indigenous-protected-areas-ipas

Det Norske Veritas (DNV) (2011). *Final report for Australian Maritime Safety Authority – Assessment of the Risk of Pollution from Marine Oil Spills in Australian Ports and Waters,* Report No PP002916. Rev 5, 14 December 2011.

Director of National Parks (DNP) (2013). South-east Commonwealth Marine Parks Network Management Plan 2013-23

Edgar, G. (1984). *Marine Life and Potential Marine Reserves in Tasmania – Part 2.* National Parks and Wildlife Service, Sandy Bay, Tasmania Occasional Paper No. 7. 102p.

Genesis Oil and Gas Consultants Ltd (Genesis) (2011). *Review and Assessment of Underwater Sound Produced by Oil and Gas Activities and Potential Reporting Requirements under the Marine Strategy Framework Directive* (Genesis Report J71656A – Final Report – G2). Genesis, Aberdeen, Scotland,

Geraci, J.R. and St. Aubin, D.J. (1988). Synthesis of Effects of Oil on Marine Mammals. Report to US Department of the Interior, Minerals Management Service, Atlantic OCS Region, OCS Study. Ventura, California

Hook, S., Batley, G., Holloway, M., Irving, P. & Ross, A. (2016). Oil Spill Monitoring Handbook. CSIRO Publishing. Melbourne

Hydro Tasmania (c/- DEI Tasmania Holdings Pty Ltd) (2001). *Tasmania Natural Gas Project – Stage 1 Longford, Victoria to Bell Bay Power Station, Tasmania - Public Environment Report.* Prepared by Hydro Tasmania, Hobart, Volumes 1 to 10.

International Maritime Organisation (IMO) (2011). Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species. Available at http://www.imo.org/en/OurWork/Environment/Biofouling/Documents/RESOLUTION%20MEPC.207%5B62%5D.pdf

IPIECA, 1995. Biological Impacts of Oil Pollution: Rocky Shores, International Petroleum Industry Environmental Conservation Association, No. 7

ITOPF (2011). Technical Paper No. 13: Effects of Oil Pollution on the Marine Environment. International Tank Owners Pollution Federation

Land Conservation Council (LCC) (1993). Marine and coastal special investigation descriptive report. Victorian Government, Melbourne.

McDonald, J.I. (2008). A Likelihood Analysis of Non-Indigenous Marine Species Introduction to Fifteen Ports in Western Australia. Fisheries Research Report No. 182. Department of Fisheries, WA. 36pp.

Myrberg, A. A. (2001). The Acoustical Biology of Elasmobranchs. Environmental Biology of Fishes 60, pp.31-45

National Oceanic and Atmospheric Administration (NOAA) (2006). Fact Sheet – Small Diesel Spills (500-5000 gallons), NOAA Office of Response and Restoration, Seattle, Washington, USA.

National Native Title Tribunal (NNTT) (2019). Application Details for VID737/2014. Available at http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/Pages/details.aspx?NTDA_Fileno=VC2014/001

NNTT, 2010. Native Title Determination Details - VCD2010/001 - Gunai/Kurnai People. National Available at http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/Pages/Determination_details.aspx?NNTT_Fileno=VCD2010/001.

NOAA (2002). Managing Seafood Safety After An Oil Spill. Seattle: Hazardous Materials Response Division, Office of Response and Restoration, National Oceanic and Atmospheric Administration. 72 pp. Available at https://response.restoration.noaa.gov/sites/default/files/managing-seafood-safety-oil-spill.pdf

Paulay, G., Kirkendale, L., Lambert, G. and Meyer, C., 2002. Anthropogenic Biotic Interchange in a Coral Reef Ecosystem: A Case Study from Guam. Pacific Science 56(4).

Parry, G.D., Campbell, S.J. and Hobday, D.K. (1990). *Marine resources off East Gippsland, South Eastern Australia; Technical Report No. 72,* Marine Science Laboratories, Queenscliff, Victoria, Australia.

Parks and Wildlife Service, Tasmania (2000). *Small Bass Strait Island Reserves, Draft Management Plan,* DPIWE, Tasmania.

Parks Victoria (ParksVic) (2017a). The Lakes National Park. Available at http://parkweb.vic.gov.au/explore/parks/the-lakes-national-park

ParksVic (2017b). Corner Inlet Marine and Coastal Park. Available at http://parkweb.vic.gov.au/explore/parks/corner-inlet-marine-and-coastal-park

ParksVic (2017c). Nooramunga Marine and Coastal Park. Available at http://parkweb.vic.gov.au/explore/parks/nooramunga-marine-and-coastal-park.

ParksVic (2017d). Wilsons Promontory Marine Park. Available at http://parkweb.vic.gov.au/explore/parks/wilsons-promontory-national-park.

ParksVic (2003). Gippsland Lakes Ramsar Site Strategic Management Plan. Available at http://parkweb.vic.gov.au/__data/assets/pdf_file/0007/313279/gippsland-lakes-ramsar-site.pdf

Phillips, D.A.B., Handreck, C.P., Bock, P.E., Burn, R., Smith, B.J. and Staples, D.A. (1984). *Coastal invertebrates of Victoria: an atlas of selected species;* Marine Research Group of Victoria, Melbourne.

Tasmanian Planning Commission (2009). *State of the Environment Tasmania 2009,* Tasmanian Planning Commission, Hobart , viewed October 2012, http://soer.justice.tas.gov.au/2009/

Threatened Species Scientific Committee (TSSC) (2013). Conservation Advice for Subtropical and Temperate Coastal Saltmarsh. Available at http://www.environment.gov.au/biodiversity/threatened/communities/pubs/118-conservation-advice.pdf.

Volkman, J.K., *et al.* (2004). A whole-of-ecosystem assessment of environmental issues for salmonid aquaculture. Aquafin CRC Project 4.2(2) (FRDC Project No. 2004/074)

Watson, G. F., and Chaloupka, M. Y. (1982). *Zooplankton of Bass Strait: Species composition, systematics and artificial key to species.* Victorian Institute of Marine Science Technical Report No. 1. 1–128.

11. ACRONYMS AND ABBREVIATIONS

A number of abbreviations, acronyms and terms have been used throughout this Offshore EP. These are described below:

ACAP	Agreement on the Conservation of Albatrosses and Petrels
ADIOS	Automated Data Inquiry for Oil Spills
ALARP	As Low As Reasonably Practicable
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
APIA	Australian Pipelines Industry Association
APPEA	Australian Petroleum Production and Exploration Association
AS	Australian Standard
ASME	American Society for Mechanical Engineers
AUV	Autonomous Underwater Vehicle
BHP	BHP Billiton
BIA	Biologically Important Area
BOM	Bureau of Meteorology
CA	Control Agency
CAMBA	China-Australia Migratory Bird Agreement 1986
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CMT	Crisis Management Team
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea 1972
CP	Cathodic Protection
dB	Decibels
DC	Direct Current
DEDJTR	Department of Economic Development, Jobs, Transport and Resources (Victoria)
DEH	Department of Environment and Heritage (now DoEE)
DEI	Duke Energy International
DELWP	Department of Environment, Land, Water and Planning, Victoria
DJPR	Department of Jobs, Precincts and Regions (Victoria) (formerly DEDJTR)
DNV	Det Norske Veritas
DoE	Department of the Environment (now DoEE)
DoEE	Department of the Environment and Energy (formerly DSEWPAC and DoE)
DoT	Department of Transport (Victoria) (formerly DEDJTR)
DPIPWE	Department of Primary Industries, Populations, Water and the Environment (Tasmania)
DSE	Department of Sustainability and Environment, Victoria (now DELWP)

DSEWPAC	Department of Sustainability, Environment, Water, Populations and Communities (now DoEE)
DTPLI	Department of Transport Planning and Local Infrastructure (Victoria) (now DEDJTR)
EAPL	East Australian Pipeline Limited
EEZ	Exclusive Economic Zone
EP	Environment Plan
EPP	Environment Protection Policy (Tasmania)
EMP	Environmental Management Plan
EMPCA	*Environmental Management and Pollution Control Act 1994* (TAS)
EMS	Environmental Management System
EMT	Environmental Management Team
EPA	Environment Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
ERA	Environmental Risk Assessment
ERMP	Emergency Response Management Plan (NM2-002PA-ERMP)
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESD	Ecologically Sustainable Development
ESV	Energy Safe Victoria
F&CRSA	Field and Control Room Services Agreement
FSA	Formal Safety Assessment
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GIS	Geographical Information System
GN	Guidance Note
GPS	Global Positioning System
ha	hectare
HAZID	Hazard Identification (Study)
HAZOP	Hazard and Operability (Study)
HB	Handbook
HDD	Horizontal directional drilled
HSE	Health, Safety and Environment
HSEMS	Health, Safety and Environmental Management System
IACS	International Association of Classification Societies
IAPPC	International Air Pollution Prevention Certificate
ICAM	Incident Cause Analysis Method

IMCA	International Marine Contractors Association
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organisation
IMS	Invasive Marine Species
IOPPC	International Oil Pollution Prevention Certificate
IP	Intersection Point
ISO	International Standards Organisation
ISPPC	International Sewage Pollution Prevention Certificate
IUCN	International Union for Conservation of Nature
JA	Jurisdictional Authority
JAMBA	Japan-Australia Migratory Bird Agreement 1974
JHA	Job Hazard Analysis
KEF	Key Ecological Feature
kg	kilogram
kHz	kilohertz
km	kilometre
km^2	square kilometre
KP	Kilometre Point
KPI	Key Performance Indicator
kV	kilovolts
L	litre
LAT	Lowest Astronomical Tide
Lat.	Latitude
LCC	Land Conservation Council
LCS	Longford Compressor Station
LEL	Lower Explosive Limit
LOC	Loss of containment
Long.	Longitude
m	metres
m^3	cubic metres
mm	millimetres
m/s	metres per second
MARPOL	International Convention for the Prevention of Pollution from Ships
MARS	Maritime Arrivals Reporting System

MAST	Marine and Safety Tasmania
MDO	Marine Diesel Oil
MFO	Marine Fauna Observer
MGO	Marine Gas Oil
MLV	Main Line Valve
MNES	Matters of National Environmental Significance
MPA	Marine Protected Area
MPa(g)	Mega Pascals (gauge)
MRT	Mineral Resources Tasmania, a division of the Department of State Growth
MSDS	Materials Safety Data Sheet
NM	Nautical Mile
NB	Nominal Bore
NEBA	Net Environmental Benefit Analysis
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measures
NOAA	National Oceanic and Atmospheric Administration (USA)
NOHSC	National Occupational Health and Safety Commission
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOx	Oxides of Nitrogen
NOPTA	National Offshore Petroleum Titles Administrator
NoT	Notice of Termination
NPI	National Pollutant Inventory
NSW	New South Wales
NZS	New Zealand Standard
OIW	oil in water
OPEP	Oil Pollution Emergency Plan
OPGGS Act	*Offshore Petroleum and Greenhouse Gas Storage Act 2006*
OPRC	International Convention on Oil Pollution Preparedness, Response and Cooperation
OPRC-HNS Protocol	Protocol on Preparedness, Response and Cooperation to Pollution Incidents by Hazardous and Noxious Substances
OSMP	Operational and Scientific Monitoring Plan
OSDAS	OSD Asset Services
OSRA	Oil Spill Response Atlas
OSTM	Oil Spill Trajectory Model
OTTER	Office of the Economic Regulator, Tasmania

OWS	Oily Water Separator
PIMS	Palisade Integrated Management Services
PEM	Protocol for Environmental Management
PJ	Petajoule
POLREP	Pollution Report
PPE	Personal Protective Equipment
PTW	Permit to Work
PWS	Parks and Wildlife Service (Tasmania)
RBI	Risk-Based Inspection
oil	Root Cause Analysis
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement 2002
ROV	Remotely Operated Vehicle
SA	Standards Australia
SCADA	Supervisory Control and Data Acquisition system
SDS	Safety Data Sheet
SDO	State Duty Officer
SEPP	State Environmental Protection Policy (Victoria)
SETFIA	South East Trawl Fishing Industry Association
SITREP	Situational Report
SOLAS	International Convention on the Safety of Life at Sea 1974
SOPEP	Shipboard Oil Pollution Emergency Plan
SOx	Sulphur Oxides
SSS	Side Scan Sonar
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978
t	tonnes
TAS	Tasmania
TEC	Threatened Ecological Community
TGP	Tasmanian Gas Pipeline
TGPPL	Tasmanian Gas Pipeline Pty Ltd
TJ	Terajoule
TP	Tangent Point
TSV	Transport Safety Victoria
TWPS	Transfield Worley Power Services
UNEP	United Nations Environment Programme

UNESCO	United Nations Educational, Scientific and Cultural Organisation
VIC	Victoria
VIV	Vortex Induced Vibrations
VOCs	Volatile Organic Compounds
ZPI	Zone of Potential Impact
˚C	degrees Celsius
%	percent