Gippsland Offshore Operations

Environment Plan Summary

CONTROLLED DOCUMENT
(VGB-EN-EMP-0004)

Revision 1 – April 2019

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Revision History

Rev	Date	Details	Author	Reviewer	Approver
0	23 March 2019	Issued to NOPSEMA	GLE	OGW	IM
1	5 April 2019	Issued to NOPSEMA	GLE	OGW	IM

Acronyms and Abbreviations

Acronym	Description
ADIOS	Automated Data Inquiry for Oil Spills
AHS	Australia Hydrological Service
ALARP	As low as reasonably practicable
AMSA	Australian Maritime Safety Authority
API	American Petroleum Institute
COE	Cooper Energy
DEDJTR	Department of Economic Development, Jobs, Transport and Resources (Victorian) now DJPR
DJPR	Department of Jobs, Precincts and Regions (Victorian) (Formerly DEDJTR)
DJPR EMB	Department of Jobs, Precincts and Regions Emergency Management Branch
EMBA	Environment that May be Affected
ERR	Earth Resources Regulation
HDD	Horizontal directional drilling
HSEC	Health, Safety, Environment and Community
IMCRA	Integrated Marine and Costal Regionalisation of Australia
IMR	Inspection, maintenance and repair
IPIECA	International Petroleum Industry Environmental Conservation Association
ITOPF	International Tanker Owners Pollution Federation
LEFCOL	Lakes Entrance Fishermen’s Society Co-operative Limited
LOC	Loss of Containment
LOWC	Loss of Well Control
MDO	Marine Diesel Oil
MEG	Mono-ethylene Glycol
MoC	Management of Change
MS	Management System
NOAA	National Oceanic and Atmospheric Administration
NOPSEMA	National Petroleum Safety and Environmental Management Authority
OPEP	Oil Pollution Emergency Plan
OPGGS(E) Regulations	Offshore Petroleum and Greenhouse Gas Storage Environmental Regulations

Acronym	Description
OSMP	Operational and Scientific Monitoring Plan
OWR	Oiled Wildlife Response
PLEM	Pipeline end manifold
PTS	Permanent Threshold Shift
RAMSAR	Convention on Wetlands of International Importance especially as Waterfowl Habitat
ROV	Remotely Operated Vehicle
SA	South Australia
SDFV	Scuba Divers Federation of Victoria
SETFIA	South-East Trawl Fishing Industry Association
SIV	Seafood Industry Victoria
SMPEP	Shipboard Marine Pollution Emergency Plan
SOPEP	Shipboard Oil Pollution Emergency Plan
SPL	Sound Pressure Level
SSF	Sustainable Shark Fishing Inc
SUTU	Subsea umbilical termination unit
TEC	Threatened Ecological Community
UNEP	United Nations Environment Programme
VRLA	Victorian Rock Lobster Association
WOMP	Well Operations Management Plan

Units

Unit	Description
‘	Minutes
“	Seconds
dB	Decibel
hrs	Hours
kHz	Kilohertz
km	Kilometres
km^2	Kilometres Squared
L	Litres

Unit	Description
m	metres
m^2	Metres Squared
m^3	Metres Cubed
MMscfd	Million standard cubic feet per day
^{o}	Degrees
^{o}C	Degrees Celsius
ppb	Parts per Billion
µPa	Micro Pascals

1 Introduction

Cooper Energy Limited (Cooper Energy) holds a 100% interest and is the operator of the Gippsland assets in the Bass Strait, including:

- Patricia-Baleen (PB) Gas Field (Production Licence VIC/L21) and pipeline (Pipeline Licences VIC/PL31 and VIC/PL31(V));
- Sole Gas Field (Production Licence VIC/L32) and pipeline (Pipeline Licences VIC/PL006401 and VIC/PL43); and
- Basker Manta Gummy (BMG) (Retention Licences VIC/RL13, VIC/RL14 and VIC/RL15).

Figure 1-1 provides the location of these permits and fields.

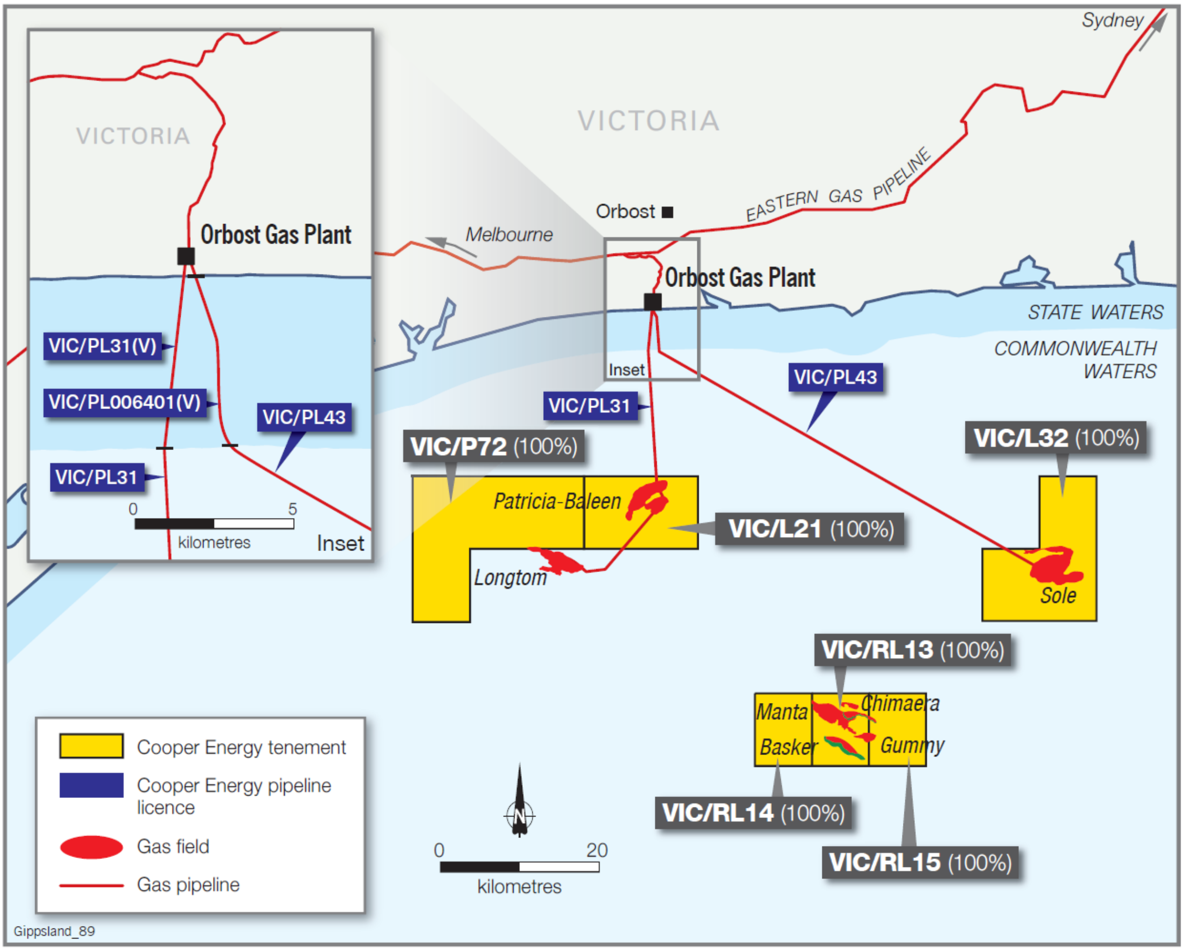

Figure 1-1 Location of Gippsland Offshore Operations Permits

1.1 Titleholder Details

Table 1-1 provides the details of titleholders and liaison person for the titles within which the petroleum activity will take place.

Table 1-1: Details of Titleholder and Liaison Person

Title and Titleholder	Titleholder Details	Liaison Person
Cooper Energy (PBF) Pty Ltd A.B.N.: 43 615 354 982 Production Licence VIC/L21 Pipeline Licences: VIC/PL31 VIC/PL31(V)	Level 8, 70 Franklin Street Adelaide, SA 5000 (08) 8100 4900	Iain MacDougall General Manager Operations Cooper Energy Limited Level 8, 70 Franklin St, Adelaide, SA, 5000 Phone: (08) 6556 2101 Email: iainm@cooperenergy.com
Cooper Energy (Sole) Pty Ltd A.B.N.: 86 613 951 429 Production Licence VIC/L32 Pipeline Licences: VIC/PL006401(V) VIC/PL43		
Cooper Energy Limited A.B.N.: 93 096 170 295 Retention Licences: VIC/RL13 VIC/RL14 VIC/RL15		

2 Location of the Activity

2.1 Overview

2.1.1 Location

The Gippsland Offshore Operations assets are in Commonwealth and State waters off Victoria's south-west coast (Figure 1-1). Assets are located within the following Licence areas:

- BMG field and associated infrastructure in VIC/RL13, VIC/RL14 and VIC/RL15, approximately 55 km from Cape Conran, Victoria;
- PB gas field and associated infrastructure in VIC/L21, 25 km south of Marlo in East Gippsland;
- PB gas pipeline and umbilical in VIC/PL31 and VIC/PL31 (V), a 24 km subsea pipeline and umbilical cable connecting the Patricia-2 and Baleen-4 wells to the Orbost Gas Plant;
- Sole gas field and associated infrastructure in VIC/L32, 40 km south of Bemm River, Victoria; and.
- Sole gas pipeline and umbilical in VIC/PL43 and VIC/PL006401(V), a 65 km subsea pipeline and umbilical connecting the Sole-3 and Sole-4 wells to the Orbost Gas Plant.

The Gippsland assets are in water depths ranging from 9 to 263 m and co-ordinates are provided in Table 2-1.

Table 2-1: Co-ordinates of the Gippsland offhore infrastructure (Datum: GDA94)

Location	Latitude	Longitude	Approx. Water depth (m)
BMG			
Basker-2 Well (B2)	38° 17’ 58.51” S	148° 42’ 24.72” E	155
Basker-3 Well (B3)	38° 17’ 58.97” S	148° 42’ 24.94” E	155
Basker-4 Well (B4)	38° 17’ 58.86” S	148° 42’ 23.58” E	155
Basker-5 Well (B5)	38° 17’ 59.31” S	148° 42’ 23.80” E	155
Basker-6 ST-1 Well (B6)	38° 19' 17.47" S	148° 43' 54.76" E	263
Basker-7 Well (B7)	38° 17' 58.79” S	148° 42' 22.31” E	155
Manta-2A Well (M2A)	38° 16’ 39.41” S	148° 42’ 58.03” E	135
Basker-A Manifold (BAM)	38° 17' 58.74” S	148° 42' 24.32” E	155
Basker-A Pipeline End Manifold (BAPLEM)	38° 17' 58.83” S	148° 42' 26.74” E	155
Basker-A Manifold Umbilical Termination Assembly (BAM UTA)	38° 17' 58.74” S	148° 42' 24.32” E	155
Manta-2A Umbilical Termination Assembly (M2A UTA)	38° 16’ 39.80” S	148° 42’ 58.36” E	135
B6 Subsea Tree Umbilical Termination Assembly (B6 UTA 1)	38° 17' 58.54" S	148° 42' 25.96" E	155

Location	Latitude	Longitude	Approx. Water depth (m)
B6 Subsea Tree Umbilical Termination Assembly 2 (B6 UTA 2)	38° 17' 38.32" S	148° 43' 3.95" E	263
B6 Subsea Tree Umbilical Termination Assembly 3 (B6 UTA 3)	38° 17' 38.53" S	148° 43' 5.38" E	263
B6 Subsea Tree Umbilical Termination Assembly 4 (B6 UTA 4)	38° 19' 16.59" S	148° 43' 54.91" E	263
PB			
Patricia-2 well	38° 01' 34.37" S	148° 27' 02.35" E	54
Baleen-4 well	38° 00' 15.52" S	148° 26' 38.91" E	54
Patricia-1 well	38° 01' 47.46" S	148° 26' 51.81" E	54
Pipeline End Manifold (PLEM)	38° 01' 35.49" S	148° 27' 02.44" E	54
PB Pipeline	38° 01' 34.38" S to 37° 47' 53.23" S	148° 27' 02.70" E to 148° 26' 11.94" E	54 - 10
PB Pipeline Tangent point	37° 59' 03.25" S	148° 26' 18.00" E	54
PB Pipeline Tangent point	37° 58' 44.76" S	148° 26' 15.30" E	54
Horizontal Directional Drill (HDD) exit	37° 48' 23.66" S	148° 26' 12.52" E	15
PB Umbilical exit	37° 47' 56.75" S	148° 26' 11.30" E	10
Sole			
Sole-2 P&A	38° 06' 13.101" S	149° 00' 33.511" E	125
Sole-3 well	38° 06' 01.184" S	149° 00' 30.801" E	124
Sole-4 well	38° 06' 00.066" S	149° 00' 31.673" E	124
Pipeline End Manifold (PLEM) Subsea Umbilical Termination Unit (SUTU)	38° 06' 00.066" S	149° 00' 31.368" E	124
Pipeline Tangent point	38° 05' 25.43" S	148° 58' 39.18" E	124
Pipeline Tangent point	38° 05' 17.54" S	148° 58' 17.28" E	124
Pipeline Tangent point	37° 52' 16.21" S	148° 26' 39.20" E	124 - 14
Pipeline Tangent point	37° 51' 47.17" S	148° 26' 17.26" E	124 - 14
Pipeline Tangent point	37° 49' 07.50" S	148° 26' 19.14" E	124 - 14
Pipeline Tangent point	37° 48' 59.07" S	148° 26' 18.78" E	12 - 14
Sole Umbilical exit	37° 48' 30.12" S	148° 26' 13.50 E	14
Sole Horizontal Directional Drill (HDD) exit	37° 48' 23.32" S	148° 26' 15.31 E	9

2.1.2 Operational Area

The Operational Area for the activity is the area where activities will take place and will be managed under this EP. The Operational Area has been defined as 500 m on either side of the Sole and PB pipelines and 500 m around the Sole, PB and BMG wells and subsea infrastructure.

The Operational Area, in some cases, is larger than the Petroleum Safety Zones (PSZs) that are in place for the Gippsland Offshore Operations infrastructure (Table 2-2).

Table 2-2: Gippsland Offshore Operations Infrastructure Petroleum Safety Zones

Asset	Infrastructure	Distance	Gazette Notice
BMG	Basker-6 (ST1) well	360 m	A443819
BMG	BMG field infrastructure	500 m	A443819
BMG	BMG exposed flowline	300 m	A443819
Sole	Pipeline End Manifold (PLEM) for Sole 3 well and Sole 4 well	500 m	A601713
PB	Baleen-4 well and Partricia-2 well	500 m	A528370

2.2 Asset Description

2.2.1 BMG

The BMG Field Development during the period 2005 – 2010 utilised the Crystal Ocean Floating Production Storage and Offloading (FPSO) to recover hydrocarbons through a series of subsea wells tied back to the Crystal Ocean. In November 2010, ROC Oil (then Titleholder and Environmental Operator) and its joint venture partners determined that BMG production under its current operational configuration was not commercially viable and a decision was taken to enter a non-production phase (NPP).

A Manta Gas Development is currently being considered by Cooper Energy. Assessments have concluded that the existing BMG wells and facilities are not required for the Manta Gas Development. Consequently, Cooper Energy intends to abandon the existing BMG wells and oil development infrastructure. Current plans are to undertake these activities in two phases:

- Phase 1 – Plug and abandon the existing Basker and Manta wells.
- Phase 2 – Decommissioning of seabed infrastructure.

The abandonment activities are outside the scope of this EP. Phase 1 activities were originally scheduled for late 2018 and were to be undertaken in accordance with the NOPSEMA accepted BMG Well Abandonment (Phase 1) EP (BMG-EN-EMP-002). This work was subsequently delayed due to challenges gaining additional regulatory approvals. Planning is underway to re-schedule a future campaign once the appropriate regulatory approvals are in place.

2.2.1.1 Equipment Summary

The following wells and subsea equipment have been preserved on the seabed at BMG:

- All wells (Basker-2, Basker-3, Basker-4, Basker-5, Basker-6 (ST-1), Basker-7 and Manta-2A) and associated well-related equipment;
- Individual Subsea Control Modules (SCMs) for Basker-6 and Basker-7;
- The Basker-A Manifold (BAM);
- The three SCMs at the BAM;
- All interconnecting flexible flowlines, service lines and control umbilicals between the BAM and individual wellheads (be they production, gas injection, gas lift, electric or hydraulic leads). This also includes the 2” Manta gas lift line which runs from the BAM to Manta-2A well;
- The following static sections of flowlines up to the mid-line connection point:
  - The main 6” BAM-DTM Basker production flowline;
  - The main 6” DTM-BAM Basker injection flow line; and
  - The main 4” M2A-DTM production flowline.
- The following control umbilicals:
  - The static section of the main electro-hydraulic control umbilical previously running between the BAM and the FPSO; and
  - The hydraulic control umbilical (static section) previously running from M2A to the FPSO.
- The Basker-6 production flowline from the B6 wellhead to the BAM (trenched as far as practicable); and
- The Basker-6 control umbilical (trenched as far as practicable).

All remaining flowlines (production, gas-lift and gas reinjection), service chemical and control umbilicals remain connected (i.e. fixed) to existing equipment (wellheads/BAM).

During the BMG Deconstruction and Well Intervention Campaign (DWIC), the seven wells were shut-in and suspended.

2.2.1.2 Well Status, Isolation and Testing

Well isolation and subsea equipment testing operations were undertaken prior to the departure of the Crystal Ocean FPSO from the field or during the DWIC in 2012.

2.2.1.3 Production, Gas Injection and Gas Lift Flowlines

Prior to the Crystal Ocean FPSO leaving the field, the subsea infrastructure was subjected to a depressurization, flushing and inhibition program. A rated blind was placed on the end of the Basker Production, Basker Injection and Manta Production lines. This was tested and confirmed leak tight.

A total of approximately 179 m^3 of residual inhibited water is expected in the NPP flowlines.

2.2.1.4 Service Control Lines

The Service Control Lines to the SSSV and Completion Isolation Valve have been left filled with the water based hydraulic control fluid Transaqua HT2™. Transaqua HT2™ is classified as a Non-Charmable Product (Initial Grouping - Group D) chemical under the North Sea OCNS and was a previously accepted chemical for use in the control lines in the BMG Phase 1 Oil Development operations.

Other chemical injection service lines have been displaced with uninhibited freshwater and capped.

2.2.2 PB

The Patricia and Baleen fields are significantly depleted and consist of dry gas. The Patricia-1 well is suspended and the Patricia-2 and Baleen-4 wells shut-in. The most recent use of the PB offshore pipeline was to transport Longtom gas and condensate rather than Patricia and Baleen gas production.

The Longtom gas field, pipeline, electrical system and associated control systems are outside the scope of this EP as Seven Group Holdings is the titleholder of the Longtom gas field and associated infrastructure.

2.2.2.1 Wells

The subsea system for Patricia-2 and Baleen-4 wells consists of wellheads with a subsea tree, fitted with production chokes, chemical injection facilities, subsea control modules and instrumentation, whereas the Patricia-1 system consists of a wellhead only. The Patricia-2 and Baleen-4 wells are currently shut-in at their subsea trees and valves have been confirmed closed. Control and monitoring of the wells is via an electro-hydraulic multiplexed control system supplied via umbilicals that connect the wells to the onshore facilities. Since an offshore electrical fault which occurred in May 2015, direct control and monitoring of the subsea system from the Orbost Gas Plant is not possible.

2.2.2.2 Pipeline

The Patricia-2 and Baleen-4 wells tie into the PB pipeline. The PB pipeline is connected to the Longtom pipeline via a PLEM which consists of a manual valve and a T-junction available for future connections. The T-junction has double isolation.

The PB pipeline system is isolated at the high integrity pipeline protection system (HIPPS) and at the onshore plant inlet. The HIPPS isolation valves failed-safe (closed) on loss of electrical signal following an electrical fault, thereby isolating the PB pipeline and a 17 km section of Longtom pipeline downstream of the HIPPS. The pipeline was then blown down to 230 kPa, and this pressure was monitored and proved to be holding static, indicating that the HIPPS valves were not passing. The HIPPS isolation valves will remain closed during the non-operation phase.

The pipeline was then injected with nitrogen to establish a pressure of 630 kPa. This positive pressure has been chosen to exceed the seawater head by 100 kPa to support the early identification of a passing valve and prove ongoing pipeline integrity.

The pipeline contains approximately 2,700 m^3 natural gas, 4,550 m^3 nitrogen, 5 m^3 Longtom condensate and 150 m^3 MEG/water mix (40:60).

2.2.2.3 Umbilical

The main umbilical consists of power/communication and chemical (MEG and hydraulic fluid) lines to and from the subsea infrastructure and the Orbost Gas Plant. The subsea main umbilical runs from the Orbost Gas Plant to the main umbilical termination assembly (MUTA), located adjacent to the Baleen-4 well. A smaller umbilical runs from the MUTA to the Patricia-2 well.

2.2.3 Sole

The Sole Development comprises two gas production wells connected to a production pipeline via a pipeline end manifold (PLEM) and tie-in spools. Communication and services for the offshore wells is provided by a control umbilical. The Sole production wells were drilled in 2018 and will commence production in 2019.

2.2.3.1 Wells

The Sole-3 and Sole-4 production wells consist of a subsea tree, fitted with production chokes, chemical injection facilities, subsea control modules and instrumentation.

The Sole-2 well is plugged and isolated from the reservoir with the wellhead still in place.

2.2.3.2 Pipeline

The Sole production pipeline is 300 mm (12 inch) in diameter carbon steel grade DNV 450. A PLEM is welded to the pipeline. The PLEM enables the production wells to be connected to the Sole production pipeline via rigid tie-in spool pieces. The PLEM is a gravity-based structure that is supported by a mudmat foundation.

Several tie-in spools and flying leads are required to connect the production wells to the Sole production pipeline and umbilical.

Pipeline external corrosion management is via anti-corrosion coating and sacrificial anodes designed to be maintenance free for the design life of the pipeline and externally visible for inspection by Remotely Operated Vehicle (ROV).

The production pipeline has been designed such that it will not be trenched but will lay on the seabed and does not require anchors.

Control of hydrate and internal corrosion will be by hydrate inhibition and corrosion control. Though unlikely, if required hydrate dissipation and scale inhibition methods will be used.

2.2.3.3 Umbilical

The Sole umbilical consists of power/communication and chemical (MEG and hydraulic fluid) lines and runs from the subsea infrastructure to the Orbost Gas Plant. It is buried along the alignment and re-surfaces inside of the 500 m radius Petroleum Safety Zone (PSV) gazetted around the production wells.

The subsea umbilical termination unit (SUTU) acts to link the production wells (via subsea trees) to the Sole umbilical via flying leads and allows pressure to be monitored along with the flow of hydrocarbons to be controlled. The SUTU is a gravity-based structure that is supported by a mudmat foundation.

2.2.4 Asset Decommissioning

Cooper Energy’s strategy in developing the Gippsland gas hub with processing via the Orbost Gas Plant is to re-life and re-use existing subsea infrastructure where practical. This has the dual benefit of reducing the economic threshold for bringing gas to market and reducing the environmental footprint.

On this basis, the following decommissioning timings are indicative and are dependent on several factors, including:

- Production duration from producing assets;
- Rig / vessel availability;
- Potential to re-purpose for adjacent projects; and
- Ability to combine decommissioning operations with other projects to carry out works in a cost-effective manner.

Table 2-3 outlines the expected abandonment and decommissioning timelines for Cooper Energy's wells and subsea infrastructure in the Gippsland Basin.

Table 2-3: Indicative Decommissioning Plan

Project	Licence	Asset	Scope	Indicative Timing	Notes
Sole	VIC/L32	Sole-2	Remove Wellhead	2034	Well abandoned August 2018. To be carried out as part of decommissioning of full Sole field infrastructure at end of production life + 5 years.
Sole	VIC/L32	Sole-3	Abandon Production Well	2034	To be carried out as part of decommissioning of full Sole field infrastructure at end of production life + 5 years.
Sole	VIC/L32	Sole-4	Abandon Production Well	2034	To be carried out as part of decommissioning of full Sole field infrastructure at end of production life + 5 years.
Sole	VIC/L32 VIC/PL43 VIC/PL006401(V).	HDD, Pipeline, Control Umbilical, infield subsea infrastructure	Decommission Subsea Infrastructure	2044	Control system has been engineered with capability to control Manta gas development. Pipeline/HDD assumed re-purposed/re-lifed for gas transmission from further developments.
Patricia Baleen	VIC/L21	Patricia-1	Abandon Exploration Well	2029	Requires rig capable of working in 52 m water depth – potentially jack-up rig, so not practicable to combine with BMG abandonment planning. Abandon as part of campaign with PB development wells.
Patricia Baleen	VIC/L21	Patricia-2	Abandon Production Well	2029	Requires rig capable of working in 52.5 m water depth – potentially jack-up rig, so not practicable to combine with BMG abandonment planning. Part of PB development well abandonment campaign.
Patricia Baleen	VIC/L21	Baleen-4	Abandon Production Well	2029	Production restart proposed 2024 in conjunction with enabling development; one or more of: Manta Gas Development / VIC/P72

Project	Licence	Asset	Scope	Indicative Timing	Notes
					based development, Longtom restart. Abandonment 5 years post final production. Requires rig capable of working in 53 m water depth – potentially jack-up rig.
Patricia Baleen	VIC/L21 VIC/PL31 VIC/PL31(V)	HDD, Pipeline, Control Umbilical	Decommission Subsea Infrastructure	2044	Assume re-purposed for one or more of: Manta Gas Development, Longtom field restart, development following VIC/P72 exploration drilling.
BMG	VIC/RL13	Basker-2	Abandon Production Well	2021	Abandonment planned as part of 2021 drilling campaign.
BMG	VIC/RL13	Basker-3	Abandon Production Well	2021	Abandonment planned as part of 2021 drilling campaign.
BMG	VIC/RL13	Basker-4	Abandon Production Well	2021	Abandonment planned as part of 2021 drilling campaign.
BMG	VIC/RL13	Basker-5	Abandon Production Well	2021	Abandonment planned as part of 2021 drilling campaign. Note reservoir section of well is already abandoned.
BMG	VIC/RL13	Basker-6	Abandon Production Well	2021	Abandonment planned as part of 2021 drilling campaign.
BMG	VIC/RL13	Basker-7	Abandon Production Well	2021	Abandonment planned as part of 2021 drilling campaign.
BMG	VIC/RL13	Manta-2A	Abandon Production Well	2021	Abandonment planned as part of 2021 drilling campaign.
BMG	VIC/RL13	Subsea Manifold & infield subsea infrastructure	Decommission Subsea Infrastructure	2026	To be decommissioned either as part of Manta field development subsea works, or standalone if Manta does not proceed.

2.3 Field Characteristics

2.3.1 BMG

Hydrocarbon from BMG infrastructure, in the unlikely event of a release will predominantly be gas with some condensate. Typical gas condensate properties are provided in Table 2-4.

Table 2-4: Basker Condensate Physical Properties (ROC 2010)

Physical Property	Value
API Gravity	65.5
Density (@11 °C)	0.718
Dynamic Viscosity @ 40°C)	0.465 cSt
Pour Point (°C)	< - 8 °C

2.3.2 PB

The Patricia and Baleen reservoirs are dry gas as provided in Table 2-5. The reservoirs are now substantially depleted.

The Longtom fluid physical characteristics are provided in Table 2-6. Approximately 5 m^3 of Longtom condensate remains in the offshore PB pipeline in its current non-operations phase.

Table 2-5: PB Reservoir Conditions (Santos 2014)

Parameter	Patricia-2	Baleen-4
Maximum Pressure at Reservoir Depth	400 psi	650 psi
Maximum temperature	120 °F	120 °F
Gas Specific Gravity	0.572	0.563
Condensate to Gas Ratio	<1 bbl/MMscf	<1 bbl/MMscf

Table 2-6: Longtom Condensate Physical Properties (Santos 2015)

		Longtom Condensate
API Gravity		51.2
Density@25oC g/ml		0.777
Dynamic Viscosity @ 20°C (cP)		1.081
GOR		10.85 stb/MMscf
Pour Point (°C)		-9 (when fresh)
	Volatiles (<180°C)	61.5
	Semi-volatile (180-265°C)	14.3

		Longtom Condensate
Boiling Point Curve (% mass)	Low Volatility (265-380°C)	21.1
	Residual (>380°C)	3.1
ITOPF Group		I

2.3.3 Sole

The Sole reservoir is a gas reservoir with very limited condensate observed or recovered during the well tests on Sole-2, Sole-3 and Sole-4. Physical characteristics of the Sole gas is provided in Table 2-7.

Table 2-7: Physical Characteristics of Sole Gas (Cooper Energy 2018)

Parameter	Sole
Maximum Pressure at Reservoir Depth	1147 psi
Maximum temperature	43 °C
Gas Specific Gravity	0.589
Condensate to Gas Ratio	<0.1 bbl/MMscf

2.4 Activities that have the Potential to Impact the Environment

This section outlines the activities included in this EP which have the potential to result in environmental aspects or hazards, leading to impacts on receptors.

The activities included in this EP are:

- Sole operations;
- BMG and PB non-production;
- Inspection, maintenance and repair (IMR) of subsea infrastructure associated with the BMG, PB and Sole fields; and
- Vessel and ROV Operations.

2.4.1 Sole Operations

The operation, monitoring and control of the Sole wells is conducted from the Orbost Gas Plant via the umbilical. Production, hydrate/scale control and internal corrosion control will operate within a closed-loop system, with no planned discharges to the marine environment. The only planned discharge during Sole operations is water-based hydraulic fluid from the control and testing of the subsea well's valves. Any other discharges would be from an accidental release.

2.4.2 BMG and PB Non-production

There are no planned discharges associated with the non-production phase of BMG and PB. Any discharges would be from an accidental release. There is no ongoing injection of chemicals into the BMG and PB infrastructure for hydrate, scale or corrosion control.

2.4.3 Inspection, Maintenance and Repair (IMR)

Inspection, maintenance and repair (IMR) programs are undertaken on each asset's subsea infrastructure to confirm and maintain the integrity of the subsea systems. IMR programs are detailed in the Sole, BMG and PB accepted Safety Cases for subsea infrastructure and accepted WOMPs for wells. Each asset has an Integrity Management Plan (IMP) that details the management, monitoring, mitigation and inspection activities determined necessary to ensure integrity is maintained for the subsea infrastructure and wells. The IMP covers all aspects of asset lifecycle management, and has been developed around the following fundamental processes:

- Definition of system limits.
- Definition of the organisation and allocation of responsibilities.
- Use of standards and risk assessment for determining appropriate controls and mitigation measures to reduce risk to ALARP.
- Continuous assurance and effective review of the system.

As detailed in the accepted asset Safety Case and WOMP a risk assessment methodology is used to assess potential threats to the subsea assets, risk mitigations and determine appropriate integrity monitoring plans including required frequency of subsea inspections. The maximum interval between inspections is 5 years, with the actual interval bought forward based on the findings of the previous inspections.

Inspection, maintenance and repair programs consist of activities such as:

- Inspection of wellheads, pipelines and subsea structure;
- Maintenance or repair of the pipeline, wells and associated subsea infrastructure; and
- Scour rectification.

2.4.4 Vessel and ROV Operations

IMR activities are undertaken by support vessels. Typical vessels utilised for previous IMR activities have been sourced locally and include the Bass Trek and Silver Star. The Bass Trek has a fuel capacity of 25 m^3 with fuel spread between numerous tanks (maximum 11.5 m^3). The Silver Star has a fuel capacity of 48 m^3 with fuel spread between numerous tanks (maximum 12 m^3). A larger vessel may be required for repair or rectifications works and may have a larger fuel tanks up to 250 m^3. Depending on the inspection and maintenance activities required, vessels are likely to be at sea for 2-4 weeks. Vessels will return to port to refuel.

Inspection and/or work-class ROVs are required for inspection, maintenance or repair activities. ROVs may use electrics or hydraulics to control the manipulator or cutting arm. Where hydraulics are used to control the arm a closed system is employed where hydraulic fluid is circulated to move the arms and is designed not to release hydraulic fluid.

3 Description of the Environment

3.1 Environment that May Be Affected

The Environment that May be Affected (EMBA) is based on the maximum credible hydrocarbon spill event that might occur during petroleum activities. For the activities under the Plan, the EMBA is based on hydrocarbon exposures above impact thresholds for ecological and social receptors for the accidental release of Marine Diesel Oil (MDO) from a vessel collision. Based on previous stochastic modelling the EMBA is expected to extend along waters off the eastern Victoria coast (Figure 3-1).

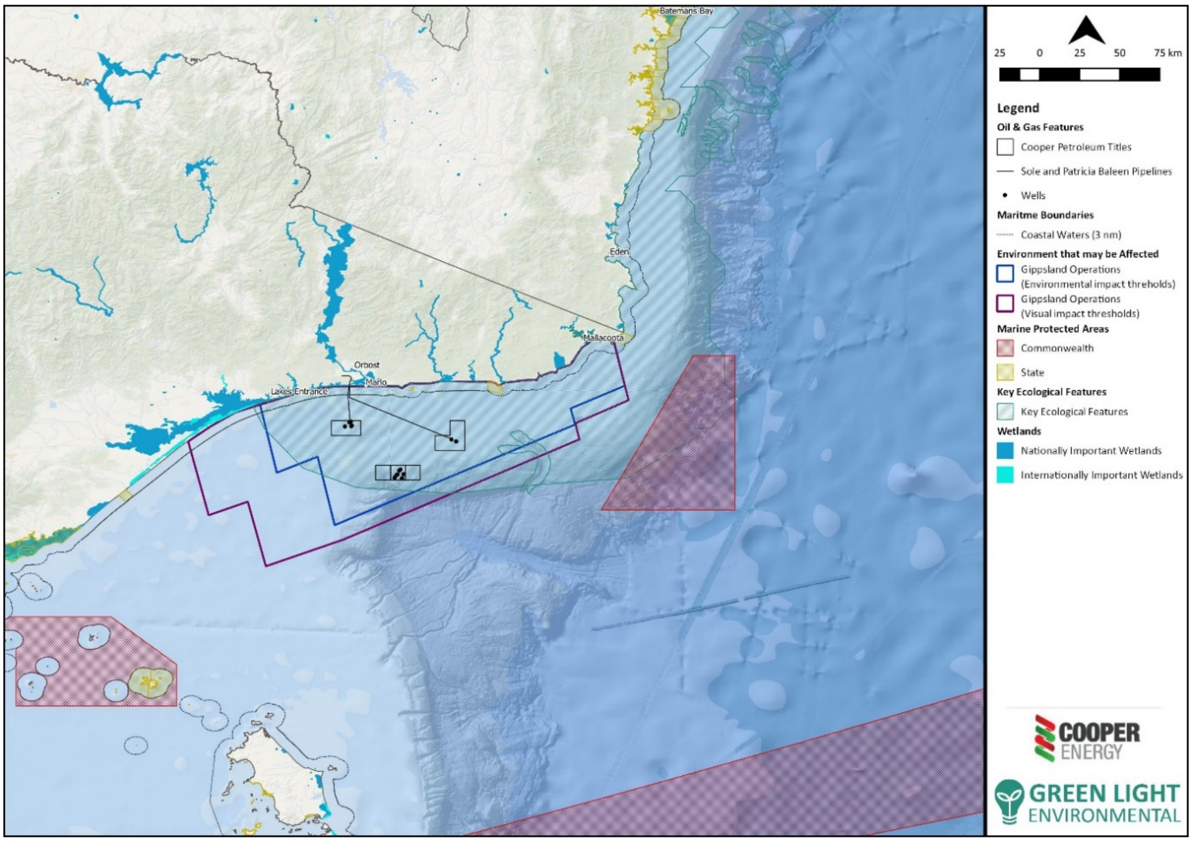

Figure 3-1: EMBA for the Gippsland Offshore Operations Activities

3.2 Regional Setting

The Gippsland Offshore Operations assets are in Commonwealth and State waters off Victoria's south-west coast in the Bass Strait.

The Gippsland assets are in water depths ranging from 9 to 263 m within the South-east Marine Region and the Twofold Shield Meso-scale Bioregion. The continental shelf within the Twofold Shelf region has a very steep inshore profile (0–20 m), with a less steep inner (20–60 m) to mid (60–120 m) shelf profile, and a generally flatter outer shelf plain (120–160 m) south-west of Cape Howe (IMCRA 1998). The wide shelf area is relatively featureless and flat (Santos 2015). The sediments on Twofold Shelf are poorly sorted, with a median of 92% sand and 8% gravel; they are composed of organic material, with a median of 64.5% calcium carbonate (IMCRA 1998). The seabed is comprised of fine to coarse sand and areas of shell (CEE Consultants 2003).

A Sole Development – Pipeline Route geoacoustic survey was undertaken in January of 2003 to characterise the bathymetry, seabed features, shallow geology, sediments and benthic habitat along the sole pipeline route (OMV 2003).

Key survey findings are:

- Bathymetry is generally gentle sloping between water depths of 14.7m approx. 200 m south of the Sole HDD beach crossing and 125.8 m at the Sole-3 location.
- Featureless seabed comprised of clays, silts, sands and gravel and some consolidated bedded sediments.
- Average seabed slopes along the proposed pipeline route do not exceed 0.25° (1:230). From the available bathymetry data, the seabed topography along the proposed pipeline route does not appear to contain significant cross slopes exceeding 10° (1:5.7).
- Poorly to well-defined megaripples and uneven surfaces were identified in a number of places along the proposed pipeline route. Megaripples are characterised by wavelength of less than 5 m to approximately 20 m, amplitudes less than 0.30 m and crest generally trending northeast suggesting a northwest to southeast primary current orientation.

Habitat characterisation surveys along the nearby PB pipeline route (OMV Australia 2002) showed a sand and shell/rubble seabed, with sparse epibiotic (e.g. sponges) coverage, with no reef systems (OMV Australia 2002). Similarly, surveys for the BMG wells (approximately 135 - 265 m water depth) note a featureless seabed. There has been extensive demersal fishing activity in the area, so seabed biota is expected to be modified from trawling and netting activities (CEE Consultants 2003).

A video survey undertaken along the PB pipeline in 2003 (CEE Consultants 2003) indicates that there are four general habitat associations on the seabed along the pipeline route. Large epibiota are very sparse, with extensive areas of sandy and shell/rubble seabed being devoid of large epibiota except for introduced screw shells and sponges. The habitats and associated biota are described below:

1. Medium sand and shell grit – extensive areas with pronounced sand waves. Epibiota was generally sparse to relatively commonly occurring sea pens and occasional sponges and stalked colonial ascidians. Sea pens were common in water depths of 22 to 27 m.
2. Shell accumulations – large patches of seabed comprised of old large shells, predominantly bivalves and scallops, with New Zealand screw shells present in large numbers. The proportion of sand ranged between zero and 20% cover.
3. Sponge garden – a small and distinct area of large sponges and bryozoans occurs at about 50 m water depth. The sponges varied in form and colour and included fans, spheres, massives, cups and fingers. Bryozoans included lace-like corals, concertina fans, perforated rigid sheets and fern-like branches. These associations indicate that although the seabed is comprised predominantly of sand and shell grit, it is stable enough to allow these associations to grow. Schools of jackass morwong, butterfly perch and individual gurnard and leatherjackets were attracted to the sponge garden.
4. Introduced NZ screw shell aggregations – the NZ screw shell (*Maoricolpus roseus*) was common in the survey area, generally in water depths greater than 40 m, sometimes forming dense beds covering 100% of the seabed.

Based on the above survey information, it is expected that the benthic habitat in the offshore Operational Area, is comprised of sandy substrate, sparse epifauna (e.g. sponges) and infauna.

Wave energy in this bioregion is relatively low. Water temperatures are also generally warmer than elsewhere on the Victorian open coast due to the influence of the East Australian Current (Parks Victoria 2003).

The coast is dominated by dunes and sandy shorelines, with occasional rock outcrops; and there are extensive areas of inshore and offshore soft sediments habitat (Barton et al. 2012). This region also has occasional low-relief reef immediately beyond the surf zone (Parks Victoria 2003).

3.3 Ecological and Social Receptors

The following tables show the presence of ecological (Table 3-1) and social (Table 3-2) receptors that may occur within the Operational Area and EMBA. Examples of values and sensitivities associated with each of the ecological or social receptors have been included in the tables. These values and sensitivities have been identified based on:

- Presence of listed threatened or migratory species or threatened ecological communities identified in the EPBC Protected Matter searches.
- Presence of BIAs and habitats critical to the survival of the species.
- Presence of important behaviours (e.g. foraging, roosting or breeding) by fauna, including those identified in the EPBC Protected Matter searches.
- They provide an important link to other receptors (e.g. nursery habitat, food source, commercial species).
- They provide an important human benefit (e.g. recreation and tourism, aesthetics, economic benefit).

Table 3-1: Presence of Ecological Receptors within the Operational Area and the EMBA

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
Habitat	Shoreline	Rocky	• Foraging habitat (e.g. birds) • Nesting or Breeding habitat (e.g. birds, pinnipeds) • Haul-out sites (e.g. pinnipeds)	-	Not present The Operational Area does not include the onshore environment.	✓	Present The coastal environment within the EMBA is comprised predominately of sandy shores with sections of rocky outcrops. Each of these shoreline types has the potential to support different flora and fauna assemblage due to the different physical factors (e.g. waves, tides, light etc.) influencing the habitat; for example: • Australian fur-seals are known to use rocky and sandy shores for haul-out and/breeding. • Birds species may use sandy or rocky areas for roosting and breeding sites. • Turtle species may use sandy area for nesting. • Rocky coasts can provide a hard substrate for sessile invertebrate species (e.g. barnacles, sponges etc) to attach to. • Artificial structures (e.g. groynes, jetties) while built for other purposes (e.g. shoreline protection, recreational activities) can also provide a hard
		Sandy	• Foraging habitat (e.g. birds) • Nesting or Breeding habitat (e.g. birds, pinnipeds, turtles) • Haul-out sites (e.g. pinnipeds)	-		✓	
		Artificial structure	• Sessile invertebrates	-		✓	

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
							substrate for sessile invertebrates to attach to.
	Mangroves (Dominant Habitat)[1]	Intertidal/subtitle habitat, mangrove communities	• Nursery habitat (e.g. crustaceans, fish) • Breeding habitat (e.g. fish)	-	Not present The Operational Area does not include the onshore environment.	-	Not expected to be present Mangrove dominated habitat is not identified in the EMBA. Whilst, mangroves have been recorded in all Australian states except Tasmania. Mangrove habitat nearshore along the Victorian coast are distributed in South Gippsland around the French Island National Park and coast around Port Welshpool. Dominant mangrove habitat from the NISB Habitat Classification Scheme are not present in the EMBA. The closest Mangrove dominated habitat occurs in southern NSW, ~25 km north of the EMBA boundary.
	Saltmarsh (Dominant Habitat)	• Upper intertidal zone, Saltmarsh habitat, habitat for fish and benthic communities	• Nursery habitat (e.g. crustaceans, fish) • Breeding habitat (e.g. fish)	-	Not present The Operational Area does not include the onshore environment.	✓	Present Saltmarsh are identified in the EMBA. Saltmarsh habitat are widespread along the Australian coast and mostly occur in the upper intertidal zone. Saltmarsh dominated habitat with greater than 10% coverage of saltmarsh occurs along

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
							most of the coastline of the EMBA in Victoria. In the broader region outside of the EMBA, it occurs at western Port Phillip Bay, northern Western Port, within the Corner Inlet-Nooramunga (Figure 3.5, Addendum 1). Saltmarsh environments are much more common in northern Australia (e.g. Queensland), compared to the temperate and southern coasts (i.e. New South Wales, Victoria, Tasmania) (Boon et al. 2011).
	TEC: Subtropical and Temperate Coastal Saltmarsh	• Upper intertidal zone, Saltmarsh habitat, habitat for fish and benthic communities	• Nursery habitat (e.g. crustaceans, fish) • Breeding habitat (e.g. fish)	-	Not present The Operational Area does not include the onshore environment.	✓	Likely to occur. The 'Subtropical and Temperate Coastal Saltmarsh' is listed as a vulnerable Threatened Ecological Community (TEC) under the EPBC Act, and it's known distribution includes the southern and eastern coasts of Australia (Figure 3.7, Addendum 1). Ecological community consists mainly of salt-tolerant vegetation (halophytes) including grasses, herbs, sedges, rushes and shrubs (TSSC 2013a). TEC environments

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
							are more common in northern Australia (Queensland), compared to the temperate and southern coasts (New South Wales, Victoria, Tasmania) (Boon et al. 2011).
	Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Rainforest and coastal vine thickets	• Provides habitat for flora and fauna • Coastal buffer against erosion	-	Not present The Operational Area does not include the onshore environment.	✓	Present The '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, including the area from Cape York Peninsula to the Gippsland Lakes in Victoria.
	Soft Sediment	Predominantly unvegetated soft sediment substrates	• Key habitat (e.g. benthic invertebrates)	✓	Present The Operational Area is located on the flat outer shelf plain of the Twofold Shelf and inshore soft sediment habitat. The benthic habitat within the Operational Area is expected to include predominantly sandy substrate with occasional low-relief reef in nearshore waters (Section 3.5, Addendum 1). The sediments on Twofold Shelf are poorly sorted, with a median of 92% sand and 8% gravel; they are	✓	Present Unvegetated soft sediments are a widespread habitat in both intertidal and subtidal areas, particularly in areas beyond the photic zone. The Gippsland Basin is composed of a series of large sediment flats, interspersed with small patches of reef, bedrock and consolidated sediment.

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
					composed of organic material, with a median of 64.5% calcium carbonate.		
	Seagrass	Seagrass meadows	• Nursery habitat (e.g. crustaceans, fish) • Food source (e.g. fish, turtles)	-	Not present The closest seagrass dominated habitat is present around Lakes Entrance in nearshore waters. Seagrass was not identified in the Sole or PB pipeline survey, and thus seagrass.	✓	Present Seagrass dominated habitat occurs in Lakes Entrance and extends along the Gippsland coast. Refer Addendum 1 - Table 3.12. In East Gippsland, seagrass meadows are common in sheltered bay environments or around small offshore islands. Species may include *Amphibolis antartica*, *Halophila australis*, *Heterozostera tasmanica*, *Posidonia australis*, *P. angustifolia*, and *Zostera muelleri*.
	Algae	Macroalgae	• Nursery habitat (e.g. crustaceans, fish) • Food source (e.g. birds, fish)	-	Not present The Operational Area does not include the nearshore intertidal and tidal zones where macroalgal communities may be present. The Operational Area is not a dominant macroalgae habitat based on the national mapping available from OzCoasts (2015).	✓	Present Benthic microalgae are ubiquitous in aquatic areas where sunlight reaches the sediment surface. Macroalgae communities are generally found on intertidal and shallow subtidal rocky substrates. They are not common as a dominant habitat type in East Gippsland but do occur in mixed reef environments. Species may include

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
							bull kelp and other brown algae species.
	TEC: Giant kelp marine forests of SE Australia	Kelp	• Primary producer habitat • Nursery habitat (e.g. crustaceans, fish) • Food source (e.g. birds, fish)	-	Not present (Section 3.7.3 – Addendum 1).	✓	May occur The 'Giant Kelp Marine Forests of South East Australia' is listed as an endangered TEC under the EPBC Act and may occur within the EMBA. The ecological community is characterised by a closed to semi-closed surface or subsurface canopy of *Macrocystis pyrifera*. This ecological community occurs on rocky substrate; some patches may occur in Victoria or northern Tasmania (Section 3.7.3 - Addendum 1).
	Coral	Hard and soft coral communities	• Nursery habitat (e.g. crustaceans, fish) • Breeding habitat (e.g. fish)	✓	Present Soft coral was identified in the PB pipeline survey at 50 m water depth and is expected to have sparse presence in the Operational Area.	✓	Present Soft corals can be found at most depths throughout the continental shelf, slope and off the slope regions, to well below the limit of light penetration. Soft corals (e.g. sea fans, sea whips) occur as part of mixed reef environments in waters along the East Gippsland coast. Soft corals can occur in a variety of water depths.

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
Marine Fauna	Plankton	Phytoplankton and zooplankton	• Food Source (e.g. fish, whales, turtles)	✓	Present Phytoplankton and zooplankton are widespread throughout oceanic environments and is expected to occur in the Operational Area. Increased abundance and productivity can occur in areas of upwelling e.g. Upwelling East of Eden KEF, which intersects with the Operational Area (Section 3.9 – Addendum 1).	✓	Present Phytoplankton and zooplankton are widespread throughout oceanic environments; however increased abundance and productivity can occur in areas of upwelling e.g. Upwelling East of Eden KEF, which intersect with the EMBA.
	Seabirds and Shorebirds	Birds that live or frequent the coast or ocean	• Listed Marine Species	✓	Present 34 seabird and shorebird species (or species habitat) may occur within the Operational Area. Ten species of albatross are listed as potentially foraging in the area; no other important behaviours were identified for other seabird or shorebird species. The Operational Area intersects BIAs for: Antipodean albatross, Black-browed albatross, Buller's albatross, Campbell albatross, Common diving-petrel, Indian yellow-nosed albatross, Shy albatross, Wandering albatross, White-faced storm-petrel.	✓	Present 36 seabird and shorebird species (or species habitat) may occur within the EMBA; with breeding, foraging and roosting behaviours identified. The EMBA intersects foraging BIAs for a number of albatross (Antipodean albatross, Black-browed albatross, Buller's albatross, Campbell albatross, Common diving-petrel, Indian yellow-nosed albatross, Shy albatross, Wandering albatross, White-faced storm-petrel, Short-tailed Shearwater and the little penguin.
			• Threatened Species	✓		✓	
			• Migratory Species	✓		✓	
			• BIA	✓		✓	

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
					Detailed existing environment description in Section 3.10 and Table 3.8 - Addendum 1.		Roosting and breeding for a variety of bird species, wader birds and terns, occurs in eastern Victoria. Detailed existing environment description in Section 3.10 and Table 3.8 - Addendum 1.
	Marine Invertebrates	Benthic and pelagic invertebrates	• Food Source (e.g. fish)	✓	Present Marine invertebrates may occur within the Operational Area. Epifauna is expected to be sparse given the water depths. Studies of infauna in shallower waters of east Gippsland has indicated a high species diversity and abundance. Infauna may also be present within the sediment profile of the Operational Area (Section 3.11 – Addendum 1). Commercially important species (e.g. Rock lobster, Giant crab) are unlikely to occur in the Operational Area as there are no low-relief rocky reef and intertidal areas. The threatened marine invertebrate species, Tasmanian Live-bearing Seastar, is not present in the Gippsland and therefore is not expected to be present within the Operation Area.	✓	Present A variety of invertebrate species may occur within the EMBA, including sponges and arthropods. Infauna studies along the Victorian coast showed high species diversity, particularly in East Gippsland. Commercially important species (e.g. Rock lobster, Giant crab) may occur within the EMBA. The threatened marine invertebrate species, Tasmanian Live-bearing Seastar, is not present in the Gippsland and therefore is not expected to be present within the EMBA.
			• Commercial Species	✓		✓	

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
	Fish	Fish	• Commercial Species	✓	Present Commercial fish species may occur within the Operational Area, however, given the lack of suitable benthic habitat, their abundance is expected to be low.	✓	Present Commercial fish species may occur within the EMBA, including Pink Ling, and species of wrasse, flathead and warehou.
			• Threatened Species	✓	Present One threatened species of fish (Australian Grayling) is known to occur within the Operational Area (Section 3.12 – Addendum 1).	✓	Present Three threatened fish species (or species habitat) may occur within the EMBA: • Australian grayling • Black rock cod • Eastern dwarf galaxias
		Sharks and Rays	• Threatened Species	✓	Present Four shark species (or species habitat) may occur within the Operational Area: • Grey nurse shark • White shark • Mako shark • Porbeagle shark The Operational Area is within a distribution BIA for the White Shark. No habitat critical to the survival of the species or behaviours were identified.	✓	Present Five shark species (or species habitat) may occur within the EMBA: • Grey nurse shark • White shark • Mako shark • Porbeagle shark • Whale shark The White Shark has known aggregation areas within eastern Victoria waters; the EMBA intersects the distribution BIA for this species. Breeding behaviour is noted for the
			• Migratory Species	✓		✓	
			• BIA and habitat critical to the survival of the species	✓		✓	

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities		Operational Area[1]		EMBA[2]
							White Shark in the EPBC Protected Matters search, however the breeding BIA is outside of the EMBA.
		Pipefish, seahorse, seadragons	• Listed Marine Species	✓	Present 27 syngnathid species (or species habitat) may occur within the Operational Area (Table 3.12 – Addendum 1). No important behaviours or BIAs have been identified.	✓	Present 27 syngnathid species (or species habitat) may occur within the EMBA. No important behaviours or BIAs have been identified.
	Marine Reptiles	Marine turtles	• Listed Marine Species	✓	Present Four marine turtle species (or species habitat) may occur within the Operational Area (Table 3.15 – Addendum 1): • Loggerhead turtle • Green turtle • Leatherback turtle • Hawksbill turtle No BIAs or habitat critical to the survival of the species were identified for marine turtles.	✓	Present Four marine turtle species (or species habitat) may occur within the EMBA. The EMBA is recognised in the EPBC Protected Matters search, as a foraging habitat for: • Loggerhead turtle • Green turtle • Leatherback turtle • Hawksbill turtle No BIAs or habitat critical to the survival of the species occur within the EMBA.
			• Threatened Species	✓		✓	
			• Migratory Species	✓		✓	
			• BIA and habitat critical to the survival of the species	–		✓	
	Marine Mammals	Seals and Sealions (Pinnipeds)	• Listed Marine Species	✓	Present Two species of pinniped (or species habitat) may occur within the	✓	Present Two pinniped species (or species habitat) may occur within the EMBA.

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
			• BIA	–	Operational Area; the Long-nosed Fur-seal and the Australian Fur-seal (Section 3.14.1 – Addendum 1). No BIAs or habitat critical to the survival of the species were identified for pinnipeds.	-	One species (Australian Fur-seal) has breeding behaviour identified; there is known breeding sites in eastern Victoria (e.g. The Skerries). No BIAs or habitat critical to the survival of the species occur within the EMBA.
		Whales	• Listed Marine Species	✓	Present 22 whale species (or species habitat) may occur within the Operational Area. Foraging behaviours were identified for some species (Sei, Fin and Pygmy Right Whale; Pygmy Blue Whale); no other important behaviours were identified (Section 3.14.2 – Addendum 1). The Operational Area intersects a distribution and a migration and resting on migration BIA for the Southern Right Whale and a foraging BIA for the Pygmy Blue Whale.	✓	Present 23 whale species (or species habitat) may occur within the EMBA. Foraging behaviours were identified for some species (Sie, Fin and Pygmy Right Whales); no other important behaviours were identified. The EMBA intersects a distribution and migration and resting on migration BIA for the Southern Right Whale and a foraging BIA for the Pygmy Blue Whale.
			• Threatened Species	✓		✓	
			• Migratory Species	✓		✓	
			• BIA	✓		✓	
		Dolphins	• Listed Marine Species	✓	Present	✓	Present Seven dolphin species (or species habitat) may occur within the EMBA. No important behaviours or BIAs have been identified.
			• Migratory Species	✓		✓	

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
					Seven dolphin species (or species habitat) may occur within the Operational Area. No important behaviours or BIAs have been identified.		
	Marine pests		• Introduced marine species	✓	Present The introduced conical New Zealand Screw Shell (*Maoricolpus roseus*) was common in the Sole and PB pipeline corridors, generally in water depths greater than 40 m (Section 3.15 – Addendum 1).	✓	Present The introduced conical New Zealand Screw Shell (*Maoricolpus roseus*) was common in the Sole and PB pipeline corridors, generally in water depths greater than 40 m.

Notes:

1. Combination of an EPBC Protected Matters Search of the Operational Area with a 5 km buffer, and characteristics of the Gippsland environment, have been used to describe ecological receptors that may occur within the Operational Area.
2. Combination of an EPBC Protected Matters Search for the EMBA area, and characteristics of the Gippsland environment, have been used to describe ecological receptors that may occur within the EMBA.

Table 3-2: Presence of Social Receptors within the Operational Area and the EMBA

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
Natural System	Commonwealth Marine Area	Key Ecological Features	• High productivity • Aggregations of marine life	✓	Present The Operational Area intersects with one KEF: • Upwelling East of Eden: an area of episodic upwelling known for high productivity and aggregations of marine life, including Blue whales, Humpback whales, seals, sharks and seabirds. Refer Section 4.1 - Addendum 1.	✓	Present Two KEFs intersect with the EMBA: • Big Horseshoe Canyon: a feature at the easternmost end of the Bass Canyon system; the hard substrates provide attachment sites for benthic flora and fauna, thus increasing structural diversity and creating sheltering habitat for benthic fishes. • Upwelling East of Eden: an area of episodic upwelling known for high productivity and aggregations of marine life, including Blue whales, Humpback whales, seals, sharks and seabirds.
		Australian Marine Park	• Aggregations of marine life	-	Not present	-	Not present
	State Parks and Reserves	Marine Protected Areas	• Aggregations of marine life	-	Not present	✓	Present Two State Marine Protected Areas intersect with the EMBA: • Beware Reef Marine Sanctuary: protects partially exposed granite reef that is home to abundant marine life and is a haul-out site for Australian and New Zealand Fur-seals. Forests of Bull kelp and the

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
							remains of a shipwreck also occur within the sanctuary. • Point Hicks Marine National Park: supports a range of habitats including granite subtidal reef, intertidal rock platforms and offshore sands. These substrates host varied benthic flora and fauna including macroalgae, sponges, and seafans; and a diverse invertebrate assemblage (e.g. seastars, sea urchins, abalone, and nudibrancs). Pelagic fish diversity is also high including schools of Butterfly Perth, Silver Sweep and Banded Morwongs.
	Wetlands of International Importance	Ramsar Wetlands	• Aggregation, foraging and nursery habitat for marine life	-	Not present	✓	Present A single RAMSAR wetland is located within (or adjacent to) the EMBA: • Gippsland Lakes
		Marine and Coastal Zone Wetlands of National Importance	• Aggregation, foraging and nursery habitat for marine life	-	• Not present	✓	Present Numerous wetlands of importance (with a coastal or marine connection) intersect with the EMBA. The two closest to the Cooper assets are: • Ewing Morass • Lake Corringle
Human System	Commercial Fisheries	Commonwealth-managed	• Economic benefit	✓	Present	✓	Present

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]	EMBA[2]
				Six Commonwealth-managed fisheries have management areas that intersect the Operational Area: • Bass Strait Central Zone Scallop • Eastern Tuna and Billfish Fishery • Small Pelagic Fishery • Southern and Easter Scalefish and Shark Fishery • Southern Bluefin Tuna Fishery, and • Southern Squid Jig Fishery Fishing intensity data suggests that the Southern and Eastern Scalefish and Shark Fishery and the Southern Squid Jig Fishery actively fish in the Operational Area. Overall active fishing effort within the Operational Area is expected to be low given the lack of suitable benthic habitat features. Refer Section 4.4 - Addendum 1.	Six Commonwealth-managed fisheries have management areas that intersect with the EMBA: • Bass Strait Central Zone Scallop • Eastern Tuna and Billfish Fishery • Small Pelagic Fishery • Southern and Easter Scalefish and Shark Fishery • Southern Bluefin Tuna Fishery, and • Southern Squid Jig Fishery Fishing intensity data suggests that the Southern and Eastern Scalefish and Shark Fishery and the Southern Squid Jig Fishery actively fish in the EMBA.
		State-managed	• Economic benefit	✓ Present A number of State-managed fisheries have management areas that intersect with the Operational Area. Based on water depth and habitat present in the	✓ Present A number of State-managed fisheries have management areas that intersect with the EMBA:

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
					Operational Area the following are likely to be present: • Scallop fishery Fishing intensity data is not available; however, fishing effort within the Operational Area is expected to be low given the lack of suitable benthic habitat features. In particular, there was no recent fishing effort within the eastern zone of the Giant Crab fishery in Victoria. Refer Section 4.4 - Addendum 1.		• Abalone fishery • Eel fishery • Giant crab fishery • Pipi fishery • Rock lobster fishery • Scallop fishery • Wrasse fishery • Sea urchin and turban shell restricted fishery Fishing intensity data is not available; however, it is possible that the Giant Crab, Rock Lobster, Scallop and Wrasse fisheries may be active within the EMBA. Refer Table 4.10 – Addendum 1.
				-	The following State Fisheries are unlikely to fish in the Operational Area due to water depths and lack of species habitat. • Abalone fishery – up to 30 m water depth. No hard substrate within the Operational Area where abalone present. • Eel fishery - Victorian coastal river basins. • Giant crab fishery Giant crabs inhabit the continental slope at approximately 200 m depth.		

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]	EMBA[2]
				• Rock lobster fishery -water depths less than 100 m deep on rock habitat reef, which is not present in the Operational Area. • Sea Urchin fishery - up to 30 m water depth. No hard substrate within the Operational Area where sea urchin present. • Wrasse fishery -depth rang 1 – 160 m usually inhabit deep exposed rock reefs which are not present in the Operational Area.	
	Recreational Fisheries	State-managed	• Community • Recreation	✓ Present Recreational fishing may occur within the Operational Area. Most recreational fishing typically occurs in nearshore coastal waters (shore or inshore vessels) and within bays and estuaries. Recreational fishing activity is expected to be minimal in the Operational Area. Refer Section 4.5 – Addendum 1.	✓ Present Most recreational fishing typically occurs in nearshore coastal waters, and within bays and estuaries; offshore (>5 km) fishing only accounts for approximately 4% of recreational fishing activity in Australia. The East Gippsland waters have a moderate fishing intensity (relative to other areas within the South-East Marine Region).
	Recreation and Tourism	Various human activities and interaction	• Community • Recreation • Economic benefit	✓ Present Marine-based recreation and tourism may occur within the Operational Area, but activity is expected to be minimal given the proportion of the lease area	✓ Present The Australian coast provides a diverse range of recreation and tourism opportunities, including scuba diving, charter boat cruises, and surfing. In

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]	EMBA[2]
				that is within nearshore waters is relatively small and the are no seabed features. Refer Section 4.7 – Addendum 1.	East Gippsland, primary tourist locations include Marlo, Cape Conran, Lakes Entrance and Mallacoota. The area is renowned for its nature-based tourism, recreational fishing and water sports. Refer Section 4.7 – Addendum 1.
	Industry	Shipping	• Community • Economic benefit	✓ Present The south-eastern coast is one of Australia's busiest in terms of shipping activity and volumes. The Operational Area does not coincide with major shipping routes. Refer Section 4.8 – Addendum 1.	✓ Present The south-eastern coast is one of Australia's busiest in terms of shipping activity and volumes. However, shipping routes typically occur only through the southern extent of the EMBA. There are no major ports within the EMBA, but minor ports do exist (e.g. Lakes Entrance) that support commercial and recreational fishing industries. Refer Section 4.8 – Addendum 1.
		Oil and Gas	• Economic benefit	- Not present Petroleum activity within the Operational Area is Cooper operated assets covered in this EP. Refer Section 4.8.2 – Addendum 1.	✓ Present Petroleum infrastructure in Gippsland Basin is well developed, with a network of pipelines transporting hydrocarbons produced offshore to onshore petroleum processing facilities at Longford and Orbost.
	Heritage	Maritime	• Shipwrecks	– Not present	✓ Present

Receptor Group	Receptor Type	Receptor Description	Values and Sensitivities	Operational Area[1]		EMBA[2]	
					Refer Section 4.9 – Addendum 1.		Two shipwrecks are within the EMBA: *Commissioner* (in 7m water depth) and *SS Federal* (in 20 m water).
		Cultural	• World Heritage Properties • Commonwealth Heritage Places • National Heritage Places	–	Not present.	–	Not present.
		Indigenous	• Indigenous use or connection	–	Not present Refer Section 4.9 – Addendum 1.	✓	Present The coastal area of south-east Australia was amongst the most densely populated regions of pre-colonial Australia. Through cultural traditions, Aboriginal people maintain their connection to their ancestral lands and waters. The Gunaikurnai, Monero and the Bidhawel (Bidwell) Indigenous people are recognised as the traditional custodians of the lands and waters within the East Gippsland Shire. The Gunaikurnai people have an approved non-exclusive native title area extending from West Gippsland in Warragul, east to the Snowy River and north to the Great Dividing Range; and 200 m offshore.

Notes:

1. Combination of an EPBC Protected Matters Search of the Operational Area with a 5 km buffer, and characteristics of the Gippsland environment, have been used to describe ecological receptors that may occur within the Operational Area.
2. Combination of an EPBC Protected Matters Search for the EMBA area, and characteristics of the Gippsland environment, have been used to describe ecological receptors that may occur within the EMBA.

4 Impact and Risk Assessment

Meaningful risk identification, analysis and evaluation requires effective impact and risk scoping. This section identifies the impacts and risks associated with environmental aspects which require assessment.

4.1 Environmental Aspect Identification

An environmental aspect is an element or characteristic of an activity, product, or service that interacts or can interact with the environment. Environmental aspects can cause environmental impacts.

All components of the petroleum activity relevant to this scope were identified and described in the Environment Plan. After describing the petroleum activity, an assessment was carried out to identify potential aspects. The outcomes of stakeholder consultation over a number of years also contributed to aspect identification. The environmental aspects identified for the petroleum activity are detailed in Table 4-1.

Based upon an understanding of the environmental aspects, relevant impacts or risks were defined. Ecological and social receptors identified with the potential to be exposed to an aspect and subsequent impacts or risks were then summarised enabling a systematic evaluation to be undertaken.

4.2 Impact and Risk Scoping

An environmental impact (or risk) is a change to the environment that is caused either partly or entirely by one or more environmental aspects. An environmental aspect can have either a direct impact on the environment or contribute only partially or indirectly to a larger environmental change. The relationship between environmental aspects and environmental impacts is one of cause and effect.

An Environmental Workshop (ENVID) was held to identify environmental impacts and risks associated with the petroleum activity and assess controls to ensure impacts and risk managed to ALARP and an acceptable level. The workshop was attended by environment and asset personnel. Following the impact assessment methodology detailed in (Appendix A), impacts and risks were evaluated to determine consequence to receptors, ALARP decision context, likelihood and residual risk level of the impact or risk. Control measures were identified, and an assessment of Acceptability was undertaken against the Cooper Energy Acceptability Criteria (Appendix A).

For most impacts identified, the workshop was able to determine that the agreed controls lowered the impact to ALARP and that the residual risk level was at an acceptable level. Where this was not possible in the workshop, further assessment was undertaken to determine the environmental consequence and assessed additional controls.

Table 4-1 to Table 4-5 provide the outcomes of the ENVID. Where further assessment was required, this is provided in Sections 4.3 and 4.4.

Environmental Performance Outcomes and Standards relevant to all impacts and risks have been defined.

Table 4-1: Activity – Aspect Relationships

	Physical Presence – Displacement of other marine users	Seabed Disturbance	Light Emissions	Underwater Sound Emissions	Atmospheric Emissions	Planned Discharges						Physical Presence – Collision with marine fauna	Accidental release		
						Subsea Operational Discharges	Cooling water and brine	Treated bilge	Sewage and greywater	Food waste	Introduction of IMS		Waste	Loss of Containment (hydrocarbons or chemicals)	Loss of Wall Control
Production and Non-Production															
Subsea infrastructure	x					x									
Sole Operations															
Valve control and testing						x									
Unplanned events														x	x
BMG and PB Non-Production															
Unplanned events														x	x
Inspection, Maintenance and Repair															
Inspection, maintenance and repair		x				x									
Span/scour rectification		x													
Support Operations															
Vessel operations	x	x	x	x	x		x	x	x	x	x	x	x	x	
ROV operations														x	

Table 4-2: Sole Operations Impact and Risk Scoping

Activity	Aspect	Impact / Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practice Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
Valve control and testing	Planned Discharge - Subsea Operational Discharges	Change in water quality	Plankton Marine fauna	Discharges of hydraulic fluid will occur from two wells in 124 m water. Discharges will be of low volume (3 L per actuation) non-continuous and expected to disperse rapidly in the offshore environment. Given the small volumes and the low-toxicity fluids, discharges are expected to rapidly dissipate and dilute in the high energy environment of Bass Strait. Impacts to water quality are expected to be temporary and localised and thus will not impact on plankton and marine fauna that maybe transient within the Operational Area.	Minor	A	C1: Offshore Environmental Chemical Assessment Process C2: Monitoring of hydraulic fluid use	Full electric control system is not technically or commercially feasible on subsea tree systems. Use of seawater could lead to integrity issues. Valve closing is not as efficient with closed-loop systems.	Unlikely	Low	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable
Unplanned Events	Accidental Release - LOC - Infrastructure	Change in water quality	**Further assessment required (Section 5.4).**									
	Accidental Release - LOWC	Change in water quality	**Further assessment required (Section 5.4.).**									

Table 4-3: BMG and PB Non-Production Impact and Risk Scoping

Activity	Aspect	Impact / Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practice Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
Unplanned Events	Accidental Release - LOC - PB Infrastructure	Change in water quality	**Further assessment required (Section 5.4).**									
	Accidental Release - LOWC - PB	Change in water quality	**Further assessment required (Section 5.4).**									
	Accidental Release - LOC - BMG Infrastructure	Change in water quality	**Further assessment required (Section 5.4).**									
	Accidental Release - LOWC - BMG	Change in water quality	**Further assessment required (Section 5.4).**									

Table 4-4: IMR Impact and Risk Scoping

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
Maintenance and repair activities Pipeline span rectification	Seabed Disturbance	Change in habitat	Benthic habitat Benthic Invertebrates	Areas of seabed may be disturbed from either direct placement of materials/infrastructure on the seabed or via smothering, caused by agitation and re-settling of seabed sediments. Areas disturbed would typically be within previously disturbed areas where infrastructure is already present. The predominant habitat within the Operational Area is sandy substrate with an area of soft corals identified in 50 m water depth along the PB pipeline. Benthic species of conservation or commercial value are unlikely in the Operational Area based on the sandy substrate. Impacts are expected to be localised and temporary with no long-term changes to habitat.	Negligible	A	C3: Offshore Scope of Work		Unlikely	Low	• Impacts well understood. • Low risk. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable
		Change in water quality	Benthic Invertebrates	Activities may result in increased turbidity near the seabed, however no water column impacts are expected as the predominant substrate is sandy, hence less likely to become suspended in the water column. The use of grout bags could result in the leaching of chemicals near the seabed. Grout bags will use cement which is commonly used in the marine environment. Low toxicity cement will be utilised. Benthic species of conservation or commercial value are unlikely in the Operational Area based on the sandy substrate. Impacts are expected to be localised and temporary with no long-term changes to water quality.	Negligible	A	C1: Offshore Environmental Chemical Assessment Process		Unlikely	Low	• Impacts well understood. • Low risk. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable
			Upwelling East of Eden KEF	The Operational Area is located within the Upwelling East of Eden KEF, an area of episodic upwelling known for high productivity and marine life. Activities may result in increased turbidity near the seabed, however, no water column impacts are expected as the predominant substrate is sandy, hence less likely to become suspended in the water column. The use of grout bags could result in the leaching of chemicals near the seabed. Grout bags will use cement which is commonly used in the marine environment. Low toxicity cement will be utilised. Impacts are expected to be localised and temporary and would not impact on the values and functions of the KEF.	Negligible							

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
Maintenance and repair	Planned Discharge - Subsea Operational Discharges	Change in water quality	Plankton Marine fauna	Discharges of operational fluids during maintenance and repair may occur. Discharges will be of low volumes (< 10 L) non-continuous and expected to disperse rapidly in the offshore environment. Given the small volumes and the low-toxicity fluids, discharges are expected to rapidly dissipate and dilute in the high energy environment of Bass Strait. Impacts to water quality are expected to be temporary and localised and thus will not impact on plankton and marine fauna that maybe transient within the Operational Area.	Negligible	A	C1: Offshore Environmental Chemical Assessment Process C4: Campaign Risk Assessment		Unlikely	Low	• Impacts well understood. • Low risk. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable

Table 4-5: Support Operations Impact and Risk Scoping

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
Vessel operations	Seabed Disturbance Anchoring	Change in habitat	Benthic habitat Benthic Invertebrates	Areas of seabed may be disturbed from anchoring in shallow waters (less than 10 m) where dynamic positioning cannot be used. Area of disturbance would be small (up to 100 m^2). The predominant habitat within the Operational Area up to 10 m water depth is sandy substrate. Benthic species of conservation or commercial value are unlikely in the Operational Area based on the sandy substrate. Impacts are expected to be localised and temporary with no long-term changes to habitat.	Negligible	A	C3: Offshore Scope of Work		Unlikely	Low	• Impacts well understood. • Low risk. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable
Vessel operations	Atmospheric Emissions	Change in air quality	Birds	Offshore winds will rapidly disperse and dilute atmospheric emissions when they are discharged into the environment. The Operational Area overlaps foraging BIAs for a number of albatross and the Common diving-petrel. The impacts on air quality is predicted to be localised to the emission point and can be expected to be reduced to background levels close to the source. No habitat critical to the survival of birds occur within the Operational Area. Atmospheric emissions are not identified as a threat in the National recovery plan for threatened albatrosses and giant petrels 2011-2016 (DSEWPaC	Negligible	A	C5: Marine Order 97: Marine Pollution Prevention – Air Pollution		Unlikely	Low	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Activity will not impact the long term survival and recovery of albatross and giant petrel populations breeding and foraging	Acceptable

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
				2011) though climate change is, however, vessel emissions would not be significant enough to impact on climate change. Impacts from vessel atmospheric emissions will be localised and temporary; limited to the Operational Area.							as per the National recovery plan for threatened albatrosses and giant petrels 2011-2016 (DSEWPaC 2011). • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	
			Coastal Settlements	There are no coastal settlements within the Operational Area or at a distance where impacts from air emissions would occur.	N/A							
Vessel operations	Light Emissions	Change in fauna behaviour	Birds	High levels of light can attract and disorientate birds. Light glow from the vessel is likely to be limited to the Operational Area and temporary in nature (days to weeks) depending on the activity. The Operational Area overlaps foraging BIAs for a number of albatross and the Common diving-petrel. The impacts on air quality is predicted to be localised to the emission point and can be expected to be reduced to background levels close to the source. No habitat critical to the survival of birds occur within the Operational Area. Light emissions are identified as a threat in National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC 2011). Impacts from vessel light emissions will be localised and temporary; limited to the Operational Area.	Negligible	A	None identified		Unlikely	**Low**	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Activity will not impact the long term survival and recovery of albatross and giant petrel populations breeding and foraging as per the National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC 2011). • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable
			Fish	High levels of light may attract fish which are then preyed upon. Light glow from the vessel is likely to be limited to the Operational Area and temporary in nature (days to weeks) depending on the activity. The threatened Australian grayling maybe present in the area; however, light is not identified as a threat to this species in the National Recovery Plan for the Australian Grayling *Prototroctes maraena* (DSE 2008). Commercial fish species may be present in the Operational Area but light from a vessel undertaking offshore activities would be the equivalent as for a fishing vessel, hence impacts to commercial fish species are unlikely.	Negligible	A	None identified		Remote	**Low**	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Activity will not impact the recovery of the Australian grayling as per the National Recovery Plan for the Australian Grayling *Prototroctes maraena* (DSE 2008). • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified.	Acceptable

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
											• No stakeholder objections or claims have been raised.	
			Marine turtles	Artificial light can disrupt turtle nesting and hatching behaviours. There are no turtle nesting beaches along the adjacent coastline to the Operational Area, therefore no impact is expected.	N/A							
Vessel operations	Planned Discharges: Cooling water Brine Treated bilge Sewage and greywater	Change in water quality	Plankton Fish (Bony fish, sharks and rays) Marine turtles Marine mammals	Waste water discharges can result in localised impact on water quality from increased temperature, salinity, nutrients, chemicals and hydrocarbons leading to toxic effects to marine fauna. Vessel waste water discharges would be of low volume during in-water activities of short duration (up to 3 weeks). Open marine waters are typically influenced by regional wind and large scale current patterns resulting in the rapid mixing of surface and near surface waters thus it is expected that any waste water discharges would disperse quickly over a small area. Juvenile lifecycle stages most vulnerable, however recovery will be rapid (UNEP, 1985). The threatened Australian grayling maybe present in the area. The National Recovery Plan for the Australian Grayling *Prototroctes maraena* (DSE 2008) identifies poor water quality as a threat to this species, however, this is associated with onshore waterways. Commercial fish species may be present in the Operational Area, however, as the discharge disperse quickly over a small area impacts are not predicted. Four threatened shark species may be present in the Operational Area. The Operational Area is also within the distribution BIA for Great White Shark, although no critical habitats or behaviours are present. Sharks will be transient through the area thus impacts are not predicted. The Recovery Plan for the White Shark (*Carcharodon carcharias*) (Commonwealth of Australia 2013) does not identify vessel discharges or equivalent as a threat. No turtle BIAs are located within the Operational Area though listed and threatened species may occur. Chemical and terrestrial discharge is identified as a threat to turtles in the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017) though not specifically from vessels. As these species would be transient in the area and impacts are predicted to be to be localised and temporary. Marine mammals can actively avoid plumes, limiting exposure. The Operational Area overlaps the Southern Right Whale migration and resting on migration BIA and the Pygmy Blue Whale foraging BIA. The Conservation Management Plan for the Southern Right Whale (Commonwealth of Australia 2012) and Conservation Management Plan for the	Minor	A	C1: Offshore Environmental Chemical Assessment Process C6: Protection of the Sea (Prevention of Pollution from Ships) Act 1983 C7: Preventative Maintenance System		Unlikely	**Low**	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Activity will not impact the recovery of the Australian grayling as per the National Recovery Plan for the Australian Grayling *Prototroctes maraena* (DSE 2008). • Activity will not impact on the recovery of marine turtles as per the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017). • Activity will not impact the recovery of the White Shark as per the Recovery Plan for the White Shark (*Carcharodon carcharias*) (Commonwealth of Australia 2013). • Activity will not impact the recovery of the Blue Whale or the Southern Right Whale as per the Conservation Management Plan for the Blue Whale, 2015-2025 and Conservation Management Plan for the Southern Right Whale, 2011-2021. • Activity will not impact on the values and functions of the Upwelling East of Eden KEF. • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
				Blue Whale (Commonwealth of Australia 2015) do not identify discharges from vessels as a threat to the recovery of these species.								
			Upwelling East of Eden KEF	Waste water discharges can result in localised impact on water quality from increased temperature, salinity, nutrients, chemicals and hydrocarbons leading to toxic effects to marine fauna. Vessel waste water discharges would be of low volume during in-water activities of short duration (up to 3 weeks). Open marine waters are typically influenced by regional wind and large scale current patterns resulting in the rapid mixing of surface and near surface waters thus it is expected that any waste water discharges would disperse quickly over a small area. The Operational Area is located within the Upwelling East of Eden KEF, an area of episodic upwelling known for high productivity and marine life. Impacts are expected to be localised and temporary and would not impact on the values and functions of the KEF.	Minor							
Vessel operations	Planned Discharge: Food waste	Change in fauna behaviour	Birds Fish	Periodic discharge of macerated food scraps to the marine environment will result in a temporary increase in nutrients in the water column that is expected to be localised to waters surrounding the vessel during in-water activities of short duration (up to 3 weeks). The Operational Area overlaps foraging BIAs for a number of albatross and the Common diving-petrel. No habitat critical to the survival of birds occur within the Operational Area. Marine pollution is identified as a threat in the National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC 2011), however, as the discharge would be sporadic and for a short duration marine pollution impacts or changes to behaviour is not expected. The threatened Australian grayling maybe present in the area. The National Recovery Plan for the Australian Grayling *Prototroctes maraena* (DSE 2008) identifies poor water quality as a threat to this species, however, this is associated with onshore waterways. Commercial fish species may be present in the Operational Area, however as the discharge would be sporadic and for a short duration changes to behaviour is not expected.	Minor	A	C8: Marine Order 95: Marine pollution prevention – garbage		Unlikely	**Low**	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Activity will not impact the recovery of the Australian grayling as per the National Recovery Plan for the Australian Grayling *Prototroctes maraena* (DSE 2008). • Activity will not impact the long term survival and recovery of albatross and giant petrel populations breeding and foraging as per the National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC 2011). • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable
Vessel operations	Planned Discharges: Food waste	Change in aesthetic value	Tourism	Sewage discharges will be rapidly diluted, with impacts limited to the Operational Area. No tourism expected within the Operational Area due to lack of features.	NA							

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
	Sewage and greywater		Coastal Settlements	There are no coastal settlements within the operational area.	NA							
Vessel operations	Underwater Sound Emissions: Continuous	Change in fauna behaviour	Fish (Bony fish, sharks and rays) Marine turtles	Vessels will emit noise from propeller cavitation, thrusters, hydrodynamic flow around the hull, and operation of machinery and equipment. Studies of underwater noise generated from propellers of support vessels when holding position indicate highest measured levels up to 182 dB re1µPa, with levels of 120 dB re 1µPa recorded at 3–4 km (Hannay et al. 2004). Popper et al. (2014) details that risks of mortality and potential mortal injury, and recoverable injury impacts to fish with no swim bladder (whale sharks) and turtles is low and that temporary threshold shift (TTS) in hearing may be a moderate risk near (10s of metres) the vessel. For fish with a swim bladder risks of mortality and potential mortal injury impacts is low with a cumulative exposure guideline for recoverable injury and TTS which is not applicable as there are not areas of site-attached species within the Operational Area. Behavioural impacts are more likely such as moving away from the vessel. There are no habitats or features within the Operational Area that would restrict fish, whale sharks or turtles from moving away from the vessel. The threatened Australian grayling maybe present in the area. The National Recovery Plan for the Australian Grayling *Prototroctes maraena* (DSE 2008) does not identify noise impacts as a threat to this species. The Operational Area is within a distribution BIA for the White Shark though no habitat critical to the survival of the species or behaviours were identified. The Recovery Plan for the White Shark (*Carcharodon carcharias*) (Commonwealth of Australia 2013) does not identify noise impacts as a threat. Four marine turtle species (or species habitat) may occur within the Operational Area though no BIAs or critical habitat to the survival of the species were identified. The Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017) identified noise interference as a threat, however, disturbance impacts to individuals are predicted which will not impact on turtles at a population level.	Minor	A	None identified	None	Unlikely	Low	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Activity will not impact the recovery of the Australian grayling as per the National Recovery Plan for the Australian Grayling *Prototroctes maraena* (DSE 2008). • Activity will not impact the recovery of the White Shark as per the Recovery Plan for the White Shark (*Carcharodon carcharias*) (Commonwealth of Australia 2013). • Activity will not impact the recovery of marine turtle species as per the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017). • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable
			Seals (Pinnipeds)	Vessels will emit noise from propeller cavitation, thrusters, hydrodynamic flow around the hull, and operation of machinery and equipment. Studies of underwater noise generated from propellers of support vessels when holding position indicate highest measured levels up to 182 dB re1µPa, with levels of 120 dB re 1µPa recorded at 3–4 km (Hannay et al. 2004). Two species of pinniped (or species habitat) may occur within the Operational Area; the Long-nosed Fur-seal and the Australian Fur-seal. No BIAs or	Minor	A	C9: Wildlife (Marine Mammals) Regulations 2009	None	Unlikely	**Low**	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Good practise controls defined and implemented.	Acceptable

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
				habitat critical to the survival of the species were identified for pinnipeds. Onset thresholds for TTS and permanent threshold shift (PTS) for seals for non-impulsive noise (vessels) suggested by NMFS (2018) are as cumulative sound exposure levels over a period of 24 hours. These cannot be compared to the sounds level recorded by Hannay et al. (2004) or McCauley (1998; 2004) which report sound pressure levels. However, based on there are no BIAs or critical habitat for pinnipeds within the Operational Area or within 4 km where vessel noise levels would dissipate to 120 dB re 1μPa (Hannay et al. 2004) which is the recommended threshold for behavioural disruption for continuous noise for marine mammals (NMFS 2013), impacts are likely to result in behavioural changes such as avoidance of the area rather than TTS or PTS impacts. Continuous vessel noise from this activity is not expected to be any higher than that generated by existing shipping traffic within the region. Temporary behavioural impacts to these species are not expected to result in a significant change to behaviours or natural movement that would result in further impact to individuals or local population levels.							• Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	
			Whales and dolphins	Vessels will emit noise from propeller cavitation, thrusters, hydrodynamic flow around the hull, and operation of machinery and equipment. Studies of underwater noise generated from propellers of support vessels when holding position indicate highest measured levels up to 182 dB re1μPa, with levels of 120 dB re 1μPa recorded at 3–4 km (Hannay et al. 2004). Seven dolphin species may occur within the Operational Area. No important behaviours or BIAs have been identified. 22 whale species (or species habitat) may occur within the Operational Area. Foraging behaviours were identified for some species (Sei, Fin and Pygmy Right Whale; Pygmy Blue Whale); no other important behaviours were identified. The Operational Area intersects a distribution and a migration and resting on migration BIA for the Southern Right Whale and a foraging BIA for the Pygmy Blue Whale. Onset thresholds for TTS and PTS for cetaceans for non-impulsive noise (vessels) suggested by NMFS (2018) are as cumulative sound exposure levels over a period of 24 hours. These cannot be compared to the sounds level recorded by Hannay et al. (2004) or McCauley (1998; 2004) which report sound pressure levels. Foraging behaviours and two BIAs are within the Operational Area or within 4 km where vessel noise levels would dissipate to 120 dB re 1μPa (Hannay et al. 2004) which is the recommended threshold for behavioural disruption for continuous noise for marine mammals (NMFS 2013). Thus, impacts are likely to result in behavioural changes such as avoidance of the area rather than TTS or PTS impacts.	Minor	A	C9: Wildlife (Marine Mammals) Regulations 2009 C10 EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans	None	Unlikely	Low	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Activity will not impact the recovery of the Blue Whale or the Southern Right Whale as per the Conservation Management Plan for the Blue Whale, 2015-2025 and Conservation Management Plan for the Southern Right Whale, 2011-2021. • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
				The Conservation Management Plan for the Blue Whale and for the Southern Right Whale and Conservation Advice for the Sei Whale, Fin Whale and Humpback Whale identify noise interference as a threat. However, continuous vessel noise from this activity is not expected to be any higher than that generated by existing shipping traffic within the region. Temporary behavioural impacts to these species are not expected to result in a significant change to foraging behaviours or natural movement that would result in further impact to individuals or local population levels.								
			Fisheries	Impacts to commercial fish species are expected to be negligible, therefore no impacts to fisheries are expected.	NA							

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
Vessel operations	Physical Presence – Collision with marine fauna	Injury/Mortality to fauna	Marine turtles Seals (Pinnipeds) Whales and dolphins (cetaceans)	Megafauna are most at risk from collision. Impacts will be limited to the Operational Area. Four marine turtle species (or species habitat) may occur within the Operational Area though no BIAs or critical habitat to the survival of the species were identified. The Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017) identified vessel strike as a threat. Two species of pinniped (or species habitat) may occur within the Operational Area; the Long-nosed Fur-seal and the Australian Fur-seal. No BIAs or habitat critical to the survival of the species were identified for pinnipeds. 22 whale species (or species habitat) may occur within the Operational Area. Foraging behaviours were identified for some species (Sei, Fin and Pygmy Right Whale; Pygmy Blue Whale); no other important behaviours were identified. The Operational Area intersects a distribution and a migration and resting on migration BIA for the Southern Right Whale and a foraging BIA for the Pygmy Blue Whale. The Conservation Management Plan for the Blue Whale and for the Southern Right Whale and Conservation Advice for the Sei Whale, Fin Whale and Humpback Whale identify vessel strike as a threat. The occurrence of vessel strikes is very low with no incidents occurring during the activities to date associated with the BMG and PB operations and Sole Development. If an incident occurred, it would be restricted to individual fauna and not have impacts to local population levels.	Minor	A	C9: Wildlife (Marine Mammals) Regulations 2009 C10: EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans		Unlikely	**Low**	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Activity will not impact the recovery of marine turtle species as per the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017). • Activity will not impact the recovery of the Blue Whale or the Southern Right Whale as per the Conservation Management Plan for the Blue Whale, 2015-2025 and Conservation Management Plan for the Southern Right Whale, 2011-2021. • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable
Vessel operations	Physical Presence	Displacement of other marine users	Fisheries	Several fisheries may have an active presence in the Operational Area. Fishing effort data is not available but is expected to be low due to the lack of features within the Operational Area. During stakeholder consultation for the Sole Development concerns were raised regarding the loss of fishing grounds in relation to restrictions to fishing within the wells PSZ. However, for reasons of safety, equipment integrity and to other marine users, PSZ are considered a necessity. The PSZ is only a small area in comparison to the larger fishing grounds of the region. Fishing can be undertaken in all other areas of the Operational Area including the Sole and PB pipelines. The exclusion of fisheries from around a vessel when undertaking IMR or seabed survey activities will have a negligible consequence on fisheries catch as the area that is restricted is small in comparison to the area available for fishing and is for a period of days to weeks.	Minor	A	C11: Ongoing consultation	Removal of PSZ: PSZ around wells is a regulatory requirement.	Unlikely	**Low**	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore will not have a significant impact to third parties. • Activity will not result in serious or irreversible damage. • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • Stakeholder objections or claims have been raised and the area that is restricted is a regulatory requirement for ensuring safe operations.	Acceptable

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
			Shipping	The Operational Area does not cross any major shipping routes. Shipping traffic within the Operational Area is low. Vessels are excluded from the PSZ around the wells. To date there has been no interactions with shipping.	Negligible							
Vessel operations	Accidental Release - Waste	Injury/Mortality to fauna	Birds Marine turtles Seals (Pinnipeds) Whales and dolphins (cetaceans)	There will be no transfer of waste from the vessel during the activity. Waste accidently released to the marine environment may lead to injury or death to individual marine fauna through ingestion or entanglement. Impacts will be restricted in exposure and quantity and will be limited to individual fauna and not have impacts to local population levels. The Operational Area overlaps foraging BIAs for a number of albatross and the Common diving-petrel. No habitat critical to the survival of birds occur within the Operational Area. Marine debris is identified as a threat in the National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC 2011), Four marine turtle species (or species habitat) may occur within the Operational Area though no BIAs or critical habitat to the survival of the species were identified. The Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017) identified marine debris as a threat. Two species of pinniped (or species habitat) may occur within the Operational Area; the Long-nosed Fur-seal and the Australian Fur-seal. No BIAs or habitat critical to the survival of the species were identified for pinnipeds. 22 whale species (or species habitat) may occur within the Operational Area. Foraging behaviours were identified for some species (Sei, Fin and Pygmy Right Whale; Pygmy Blue Whale); no other important behaviours were identified. The Operational Area intersects a distribution and a migration and resting on migration BIA for the Southern Right Whale and a foraging BIA for the Pygmy Blue Whale. The Conservation Management Plan for the Blue Whale and for the Southern Right Whale and Conservation Advice for the Sei Whale, Fin Whale and Humpback Whale do not identify marine debri as threat.	Negligible	A	C8: Marine Order 95: Marine pollution prevention – garbage		Remote	Low	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Activity will not impact the long term survival and recovery of albatross and giant petrel populations breeding and foraging as per the National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC 2011). • Activity will not impact the recovery of marine turtle species as per the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017). • Activity will not impact the recovery of the Blue Whale or the Southern Right Whale as per the Conservation Management Plan for the Blue Whale, 2015-2025 and Conservation Management Plan for the Southern Right Whale, 2011-2021. • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable

Activity	Aspect	Impact/Risk	Affected receptor	Consequence Evaluation	Consequence	ALARP Decision Context	Good Practise Controls	Additional control measures considered	Likelihood	Residual Risk	Acceptability Assessment	Acceptability Outcome
Vessel Operations ROV Operations	Accidental Release - Minor Spill (hydrocarbon or chemical)	Change in water quality	Plankton Marine fauna	Minor spills < 200 L may occur from: • Vessel equipment, bulk storage or package chemical leak (deck spill). • ROV hydraulic hose leak. Given the small volumes and the low-toxicity hydrocarbons and chemicals that could be discharged, minor spills are expected to rapidly dissipate and dilute in the high energy environment of Bass Strait. Impacts to water quality are expected to be temporary and localised and thus will not impact on plankton and marine fauna that maybe transient within the Operational Area.	Negligible	A	C12: ROV pre-dive Inspections C13: Containment C14: Shipboard Marine Pollution Emergency Plan (SMPEP)	Electric ROV – not always available	Remote	Low	• Impacts well understood. • Residual risk is Low. • Consequence level is below 4, therefore no potential to affect biological diversity and ecological integrity. • Activity will not result in serious or irreversible damage. • Good practise controls defined and implemented. • Cooper Energy HSEC MS Standards and Risk Control Processes have been identified. • No stakeholder objections or claims have been raised.	Acceptable
Vessel operations	Introduction of Invasive Marine Species	Change in ecosystem dynamics	**Further assessment required (Section 4.3).**									
Vessel operations	Accidental Release - LOC - Vessel Collision	Change in water quality	**Further assessment required (Section 4.4).**									

4.3 Risk: Introduction of Invasive Marine Species

Table 4-6 provides a summary of the environment impact / environmental risk assessment (EIA /ERA) for the introduction of invasive marine species (IMS).

Table 4-6: Introduction of Invasive Marine Species EIA / ERA

Cause of Aspect	Vessels ballast water exchange and vessel and sub-sea equipment biofouling.
Summary of impact(s)	Discharge of ballast water and biofouling has the potential to introduce IMS which have the potential to change: • Ecosystem dynamics • Functions, interests or activities of other users.
Consequence Evaluation	
Receptor(s)	**Description of Potential Environmental Impact**
Benthic Habitat	IMS are marine plants or animals that have been introduced into a region beyond their natural range and can survive, reproduce and establish founder populations. IMS have historically been introduced and translocated around Australia by a variety of natural and human means including biofouling and ballast water. Species of concern are those that are not native and are likely to survive and establish in the region; and are able to spread by human mediated or natural means. Factors that dictate their survival and invasive capabilities depends on environmental factors such as water temperature, salinity, nutrient levels and habitat type. The New Zealand screw shell (*Maoricolpus roseus*), which is classed as a marine pest, is known to occur within the Bass Strait and has been identified within each asset's Operational Area. During vessel activities the vessel may move between each asset's Operational Area and potentially other Cooper Energy assets. In-water equipment that may be redeployed at another location (ROV, sample equipment) has the potential to spread IMS if fouled. To reduce this risk any in-water equipment deployed will be cleaned prior to leaving the asset's Operational Area to reduce risks of translocation. As any biofouling is from the area that the in-water equipment was deployed, cleaning can be undertaken into the marine environment. The introduction of an IMS can have a range of impacts on the receiving environment and can potentially alter the ecosystem dynamics of an area. Due to the complexity of ecosystems and level of interactions between and amongst biotic and abiotic receptors, predicting impacts associated with an IMS are difficult, as there is no sure way to predict how an individual species may interact with the foreign environment. Once an IMS is established, its level of invasiveness and ecosystem damage is determined by a range of factors detailed above. IMS have the potential to change ecosystem dynamics by competing for natural resources, reducing the availability of natural resources, predation, change natural cycling processes, segregation of habitat, spread of viruses, change in water quality, producing toxic chemicals, disturb, injure or kill vital ecosystem organisms (ecosystem engineers and keystone species), change surrounding ecosystems, change conservation values of protected areas and create new habitats. IMS have proven economically damaging to areas where they have been introduced and established, particularly as IMS are difficult to eradicate from areas once established (Hewitt et al. 2002). If the introduction is captured early, eradication may be effective but is likely to be expensive, disruptive and, depending on the method of eradication, harmful to other local marine life. It has been found that highly disturbed nearshore 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). IMS can have a primary and/or secondary impact on socio economic receptors. Primary impacts include direct damage to vessels, equipment and infrastructure which may then cause flow on affects and lead to a reduction in efficiency, productivity and profit. The presence of fouling organisms within a marine environment is likely to have the same or similar impacts to socio-economic receptors. Secondarily, ecological impacts associated with IMS introduction may have an impact to socio economic receptors through reduction in ecological values. Marine pest species can 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 (DSE 2004). In Commonwealth waters, successful colonisation in the recipient region would be less likely given that the benthic habitats within and near the Operational Area are predominantly bare sands with patchy occurrences of hard substrate and are within deeper waters (i.e. approximately 125 m) which are unlikely to support benthic communities. In State waters, successful colonisation of IMS may occur on hard substrates or artificial structures. If an IMS was introduced, and if it did colonise an area, there is the potential for impacts to marine communities which support listed marine fish species and commercial fish and invertebrate species. No protected marine areas, habitats or communities were identified in or near the Operational Area that maybe impacted. The KEF Upwelling East of Eden values are not based on its benthic communities but is an area of high productivity and aggregations of marine life such as top order predators, marine mammals and seabirds. The introduction of an IMS is not predicted to impact this productivity which is based on dynamic eddies of the East Australian Current causing episodic productivity events when they interact with the continental shelf and headlands (DoEE 2018). Consequently, if an IMS is introduced there is the potential for localised medium-term impacts to benthic communities which support listed marine fish species and commercial fish and invertebrate species resulting in a Moderate (3) consequence.
ALARP Decision Context	**B**
Control Measure	**Source of good practice control measures**
C15: Marine Order 98: Marine pollution – anti-fouling systems	The *Protection of the Sea (Harmful Anti-fouling Systems) Act 2006* enacts the Marine Order 98: Marine pollution – anti-fouling systems. This marine order requires that an anti-fouling certificate is in place for vessels.
C16: National Biofouling Management Guidance for the Petroleum Production and Exploration Industry	The National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (Commonwealth of Australia 2009) recommends and provides information on undertaking a vessel specific risk assessment to identify the level of risk a vessel poses, and the level of controls required to reduce IMS introduction risks. Cooper Energy has developed an IMS risk assessment process that is undertaken for vessels to ensure risk are managed to ALARP. The National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (Commonwealth of Australia 2009) recommends that routine

	cleaning, maintenance, drying and storage of ROVs and in-water equipment to maintain a low risk of any biofouling mediated translocation of marine pests.		
C17: Australian Ballast Water Management Requirements	The Australian Ballast Water Management Requirements (DAWR 2017) describe the requirements for ballast water management specifically: • Vessel ballasting operations must be undertaken as per an approved Ballast Water Management Plan (BWMP). • International vessels entering Australian waters require an International Ballast Water Management Certificate. • Vessels that carry ballast water must maintain a complete and accurate Ballast Water Record System.		
C18: Guidelines for the Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species (Biofouling Guidelines)	The Guidelines for the Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species (Biofouling Guidelines) (IMO 2011) specifically requires a biofouling management plan and record book to be available and maintained.		
Likelihood	**Unlikely (D)**	**Residual Risk**	**Medium**

4.4 Risk: Loss of Containment

As detailed in Section 4.2 Impact and Risk Scoping a number of loss of containment scenarios where identified that required further assessment. Accident releases that could occur at Sole, PB and BMG are identified in Table 4-7.

Table 4-8 provides a summary of the EIA /ERA for a loss of containment for the scenarios in Table 4-7.

Table 4-7: Potential Loss of Containment Release Types, Causes and Estimated Volumes

Accidental Release Types	Cause of Aspect	Fluid Type and Volume
Loss of containment: PB pipeline	Loss of containment from the PB pipeline as a result of erosion, corrosion or external forces (e.g. fishing vessel interactions or dropped object).	Gas: 2,700 m^3 Nitrogen: 4,550 m^3 Longtom condensate: 5 m^3 MEG/water mix (40:60 ratio): 150 m^3
Loss of containment: PB umbilical	Loss of containment from an umbilical as a result of third party damage.	Hydraulic fluid: 3.2 m^3
Loss of well control: PB	Patricia-2 and Baleen-4: The Patricia-2 and Baleen-4 wells were leak-tested prior to being shut in with two tested barriers which met the requirements of API 14B. A significant well release is not deemed credible from these well on this basis. The Patricia and Baleen fields are significantly depleted and consist of dry gas. A pressure-volume-temperature (PVT) analysis (Santos, 2014) was undertaken for the Patricia and Baleen field and found that if the well did flow there would be no condensate recovery from the gas. Patricia-1 well has been suspended to industry standards.	Dry gas: 0.022 MMscfd (900 scf/hr)
Loss of containment: Sole pipeline	Loss of containment from the Sole pipeline as a result of erosion, corrosion or external forces (e.g. fishing vessel interactions or dropped object). Volumes assumed base rate of 67.5 MMscfd during operations.	Gas: 274,000 m^3 Condensate: 1 m^3 MEG: 5.3 m^3 Corrosion inhibitor: 4 L
Loss of containment: Sole umbilical	Loss of containment from an umbilical as a result of third party damage.	MEG: 61.4 m^3 Hydraulic fluid HP: 41.0 m^3 Corrosion inhibitor: 9.0.5m^3 Hydraulic fluid LP: 17.7 m^3
Loss of well control: Sole	Loss of well integrity or third party damage leading to LOWC. Volume assumes well head has been completely removed and LOC is via open hole through the production tubing at the seafloor. This is not a credible scenario but has been used as a conservative approach for the operating wells. Sole-2 well has been suspended to industry standards.	Max gas: 149 MMscfd at seafloor

Accidental Release Types	Cause of Aspect	Fluid Type and Volume
Loss of containment: BMG flowlines	A loss of containment from the flowlines as a result of third party impact, dropped object damage or internal/external corrosion. Along with inhibited water some residual gas maybe present in these structures and the Basker-6 flowline contains ~ 2.3 m^3 diesel from previous dewaxing activities.	Max initial gas: 460 kg Longer term gas: 2 kg/day Diesel: 2.3 m^3 Inhibited water: 101.07 m^3
Loss of containment: BMG manifold and jumpers	A loss of containment from the manifold or jumpers as a result of third party impact, dropped object damage or internal/external corrosion. Maximum credible value of initial release is 230 kg/day gas, with likely figure considerably less. A special case is the B6 flowline where initial volume is estimated at 70kg. Low levels of condensate to accompany this release rate. Max long-term release likely estimated at under 20 kg/day (jumper volume)	Max initial gas: 230 kg Longer term gas: 20 kg/day Diesel: 2.3 m^3 Inhibited water: 101.07 m^3
Loss of containment: BMG umbilical	Loss of containment from an umbilical as a result of third party damage.	Hydraulic fluid: 4,201 L Gas: 1 – 2 kg/day
Loss of well control: BMG	BMG wells designed and tested to API 6A and pressure tested on completion have been shut-in with at least two independent mechanical barriers confirmed and tested on the tubing side with one downhole barrier (i.e. between the reservoir and the environment). Where the barrier contained a valve, it was tested in accordance with API 14B[1]. For wells which did not meet this requirement (Basker-5) the reservoir section of the well was abandoned and tested in accordance with the requirements for a permanent barrier. All subsurface safety valves and valves on the wellheads were verified as closed. The NPP risk assessment (NPP Risk Assessment 3826-HS-H0106) looked at credible failure mechanisms and determined the incidents which might result in a hydrocarbon release from production wells. These largest of these was conservatively assessed as: Third party impact damage to the wellhead with a maximum rate of 0.022 MMscfd (650kg/d) gas, negligible oil and approximately 0.75 bbl/d[2] (120 kg/day) condensate may be expected to be released to the environment for a 20 day period. A longer term continuous leak would be up to 130 kg/day with small amounts of condensate, but more likely 0 – 5 kg/day gas. Negligible hydrocarbon liquids (i.e. BMG crude) released.	Initial released 20 days: Gas: 0.022 MMscfd (650 kg/day) Condensate: 0.75 bbl (120 L/day) Longer term: Gas: 130 kg/day Condensate: minor
Vessel collision	A collision between the survey vessel and a third-party vessel could result in a tank rupture. For the impact assessment the vessel largest fuel tank volume was used as recommended by AMSA's guideline for indicative maximum credible spill volumes for other,	MDO: 250 m^3

[1] It should be noted that this criteria establishes if valves leak in excess of 900 scf/hr (gas) or 24 ltrs/hr (liquid) (i.e. it is not a leak-tight test). Therefore, over time leakage past valves may lead to some re-pressurisation of subsea equipment. This equipment is ultimately enclosed by a "leak tight" blind flange at the end of flowlines.

[2] This release rate does not create a visible sheen at the sea surface (RPS-APASA, 2012).

Accidental Release Types	Cause of Aspect	Fluid Type and Volume
	non-oil tanker, vessel collision (AMSA 2015). This was assessed to be 250 m^3 of marine diesel oil (MDO). Vessel grounding was not assessed as a credible risk as the closest distance to shore that a vessel would operate would be at the PB or Sole HDD sites which are ~ 300 m from shore and in waters depths of > 9 m. There are no emergent features within the Operational Area.	

Table 4-8: Loss of Containment EIA / ERA

Summary of impact(s)	Spills to the marine environment have the potential to expose ecological and social receptors to different hydrocarbon expressions and concentrations. Hydrocarbon expressions include: • Surface; and • In water (entrained only). These exposures have the potential to result in potential impacts directly via: • Potential toxicity effects/physical oiling; and • Potential for reduction in intrinsic values/visual aesthetics. Or indirectly as a result of the potential impacts noted above, there is the potential to result in: • Potential impact to commercial businesses.
Consequence Evaluation - Chemicals	
Receptor(s)	**Description of Potential Environmental Impact**
Marine fauna Commercial fisheries Upwelling East of Eden KEF	Due to the dynamic wind and current conditions in the Bass Strait, spilt chemicals would disperse rapidly and mix with the receiving waters. The potential consequence to social and ecological receptors is considered to be Negligible (1), as impacts to water quality are expected to be temporary and localised and therefore will not impact on plankton, marine fauna and commercial fish species that maybe transient within the Operational Area or affect local ecosystem functioning or the values and functions of the KEF. No significant impacts to third parties are predicted.
Consequence Evaluation – Gas Exposure	
Marine fauna Commercial fisheries Upwelling East of Eden KEF	Low-oxygen conditions caused by methane-consuming microbes, could threaten small marine organisms (e.g. plankton, fish larvae, and other fauna that are not actively mobile, that provide a vital link in the marine food chain. However, given the relatively shallow and well mixed surrounding waters, this is not considered likely to occur. Toxicity impacts are not predicted so the potential consequence to social and ecological receptors is considered to be Negligible (1), as impacts are expected to be temporary and localised and therefore will not impact on

	plankton, marine fauna and commercial fish species that maybe transient within the Operational Area or affect local ecosystem functioning or the values and functions of the KEF. No significant impacts to third parties are predicted.
Consequence Evaluation – Marine Diesel	
Seabirds	Surface Hydrocarbon Exposure When first released, MDO 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 a large number of birds will be affected as sea surface oil >10 g/m^2 (10 µm) is only predicted for the first 36 hrs. Seabirds rafting, resting, diving or feeding at sea have the potential to come into contact with areas where hydrocarbons concentrations greater than 10 µm and due to physical oiling may experience lethal surface thresholds. As such, acute or chronic toxicity impacts (death or long-term poor health) to birds are possible but unlikely for an MDO spill as the number of birds would be limited due to the small area and brief period of exposure above 10 µm (exposures expected to reduce < 10 µm within 36 hours). Therefore, potential impact would be limited to individuals, with population impacts not anticipated. The potential consequence to seabirds from a vessel collision (MDO) event is assessed as Minor (2) based on the potential for localised and short-term impacts to species of recognized conservation value but not affecting local ecosystem functioning.
Marine Turtles	Surface Hydrocarbon Exposure 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 exposed to MDO is expected to be low as there are no BIAs or habitat critical to the survival of the species present, hence, turtles may be transient within the EMBA. Sea surface oil >10 g/m^2 (10 µm) is only predicted for the first 36 hrs limiting the period when oiling may occur. Therefore, potential impact would be limited to individuals, with population impacts not anticipated. The potential consequence to turtles from a vessel collision (MDO) event is assessed as Minor (2) based on the potential for localised and short-term impacts to species of recognized conservation value but not affecting local ecosystem functioning.
Marine Mammals (Pinnipeds)	Surface Hydrocarbon Exposure 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. The number of pinnipeds that may be exposed to MDO is expected to be low as there are no BIAs or habitat critical to the survival of the species present, hence, pinnipeds may be transient within the EMBA. Sea surface oil >10 g/m^2 (10 µm) is only predicted for the first 36 hrs limiting the period when oiling may occur. Therefore, potential impact would be limited to individuals, with population impacts not anticipated. Given that fur seals are vulnerable to hypothermia from oiling, the potential consequence to pinnipeds from a vessel collision (MDO) event is assessed as

	Moderate (3) based on the potential for medium term impacts to species of recognized conservation value but not affecting local ecosystem functioning
Marine Mammals (Cetaceans)	Surface Hydrocarbon Exposure Physical contact by individual whales of MDO is unlikely to lead to any long-term impacts. Given the mobility of whales, only a small proportion of the migrating population would surface in the affected areas, resulting in short-term and localised consequences, with no long-term population viability effects. If whales are foraging at the time of the spill, a greater number of individuals may be present in the area where sea surface oil is >10 g/m^2 (10 μm), however due to the short duration of the surface exposure above the impact threshold (~36 hrs), this is not likely. The potential consequence to cetaceans from a vessel collision (MDO) event is assessed as Minor (2) based on the potential for localised and short-term impacts to species of recognized conservation value but not affecting local ecosystem functioning.
State Marine Protected Areas	Surface Hydrocarbon Exposure Based on the worse case potential consequence to key receptors (e.g. seabirds, pinnipeds and cetaceans) the potential consequence to Beware Reef Marine Sanctuary and Point Hicks Marine Park is assessed to be Moderate (3) as per the assessment for pinnipeds. Refer also to: • Seabirds. • Marine mammals (Pinnipeds, Cetaceans).
Recreation and Tourism (including recreational fisheries)	Surface Hydrocarbon Exposure Visible surface hydrocarbons have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. Given the nature of the oil, it is expected to rapidly weather offshore and once onshore is expected to continue weathering until it is flushed via natural processes from the coastline, or until it is physically cleaned-up. Regardless any exposure is expected to be limited in duration and consequently, the potential consequence to recreation and tourism from a vessel collision (MDO) event are considered to be Minor (2) as they could be expected to result in localised short-term impacts. Refer also to: • Marine Mammals (Pinnipeds, Cetaceans). • State Marine Protected Areas.
Shipping	Surface Hydrocarbon Exposure Vessels may be present in the area where sea surface oil is >10 g/m^2 (10 μm), however, due to the short duration of the surface exposure above the impact threshold (~36 hrs) impacts would be localised and short term, consequently, the potential consequence is considered to be Negligible (1).
Oil and gas	Surface Hydrocarbon Exposure Oil and gas infrastructure present in the area where sea surface oil is >10 g/m^2 (10 μm) could be potentially oiled. However, due to the short duration of the surface exposure above the impact threshold (~36 hrs) impacts would be localised and short term, consequently, the potential consequence is considered to be Negligible (1).

Rocky Shoreline	Shoreline Hydrocarbon Exposure The sensitivity of a rocky shoreline to oiling is dependent on a number of factors including its topography and composition, position, exposure to oceanic waves and currents etc. Exposed rocky shorelines are less sensitive than sheltered rocky shorelines. One of the main identified values of rocky shores/scarps is as habitat for invertebrates (e.g. sea anemones, sponges, sea-squirts, molluscs). Rocky areas are also utilised by some pinniped and bird species; noting that foraging and breeding/nesting typically occurs above high tide line. The impact of oil on any organism depends on the toxicity, viscosity and amount of oil, on the sensitivity of the organism and the length of time it is in contact with the oil. Even where the immediate damage to rocky shores from oil spills has been considerable, it is unusual for this to result in long-term damage and the communities have often recovered within 2 or 3 years (IPIECA 1995). The potential consequence to rocky sites from a vessel collision (MDO) event is assessed as Moderate (3) based on the potential for localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function. Refer also to: • Marine Invertebrates. • Seabirds and Shorebirds. • Pinnipeds.
Sandy Shoreline	Shoreline Hydrocarbon Exposure Sandy beaches are considered to have a low sensitivity to hydrocarbon exposure. Sandy beaches provide habitat for a diverse assemblage (although not always abundant) of infauna (including nematodes, copepods and polychaetes); and macroinvertebrates (e.g. crustaceans). Due to proximity to shore, a release of MDO may reach the shoreline prior to it completely weathering and consequently impacts due to toxicity and/or smothering of infauna may occur. The potential consequence to sandy shorelines from a vessel collision (MDO) event is assessed as Moderate (3) based on the potential for localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function. Refer also to: • Marine Invertebrates. • Seabirds and Shorebirds. • Pinnipeds. • Recreation.
Mangroves	Shoreline Hydrocarbon Exposure Mangroves are considered to have a high sensitivity to hydrocarbon exposure. Mangroves can be killed by heavy or viscous oil, or emulsification, that covers the trees' breathing pores thereby asphyxiating the subsurface roots, which depend on the pores for oxygen (IPIECA 1993). Mangroves can also take up hydrocarbons from contact with leaves, roots or sediments, and it is suspected that this uptake causes defoliation through leaf damage and tree death (Wardrop et al. 1987). Acute impacts to mangroves can be observed within weeks of exposure, whereas chronic impacts may take months to years to detect.

	Given the non-viscous nature of MDO and impacts are expected to be limited to the volatile component of the hydrocarbon, however given their sensitivity to hydrocarbons, the potential consequence to mangroves is assessed to be Moderate (3) based on the potential for localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function.
Saltmarsh	<u>Shoreline Hydrocarbon Exposure</u> Saltmarsh is considered to have a high sensitivity to hydrocarbon exposure. Saltmarsh vegetation offers a large surface area for oil absorption and tends to trap oil. Evidence from case histories and experiments shows that the damage resulting from oiling, and recovery times of oiled marsh vegetation, are very variable. In areas of light to moderate oiling where oil is mainly on perennial vegetation with little penetration of sediment, the shoots of the plants may be killed but recovery can take place from the underground systems. Good recovery commonly occurs within one to two years (IPIECA 1994). The potential consequence to saltmarsh is assessed to be Moderate (3) based on the potential for localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function.
Invertebrates	<u>Shoreline Hydrocarbon Exposure</u> The impact of oil on any marine organism depends on the toxicity, viscosity and amount of oil, on the sensitivity of the organism and the length of time it is in contact with the oil. Acute or chronic exposure, through surface contact, and/or ingestion can result in toxicological impacts, reproductive impacts, smothering and potentially cause death. However, the presence of an exoskeleton (e.g. crustaceans) will reduce the impact of hydrocarbon absorption through the surface membrane. Other invertebrates with no exoskeleton and larval forms may be more sensitive to impacts from hydrocarbons. If invertebrates are contaminated by hydrocarbons, tissue taint can remain for several months, but can eventually be lost. As MDO is expected to rapidly spread out, a large portion of the coast with the potential to be exposure to hydrocarbons comprises habitats that are suitable for intertidal invertebrates could be exposed, with the potential consequences assessed as Moderate (3) based on the potential for localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function.
Seabirds and Shorebirds	<u>Shoreline Hydrocarbon Exposure</u> Direct contact with hydrocarbons can foul feathers, which may result in hypothermia due to a reduction in the ability of the bird to thermo-regulate and impair water-proofing. Oiling of birds can also suffer from damage to external tissues, including skin and eyes, as well as internal tissue irritation in their lungs and stomachs. Toxic effects may result where the oil is ingested as the bird attempts to preen its feathers, or via consumption of oil-affected prey. The potential consequence to seabirds and shorebirds from a vessel collision (MDO) event is assessed as Moderate (3) based on the potential for localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function.
Marine Reptiles	<u>Shoreline Hydrocarbon Exposure</u> NA

Marine Mammals (Pinnipeds)	<u>Shoreline Hydrocarbon Exposure</u> Pinnipeds have high site fidelity and can be less likely to exhibit avoidance behaviours, thus staying near established colonies and haul-out areas. Fur seals are particularly vulnerable to hypothermia from oiling of their fur and consequently, once onshore hydrocarbons pose a significant hazard to pinnipeds with biological impacts caused from ingestion possibly resulting in reduced reproduction levels. Thus, the potential consequence to pinnipeds from exposure are assessed as Moderate (3) based on the potential for localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function.
Wetlands	<u>Shoreline Hydrocarbon Exposure</u> The impacts of hydrocarbons on wetlands are generally similar to those described for mangroves and saltmarshes. The degree of impact of oil on wetland vegetation are variable and complex, and can be both acute and chronic, ranging from short-term disruption of plant functioning to mortality. Spills reaching wetlands during the growing season will have a more severe impact than if oil reaches wetlands during the times when many plant species are dormant. Wetland habitat can be of particular importance for some species of birds and invertebrates. As such, in addition to direct impacts on plants, oil that reaches wetlands also affects these fauna utilising wetlands during their life cycle, especially benthic organisms that reside in the sediments and are a foundation of the food chain. Thus, the potential consequence to wetlands from exposure are assessed as Moderate (3) based on the potential for localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function. Refer also to: • Marine Invertebrates. • Seabirds and Shorebirds.
Coastal Settlements	<u>Shoreline Hydrocarbon Exposure</u> Visible hydrocarbons have the potential to reduce the visual amenity of the area for coastal settlements. Given its rapid weathering and potential for tidal flushing and rapid degradation, the potential consequence to coastal settlements is assessed as Minor (2) based on the potential for localised short-term impacts. Refer also to: • Rocky Shores. • Sandy Beaches.
Recreation and Tourism	<u>Shoreline Hydrocarbon Exposure</u> Visible hydrocarbons have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. The potential consequence to recreation and tourism is assessed as Minor (2) based on the potential for localised short-term impacts. Refer also to: • Rocky Shores. • Sandy Beaches. • Coastal Settlements.

Heritage	<u>Shoreline Hydrocarbon Exposure</u> Visible hydrocarbons have the potential to reduce the visual amenity of heritage sites. However, it is expected that these sites would be above the high tide mark. Thus, the potential consequence to heritage is assessed as Minor (2) as they could be expected to result in localised short-term impacts. Refer to: • Rocky Shores. • Sandy Beaches. Coastal Settlements.
Coral	<u>In-water Hydrocarbon Exposure</u> Exposure of entrained hydrocarbons to shallow subtidal corals has the potential to result in lethal or sublethal toxic effects, resulting in acute impacts or death at moderate to high exposure thresholds (Shigenaka 2001). Contact with corals may lead to reduced growth rates, tissue decomposition, and poor resistance and mortality of sections of reef (NOAA 2010). However, given the lack of hard coral reef formations, and the sporadic cover of soft corals in mixed reef communities, such impacts are considered to be limited to isolated corals. Thus, the potential consequence to corals is assessed as Minor (2) based on the potential for localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning.
Macroalgae	<u>In-water Hydrocarbon Exposure</u> Reported toxic responses to oils have included a variety of physiological changes to enzyme systems, photosynthesis, respiration, and nucleic acid synthesis (Lewis & Pryor 2013). A review of field studies conducted after spill events by Connell et al. (1981) indicated a high degree of variability in the level of impact, but in all instances, the algae appeared to be able to recover rapidly from even very heavy oiling. In the event that a TEC: Giant kelp marine forests of SE Australia is present within the area potentially affected following a spill, there is the potential to expose this important habitat to in-water hydrocarbons. However as described above, given hydrocarbons are expected to have limited impacts to macroalgae and as MDO is not sticky and expected to rapidly degrade upon release, the potential consequence to macroalgae is assessed as Minor (2) based on the potential for localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning.
Seagrass	<u>In-water Hydrocarbon Exposure</u> There is the potential that exposure could result in sub-lethal impacts, more so than lethal impacts, possibly because much of seagrasses' biomass is underground in their rhizomes (Zieman et al. 1984). Thus, the potential consequence to seagrass is assessed as Minor (2) based on the potential for localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning.
Plankton	<u>In-water Hydrocarbon Exposure</u> Relatively low concentrations of hydrocarbon are toxic to both plankton [including zooplankton and ichthyoplankton (fish eggs and larvae)]. Plankton risk exposure through ingestion, inhalation and dermal contact.

	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), allowing for seasonal influences on the assemblage characteristics. Thus, the potential consequence to plankton is assessed as Minor (2) based on the potential for short-term and localised impacts, but not affecting local ecosystem functioning.
Invertebrates	<u>In-water Hydrocarbon Exposure</u> Acute or chronic exposure through contact and/or ingestion can result in toxicological risks. However, the presence of an exoskeleton (e.g. crustaceans) reduces the impact of hydrocarbon absorption through the surface membrane. Invertebrates with no exoskeleton and larval forms may be more prone to impacts. Localised impacts to larval stages may occur which could impact on population recruitment that year. Thus, the potential consequence to invertebrates including commercially fished invertebrates is assessed as Minor (2) based on the potential for localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning.
Fish and Sharks	<u>In-water Hydrocarbon Exposure</u> 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, 2010). Subsurface hydrocarbons could potentially result in acute exposure to marine biota such as juvenile fish, larvae, and planktonic organisms, although impacts are not expected 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 period of water quality impairment, 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. Thus, the potential consequence to fish and sharks including commercially fished species is assessed as Minor (2) based on the potential for localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning.
Pinnipeds	<u>In-water Hydrocarbon Exposure</u> Exposure to low/moderate effects level hydrocarbons in the water column or consumption of prey affected by the oil may cause sub-lethal impacts to pinnipeds, however given the temporary and localised nature of the spill, their widespread nature, the low-level exposure zones and rapid loss of the volatile components of MDO in choppy and windy seas (such as that of the EMBA), the potential consequence is assessed as Minor (2) based on the potential for localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning.
Cetaceans	<u>In-water Hydrocarbon Exposure</u> The potential for impacts to cetaceans would be limited to a relatively short period following the release and would need to coincide with 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. A proportion of the migrating population of whales could be affected for a single migration event, thus potential consequence is assessed as Minor (2) based on the potential for localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning.
Commercial Fisheries and Recreational Fishing	<u>In-water Hydrocarbon Exposure</u> 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 MDO would only be in place 1-3 days after release, therefore physical displacement to vessels is unlikely to be a significant impact. Thus, the potential consequence to commercial and recreational fisheries is assessed as Minor (2) based on the potential for localised short-term impacts to species/habitats of recognised conservation value, but not affecting local ecosystem functioning. Refer also to: • Fish and Sharks • Invertebrates.
State Marine Protected Areas	<u>In-water Hydrocarbon Exposure</u> Based on the worse case potential consequence to key receptors the consequence to protected marine areas is assessed Minor (2). Refer to: • Invertebrates. • Macroalgae. • Pinnipeds.
Key Ecological Features	<u>In-water Hydrocarbon Exposure</u> Based on the worse case potential consequence to key receptors within these KEFs, the potential consequence is assessed to be Minor (2). Refer also to: • Coral. • Macroalgae. • Seagrass. • Plankton. • Invertebrates • Seabirds. • Fish and Sharks. Marine mammals (Pinnipeds, Cetaceans).
ALARP Decision Context	**B**
Control Measure	**Source of good practice control measures**

C19: Petroleum Safety Zone	Chapter 6, Part 6.6 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) provides for PSZs which are specified areas surrounding petroleum wells, structures or equipment which vessels or classes of vessel are prohibited from entering or being present in. PSZs for the Gippsland Offshore Operation's infrastructure are detailed in Section 3.1.1.
C20: Subsea infrastructure identified to marine users	As not all subsea infrastructure is within a PSZ infrastructure (wells and pipelines) is shown on navigational charts. In addition, Cooper Energy provides subsea infrastructure coordinates to local fishers via plotter updates. These controls have been put in place in response to stakeholder consultation with marine users.
C21: Accepted Safety Case	Under the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009 and Victorian Offshore Petroleum and Greenhouse Gas Storage Regulations 2011, licenced pipelines are facilities requiring a safety case. The Safety Case details the pipeline and associated infrastructure, design standards and parameters, subsea control system, process and emergency shutdown sequences and equipment inspection, maintenance, repair and intervention requirements.
C22: Accepted WOMP	Under Part 5 of the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011, a NOPSEMA accepted WOMP is required to enable well activities to be undertaken. The WOMP details well barriers and the integrity testing in place for the wells under this EP. Cooper Energy's NOPSEMA-accepted WOMPs describe Cooper Energy's minimum requirements for well barriers during all phases of a well. Specifically, it requires a minimum of two independent tested barriers.
C23: Marine Order 3: Seagoing qualifications	AMSA Marine Order 3 [Seagoing qualifications] requires that crew meet the minimum standards for safely operating a vessel, including watchkeeping requirements.
C24: Marine Order 30: Prevention of collisions	AMSA Marine Order 30 [Prevention of collisions] requires that onboard navigation, radar equipment, and lighting meets industry standards.
C25: Marine Order 31: Vessel surveys and certification	All vessels contracted to Cooper Energy will have in date certification in accordance with AMSA Marine Order 31 [Vessel surveys and certification]).
C14: SMPEP (or equivalent)	In accordance with MARPOL Annex I and AMSA's Marine Order 91: Marine Pollution Prevention – oil, a SMPEP (or equivalent, according to class) is required to be developed based upon the Guidelines for the Development of Shipboard Oil Pollution Emergency Plans, adopted by IMO as Resolution MEPC.54(32) and approved by AMSA. To prepare for a spill event, the SMPEP details: • Response equipment available to control a spill event; • Review cycle to ensure that the SMPEP is kept up to date; • Testing requirements, including the frequency and nature of these tests. In the event of a spill, the SMPEP details: • Reporting requirements and a list of authorities to be contacted; • Activities to be undertaken to control the discharge of hydrocarbon; • Procedures for coordinating with local officials. Specifically, the SMPEP contains procedures to stop or reduce the flow of hydrocarbons to be considered in the event of tank rupture.

C11: Ongoing consultation	Under the *Navigation Act 2014* (Cth), the Australian Hydrographic Service (AHS) are responsible for maintaining and disseminating hydrographic and other nautical information and nautical publications including: • Notices to Mariners • AUSCOAST warnings Relevant details will be provided to the Joint Rescue Coordination Centre (JRCC) to enable AUSCOAST warnings to be disseminated.
	Under both the *OPGGS Act 2006* (Cth) and *OPGGS Act 2010* (Vic) there is provision for ensuring that petroleum activities are carried out in a manner that doesn't interfere with other marine users to a greater extent than is necessary or the reasonable exercise of the rights and performance of the duties of the titleholder. Cooper Energy ensures this is achieved by conducting suitable consultation with relevant stakeholders. Consultation with potentially affected fisheries enables the risk of interaction with these users for the duration of the marine operations scope is limited.
C26: Fisheries Damage Protocol	Through consultation for the BMG asset a Fisheries Damage Protocol was developed with South-east Fishing Trawl Industry Association (SETFIA) and Southern Shark Industry Alliance (SSIA) to provide a compensation mechanism to fishers who damage equipment on infrastructure on the seabed outside of the PSZ. This protocol has been updated to include all Gippsland assets infrastructure outside of a PSZ.

Likelihood	**Remote (E)**	**Residual Risk**	**Low**

4.5 Summary of Control Measures Applicable to all Aspects of the Activity

Table 4-9 and Table 4-10 provide a summary of the control measures applicable to the various aspects identified in Section 4.2, 4.3 and 4.4.

Table 4-9: Operations Control Measures

Control Measure	Applicability to Operations
C1: Offshore Environmental Chemical Assessment Process	Hydraulic fluid meets the requirements of the Cooper Energy Chemical Assessment Process.
C2: Monitoring of hydraulic fluid use	Hydraulic fluid tank level monitored daily to identify any excessive use.
C19: Petroleum Safety Zone (PSZ) *C20: Subsea infrastructure identified to marine users*	Wells and infrastructure within a PSZ or marked on navigational charts. Local fishing vessels have vessel plotters with Sole, BMG and PB infrastructure coordinates
C21: Accepted Safety Case	Pipelines and infrastructure managed and inspected as per the requirements of the accepted Safety Case.
C22: Accepted Well Operations Management Plan (WOMP)	Wells managed and inspected as per the requirements of the accepted WOMP.
C26: Fisheries Damage Protocol	Fisheries Damage Protocol in place to provide a compensation mechanism to fishers who damage fishing equipment on Gippsland assets infrastructure outside of the PSZ.

Table 4-10: IMR and Vessel Control Measures

Control Measure	Applicability to IMR and Vessel
C1: Offshore Environmental Chemical Assessment Process	Chemicals, including grout bags, that may be used and discharged during inspection, maintenance and repair activities; and Chemicals used as a component of a planned vessel discharge; will meet the requirements of the Cooper Energy Chemical Assessment Process.
C3: Offshore Scope of Work	No equipment laydown or anchoring within the sponge and bryozoan habitat at ~ 50 m water depth along the PB pipeline.
C4: Campaign Risk Assessment	Campaign risk assessment identifies controls to minimise discharges of fluids from equipment during maintenance and repair activities.
C5: Marine Order 97: Marine Pollution Prevention – Air Pollution	Low-sulphur (<3.5% m/m) marine-grade diesel used. Vessels with diesel engines>130 kW must be certified to emission standards (e.g. IAPP, EIAPP). Vessels implement their Ship Energy Efficiency Management Plan (SEEMP) to monitor and reduce air emissions (as appropriate to vessel class).

Control Measure	Applicability to IMR and Vessel
C6: Protection of the Sea (Prevention of Pollution from Ships) Act 1983	Bilge water treated via a MARPOL (or equivalent) approved oily water separator and only discharge if oil content less than 15 ppm. Sewage discharged at sea is treated via a MARPOL (or equivalent) approved sewage treatment system. Food waste only discharged when macerated to ≤25 mm and vessel greater than 3 nm from land.
C7: Preventative Maintenance System	Equipment used to treat planned vessel discharges maintained in accordance with preventative maintenance system. Combustion equipment maintained in accordance with preventative maintenance system.
C8: Marine Order 95: Marine pollution prevention – garbage	Waste handled according to vessel waste management plan. Waste with potential to be windblown stored in covered containers. Waste lost overboard recovered if possible
C9: Wildlife (Marine Mammals) Regulations 2009 *C10 EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans*	Vessels adhere to the distances and vessel management practices of EPBC Regulations (Part 8) and Wildlife (Marine Mammals) Regulations 2009
C11: Ongoing consultation	Notifications for any on-water activities and ongoing consultations undertaken as per Section 9 Stakeholder Consultation
C12: ROV pre-dive Inspections	ROV pre-dive inspection confirms umbilical in good condition.
C13: Containment	Materials and equipment that have the potential to spill onto the deck or ocean are within a contained area.
C14: Shipboard Marine Pollution Emergency Plan (SMPEP)	Vessel has a SMPEP (or equivalent appropriate to class) which is: o Implemented in the event of a spill to deck or ocean. o Exercised as per the vessels exercise schedule. Spill response kits are located in high spill risk areas and routinely checked to ensure adequate.
C15: Marine Order 98: Marine pollution – anti-fouling systems.	Vessel will have a current anti-fouling certificate.
C16: National Biofouling Management Guidance for the Petroleum Production and Exploration Industry.	Vessel and in-field equipment will have a low-risk rating based on the Cooper Energy IMS Risk Assessment.
C17: Australian Ballast Water Management Requirements	Vessel will have a valid Ballast Water Management Plan and if required, a ballast water management certificate.

Control Measure	Applicability to IMR and Vessel
C18: Guidelines for the Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species	Vessel will have a Biofouling Management Plan and record book or equivalent.
C23: Marine Order 3: Seagoing qualifications.	Relevant crew hold valid STCW certificates (or equivalent to class).
C24: Marine Order 30: Prevention of collisions.	Navigation, radar equipment, and lighting meets the marine order requirements.
C25: Marine Order 31: Vessel surveys and certification.	Vessels have the appropriate class certification.

5 Oil Spill Response Overview

5.1 Oil Spill Response Strategies

This section presents the risk assessment for oil spill response options as required by the OPGGS(E) Regulations (Cwlth) and OPGGS Regulation (Vic) 15(4)(b). This section informs the Cooper Energy Victorian OPEP (VIC-EPER-EMP-0001).

5.1.1 Hydrocarbon Spill Risks associated with the Activity

Table 5-1 summarises the spill scenarios identified in Section 4.4 for the PB, Sole and BMG locations during the activities associated with this EP. Where spill scenarios are identified, the control agency is shown in brackets.

Table 5-1: Hydrocarbon spill risks associated with the activity

Spill Risk	State Waters		Commonwealth waters		
	PaB	Sole	PaB	Sole	BMG
Minor vessel spills (Level 1)	✓ (DJPR EMB)	✓ (DJPR EMB)	✓ (AMSA)	✓ (AMSA)	✓ (AMSA)
LOC Vessel Collision (MDO spill) (Level 1 or 2)	✓ (DJPR EMB)	✓ (DJPR EMB)	✓ (AMSA)	✓ (AMSA)	✓ (AMSA)
Umbilical, pipeline or infrastructure leak (Chemical, condensate, diesel) (Level 1)	✓ (Cooper Energy)	✓ (Cooper Energy)	✓ (Cooper Energy)	✓ (Cooper Energy)	✓ (Cooper Energy)
LOWC (gas) (Level 1)	-	-	✓ (Cooper Energy)	✓ (Cooper Energy)	✓ (Cooper Energy)

5.1.2 Response Option Selection

Not all response options and tactics are appropriate for every oil spill. Different oil types, spill locations, and volumes require different response options and tactics, or a combination of response options and tactics, to form an effective response strategy.

Net Environmental Benefit Analysis (NEBA) is the process of considering advantages and disadvantages of different spill response options (including no response) to arrive at a spill response decision resulting in the lowest overall environmental and social impacts. NEBA is undertaken at a strategic level to identify pre-determined recommended response strategies, and an operational NEBA is undertaken throughout the emergency response. The process requires the identification of sensitive environmental receptors and the prioritisation of those receptors for protection so that the strategic objectives of the response can be established.

Table 5-2 provides an assessment of the available oil spill response options, their suitability to the potential spill scenarios and their recommended adoption for the identified events.

5.2 Response Priority Areas

To support the identification of priority response areas, shoreline sensitivity analysis and mapping was undertaken guided by IPIECA principles and informed by the regional description of the environment and understanding of receptor presence in the region. The Response Priority Areas are detailed in the OPEP Section 4.4. Priority Protection Areas.

5.3 Pre-spill Net Environmental Benefits Assessment (NEBA)

Location specific information was used for each of the priority response planning areas to further refine receptor presence, with these receptors ranked based upon the sensitivity criteria detailed in the OPEP Section 4.4. Priority Protection Areas. An assessment of the effective spill response strategies and the net benefit they offer, specific to the sensitivities located within each of the priority response planning areas is provided in the OPEP Section 4.4. Priority Protection Areas.

Table 5-2: Suitability of Response Options

Response Option	Description	LOC – Vessel Collision (MDO)	Viable Response?	Strategic Net Benefit?	BMG Condensate	Viable Response?	Strategic Net Benefit?	LOWC - Gas	Viable Response?	Strategic Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Achieved by vessel SMPEP/SOPEP.	✓	✓	Implement offshore inspection to assess and determine remedial option.	✓	✓	Implement Victorian Offshore Source Control Plan (VIC-DC-ERP-0001) to assess and determine remedial option.	✓	✓
Monitor & Evaluate	Direct observation – Aerial or marine; Vector Calculations; Oil Spill Trajectory Modelling; Satellite Tracking Buoys. To maintain situational awareness, all monitor and evaluate options suitable.	MDO spreads rapidly to thin layers. Aerial surveillance is considered more effective than vessel to inform spill response and identify if oil has contacted shoreline or wildlife. Vessel surveillance is limited in effectiveness in determining spread of oil. Manual calculation based upon weather conditions will be used at the time to provide guidance to aerial observations. Oil Spill Trajectory Modelling may also be used to forecast impact areas. Deployment of oil spill monitoring buoys at the time of vessel incident will assist in understanding the local current regime during the spill event.	✓	✓	Small spill size and rapid weathering. Spill residues at maximum rates are not expected to be visible based upon preliminary modelling performed by RPS-APASA (2012). Leak most likely observed during inspection activities. If identified at surface, monitoring will be used to confirm weathering predictions. Aerial surveillance is considered more effective than vessel surveillance to inform spill response. Vessel surveillance limited in effectiveness in determining spread of oil. Manual calculation based upon weather conditions will be used at the time to provide guidance to aerial observations. Oil Spill trajectory modelling considered limited in ability to predict movement given the size of the spill and resolution of the modelling (unlikely to be used).	✓	✓	For a continuous significant spill event (LOWC) hydrocarbons will be present at the surface for the duration of the release. To maintain situational awareness, all monitor and evaluate techniques will be considered during gas spill incidents to validate predicted impacts and assess the application of further response strategies if required.	✓	✓
Dispersant Application	Breakdown surface spill & draw droplets into upper layers of water column. Increases biodegradation and weathering and provides benefit to sea-surface air breathing animals.	MDO, while having a small persistent fraction, spreads rapidly to thin layers. Insufficient time to respond while suitable surface thicknesses are present. Dispersant application can result in punch-through where dispersant passes into the water column without breaking oil layer down if surface layers are too thin. Application can contribute to water quality degradation through chemical application without removing surface oil. Considered not to add sufficient benefits.	✗	✗	Condensate slick is not expected to be visible. If seen, thickness would not support dispersant application.	✗	✗	The area affected by a LOWC gas release is likely to be localised around the wellhead, with plumes predicted to surface anywhere inside a 50 m radius of the release point.	✗	✗
Contain & Recover	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities.	MDO spreads rapidly to less than 10 µm and suitable thicknesses for recovery are only present for the first 36 hours for a large offshore spill, and there is insufficient mobilisation time to capture residues. In general, this method only recovers approximately 10-15% of total spill residue, creates significant levels of waste, requires	✗	✗	Condensate slick is not expected to be visible. If seen, thickness would not support contain and recovery techniques.	✗	✗	Any gas plume is predicted within 50 m of the release point only with surface exposure above impact/actionable thresholds not expected.	✗	✗

Response Option	Description	LOC – Vessel Collision (MDO)	Viable Response?	Strategic Net Benefit?	BMG Condensate	Viable Response?	Strategic Net Benefit?	LOWC - Gas	Viable Response?	Strategic Net Benefit?
		significant manpower and suitable weather conditions (calm) to be deployed.								
Protect & Deflect	Booms and skimmers deployed to protect environmental sensitivities.	MDO spreads rapidly to less than 10 µm and suitable thicknesses for recovery are only present for the first 36 hours for a large offshore spill, and there is insufficient mobilisation time to capture residues prior to hydrocarbons washing ashore. In addition to this, corralling of surface hydrocarbons close to shore is not expected to be effective for MDO and as thus is not expected to provide sufficient benefit.	✖	✖	Not required. No shoreline impacts predicted	✖	✖	Any gas plume is predicted within 50 m of the release point only with surface exposure above impact/actionable thresholds not expected. No shoreline contact is predicted.	✖	✖
Shoreline Clean-up	Shoreline clean-up is a last response strategy due to the potential environmental impact.	As shoreline exposure is possible depending on the spill location, and as there are various shoreline techniques that are appropriate for this type of hydrocarbon, a shoreline clean-up may be an effective technique for reducing shoreline loadings where access to shorelines is possible.	✓	✓	Not required. No shoreline impacts predicted	✖	✖	Any gas plume is predicted within 50 m of the release point only with surface exposure above impact/actionable thresholds not expected. No shoreline contact is predicted.	✖	✖
Oiled wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-spill captive management. In Victoria, this is managed by DELWP.	Given limited size and rapid spreading of the MDO spill, large scale wildlife response is not expected. However, individual birds could become oiled in the vicinity of the spill. OWR is both a viable and prudent response option for this spill type.	✓	✓	Not expected to create a surface sheen. OWR response not considered viable or offering net benefits	✖	✖	Any gas plume is predicted within 50 m of the release point only with surface exposure above impact/actionable thresholds not expected. Limited potential for oiled wildlife.	✖	✖
Scientific Monitoring	Scientific Monitoring is undertaken to understand and quantify the nature of short term and long term environmental impacts and subsequent recovery.	Given the size and rapid dispersion of a MDO spill scientific monitoring would only be implemented to demonstrate to stakeholders that the impacts from the spill were short-term and localised as predicted. Thus, water and sediment sampling could potentially be undertaken.	✓	✓	Given the limited size, rapid evaporation and dispersion of a condensate spill scientific monitoring would only be implemented to demonstrate to stakeholders that the impacts from the spill were short-term and localised as predicted. Thus, water sampling could potentially be undertaken. Sediment sampling not required as no shoreline impacts.	✓	✓	Gas and water sampling initiated for well-related releases to assist in determining the source of the release. Information would assist in the assessment of source control options.	✓	✓

5.4 Spill Response: Source Control

Well-related source control activities may range from:

- ROV intervention utilising specialist ROV tooling; and/or
- Well capping; and/or
- Relief well installation.

The potential impacts and risks associated with performing these activities are covered under the aspects evaluated in the accepted WOMP and thus are not considered further.

Source control arrangements for LOC from vessel failures includes:

- Closing water tight doors;
- Checking bulkheads;
- Determining whether vessel separation will increase spillage;
- Isolating penetrated tanks; and
- Tank lightering, etc.

Implementation of source control for vessels is detailed within the below documents, and is not discussed further:

- Vessel-specific Shipboard Oil Pollution Emergency Plan (SOPEP/SMPEP);
- Vessel Specific Safety Cases; and
- National Plan for Maritime Environmental Emergencies (NatPlan).

Source controls arrangements for the Sole pipeline includes shutting in the wells and pipeline. The potential impacts and risks associated with this is covered under the aspects evaluated in the accepted WOMP and Safety Case and thus are not considered further.

For all pipeline and infrastructure leaks and vessel inspection and repair program would be implemented. The potential impacts and risks associated with these activities are covered in the EP.

5.5 Spill Response: Monitor and Evaluate

Ongoing monitoring and evaluation of the oil spill is a key strategy and critical for maintaining situational awareness and to complement and support the success of other response activities. In some situations, monitoring and evaluation may be the primary response strategy where the spill volume/risk reduction through dispersion and weathering processes is considered the most appropriate response. Monitor and evaluate will apply to all marine spills. Higher levels of surveillance such as vessel/aerial surveillance, oil spill trajectory modelling and deployment of satellite tracking drifter buoys will only be undertaken for Level 2/3 spills given the nature and scale of the spill risk.

It is the responsibility of the Control Agency to undertake operational monitoring during the spill event to inform the operational response. Operational monitoring includes the following:

- Aerial observation;
- Vessel observation;
- Computer-based tools:

  - Oil spill trajectory modelling;
  - Vector analysis (manual calculation);
  - Automated Data Inquiry for Oil Spills (ADIOS) (a spill weathering model); and
- Utilisation of satellite tracking drifter buoys.

Table 5-3 provides a summary of the EIA/ERA for monitoring and evaluation activities.

Table 5-3: Monitor and Evaluate EIA/ERA

Cause of Aspect	The following hazards associated with operational monitoring have the potential to interfere with marine fauna: • Aircraft use for aerial surveillance (fixed wing or helicopter). • Vessels use for surveillance.
Summary of impact(s)	The potential impacts of underwater sound emissions in the marine environment are: • Localised and temporary fauna behavioural disturbance that significantly affects migration or social behaviours.
Consequence Evaluation	
Receptor(s)	**Description of Potential Environmental Impact**
Marine mammals Marine reptiles Fish Commercial fisheries	The potential impacts associated with underwater sound emissions from vessels have been evaluated in Section 4.0 of the EP. Based upon the nature and scale of the activities, the evaluation is considered appropriate for any marine surveillance undertaken and thus has not been considered further. Helicopters and aircraft generate airborne noise, which may penetrate into the marine environment. The intensity of the received sound depends upon the source level, altitude, and depth of the receiver. Richardson et al. (1995) reports figures for a Bell 214 helicopter (stated to be one of the noisiest) being audible in air for four minutes before it passed over underwater hydrophones, but detectable underwater for only 38 seconds at 3 m depth and 11 seconds at 18 m depth. Thus, impacts to fauna aircraft or helicopters are unlikely as they will not be close to the sea surface and will not be approaching fauna. Thus, potential consequences are assessed as Negligible (1).
ALARP Decision Context	**A**

Control Measure	Source of good practice control measures		
Wildlife (Marine Mammals) Regulations 2009 EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans	EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans – The Australian Guidelines for Whale and Dolphin Watching, describes strategies to ensure whales and dolphins are not harmed during offshore interactions with people. These guidelines were developed jointly by all state and territory governments through the Natural Resource Management Ministerial Council and although are more relevant for tourism activities, provide a list of good requirements that are generally adopted by the oil and gas industry to minimise the risk of fauna strike occurring; this also has the effect of ensuring a separation distance from vessels restricting the potential for noise impacts. Distances for helicopters are also provided. Wildlife (Marine Mammals) Regulations 2009 provide the same distances and management actions but also apply to pinnipeds. AMSA Marine Notice 15/2016 Minimizing the risk of collisions with cetaceans; also identifies control measures for vessel operators to minimise the impact of underwater sound on marine fauna. These control measures are the same as those identified within EPBC Regulations 2000 and thus have not been discussed further. EPSs for this control measure are detailed in the OPEP.		
Likelihood	**Remote (E)**	**Residual Risk**	**Low**

5.6 Spill Response: Protect and Deflect

Based upon sensitivity mapping undertaken as described in Appendix C of the EP, the following protection priority areas were identified and would be subject to protection and deflection response operations in the event that hydrocarbon exposure from an oil spill is predicted via operational monitoring:

- Tamboon Inlet
- Sydenham Inlet
- Yeerung River
- Snowy River
- Gippsland Lakes (east and west)

The OPEP details the resource capability to undertake protection and deflection activities, their availability and hence Cooper Energy's capability to support a 'protect and deflect' response.

Cooper Energy considers that in the event of a 'worst-case' spill event, there are sufficient protection and deflection resources to respond to priority protection areas and areas where response strategies may be practically implemented. Based on this availability, Cooper Energy considers that there are no other practicable controls, appropriate to the nature and scale of the oil spill risk, which could be implemented to affect more timely response activities.

Table 5-4 provides a summary of the EIA / ERA for protection and deflection activities.

Table 5-4: Protect and Deflect EIA / ERA

Cause of Aspect	The following hazards associated with protection and deflection have been identified: • Personnel and equipment access to beaches; nearshore waters and inland water ways.
Summary of impact(s)	The potential impacts of physical disturbance to the environment are: • Damage to or loss of vegetation; • Disturbance to fauna habitat and fauna from noise and light emissions from response activities; and • Temporary exclusion of the public from amenity beaches.
Consequence Evaluation	
Receptor(s)	**Description of Potential Environmental Impact**
Nearshore habitats Shoreline habitats	The noise and general disturbance created by protection and deflection activities could potentially disturb the feeding, breeding, nesting or resting activities of resident and migratory fauna species that may be present such as seabirds. However, potential impacts would be localised and for a short period of time and unlikely to impact at a population level. Loss of vegetation may occur where equipment cannot be mobilise using existing tracks or where protection booms may be placed. A NEBA will be undertaken to ensure there is a net benefit if vegetation is required to be impacted. Areas maybe temporary restricted to the public while protection and deflection activities occur. As the diesel will weather rapidly this would only occur for days to weeks. The potential consequence is assessed as Minor (2).
ALARP Decision Context	**A**
Control Measure	**Source of good practice control measures**
Maintain shoreline assessment and clean-up capability as described in the OPEP.	Maintaining the capability described in OPEP is key for ensuring that the any response is implemented effectively and quickly. EPS for this control measure are detailed in the OPEP.
Develop Tactical Response Plans (TRPs) for priority protection sites.	Identify priority protection sites in accordance with Appendix C in the EP and apply tactical response planning measures as identified within the OPEP. EPS for this control measure are detailed in the OPEP.
Consultation	Consultation In the event of a spill will ensure that relevant government agencies support the tactical response arrangements thus minimising potential impacts and risks to sensitivities. EPS for this control measure are detailed in the OPEP.

Use of Existing Tracks and Pathways.	Utilising existing tracks and paths where possible will ensure the disturbance footprint associated with the implementation of this response technique is reduced to ALARP. EPS for this control measure are detailed in the OPEP.		
Likelihood	**Remote (E)**	**Residual Risk**	**Low**

5.7 Spill Response: Shoreline Assessment and Clean-up

Any shoreline operations will be undertaken in consultation with, and under the control of DJPR EMB, the Control Agency for Victoria and the appropriate land managers of the shoreline affected.

Shoreline clean-up consists of different manual and mechanical recovery techniques to remove oil and contaminated debris from the shoreline to reduce ongoing environmental contamination and impact. It may include the following techniques:

- Natural recovery – allowing the shoreline to self-clean (no intervention undertaken);
- Manual collection of oil and debris – the use of people power to collect oil from the shoreline;
- Mechanical collection – use of machinery to collect and remove stranded oil and contaminated material;
- Sorbents – use of sorbent padding to absorb oil;
- Vacuum recovery, flushing, washing – the use of high volumes of low-pressure water, pumping and/or vacuuming to remove floating oil accumulated at the shoreline;
- Sediment reworking – move sediment to the surf to allow oil to be removed from the sediment and move sand by heavy machinery;
- Vegetation cutting – removing oiled vegetation; and
- Cleaning agents – application of chemicals such as dispersants to remove oil.

Shorelines within the EMBA are predominantly sandy beaches with numerous estuaries present along the Victorian Coastline.

Based upon this behaviour, the following methods may have environmental benefit:

- Manual clean-up;
- Closure of estuaries resulting in additional stranding on sandy beach; and
- Mechanical collection – use of machinery to collect and remove stranded oil and contaminated material.

The OPEP details the shoreline assessment and clean-up processes and the resources required to undertake shoreline assessment activities, their availability and Cooper Energy's capability to support shoreline assessment and clean-up activities.

It is unlikely that the worst case of 250 m^3 of MDO from a vessel collision would end up onshore even from a vessel activity in nearshore waters. It is also unlikely that all the spilt volume would wash ashore in one day. Consequently, in response to this type of event, Cooper Energy would propose to send a number of teams to the affected shorelines to assess potential impact, recommend response techniques and the number of teams required such that secondary impacts are reduced to as little as practicable.

Table 5-5 provides the EIA/ERA for shoreline assessment and clean-up.

Table 5-5: Shoreline assessment and clean up EIA/ERA

Cause of Aspect	The following hazards are associated with shoreline clean-up activities and may interfere with environmental sensitivities: • Personnel and equipment access to beaches; • Shoreline clean-up; and • Waste collection and disposal.
Summary of impact(s)	The known and potential impacts of these activities are: • Damage to or loss of vegetation; • Disturbance to fauna habitat and fauna from noise, air and light emissions from response activities; and • Temporary exclusion of the public from amenity beaches. Sandy beaches are the focus for the consequence evaluation as they are considered to provide an indication of the worst-case consequences from implementing shoreline response due to presence of potential sensitivities and the invasive nature of techniques (such as mechanical collection).
Consequence Evaluation	
Receptor(s)	**Description of Potential Environmental Impact**
Seabirds Pinnipeds Shoreline habitats Socio-economic	The noise and general disturbance created by shoreline clean-up activities could potentially disturb the feeding, breeding, nesting or resting activities of resident and migratory fauna species that may be present (such as seabirds, penguins and fur-seals). Any erosion caused by responder access to sandy beaches, or the removal of sand, may also bury nests. In isolated instances, this is unlikely to have impacts at the population level. Based upon the low viscosity, MDO is likely to infiltrate porous shorelines (such as sandy beaches). Consequently, clean-up efforts expected to result in more of a disturbance to the coastline as mechanical recovery could be required (resulting in excavation of shorelines). If not done correctly, any excavation along the coast could increase beach erosion and limit longer term recovery. The very presence of stranded oil and clean-up operations will necessitate temporary beach closures (likely to be weeks but depends on the degree of oiling and nature of the shoreline). This means recreational activities (such as swimming, walking, fishing, boating) in affected areas will be excluded until access is again granted by local authorities. Given the prevalence of rocky shorelines in the EMBA, this is unlikely to represent a significant social or tourism drawback. The potential consequence is assessed as Moderate (3).
ALARP Decision Context	**A**

Control Measure	Source of good practice control measures		
Victorian OPEP	Maintaining the capability for shoreline assessment is key for ensuring that any response is implemented effectively and quickly. EPSs for this control measure are detailed in the OPEP.		
Consultation	Consultation in the event of a spill will ensure that relevant government agencies support the shoreline assessment and clean up strategy thus minimising potential impacts and risks to sensitivities. EPSs for this control measure are detailed in the OPEP.		
Use of Existing Tracks and Pathways	Utilising existing tracks and paths where possible will ensure the disturbance footprint associated with the implementation of this response technique is reduced to ALARP. EPSs for this control measure are detailed in the OPEP.		
Likelihood	**Remote (E)**	**Residual Risk**	**Low**

5.8 Spill Response: Oiled Wildlife Response

In the event of a Level 2 MDO spill, the impacts on wildlife are determined by the types of fauna present, the type of oil spilled and the extent of exposure. A review of the species likely to be present within the EMBA identifies marine birds, shorebirds and fur-seals could be affected.

Oiled wildlife response (OWR) consists of a three-tiered approach involving:

- Primary: Situational understanding of the species/populations potentially affected (ground-truth species presence and distribution by foot, boat or aerial observations);
- Secondary: Deterrence or displacement strategies (e.g., hazing by auditory bird scarers, visual flags or balloons, barricade fences; or pre-emptive capture); and
- Tertiary: Recovery, field stabilisation, transport, veterinary examination, triage, stabilisation, cleaning, rehabilitation, release.

The OPEP details the oiled wildlife response and the resources required to undertake oiled wildlife response activities, their availability and Cooper Energy's capability to support oiled wildlife response activities.

Cooper Energy considers that in the event of a 'worst-case' spill event, there are sufficient oiled wildlife resources to respond to individual oiled bird species as a result of the spill. Based on this availability, Cooper Energy considers that there are no other practicable controls, appropriate to the nature and scale of the oil spill risk, which could be implemented to affect more timely response activities.

Table 5-6 provides the EIA/ERA for OWR activities.

Table 5-6: Oiled Wildlife Response EIA/ERA

Cause of Aspect	The hazards associated with OWR are: • Hazing of target fauna may deter non-target species from their normal activities (resting, feeding, breeding, etc.); • Distress, injury or death of target fauna from inappropriate handling and treatment; and • Euthanasia of target individual animals that cannot be treated or have no chance of rehabilitation.
Summary of impact(s)	The potential impacts of this activity are disturbance, injury or death of fauna.
Consequence Evaluation	
Receptor(s)	**Description of Potential Environmental Impact**
Marine fauna	Untrained resources capturing and handling native fauna may cause distress, injury and death of the fauna. To prevent these impacts, only appropriately trained oiled wildlife responders will approach and handle fauna. This will eliminate any handling impacts to fauna from untrained personnel and reduce the potential for distress, injury or death of a species. It is preferable to have oil-affected animals that have no prospect of surviving or being successfully rehabilitated and released to the environment humanely euthanized than to allow prolonged suffering. The removal of these individuals from the environment has additional benefits in so far as they are not consumed by predators/scavengers, avoiding secondary contamination of the food-web. Hazing and exclusion of wildlife from known congregation, resting, feeding, breeding or nesting areas may have a short- or long-term impact on the survival of that group if they cannot access preferred resources. These effects may be experienced by target and non-target species. For example, shoreline booming or ditches dug to contain oil may prevent penguins from reaching their burrows after they've excited the water and low helicopter passes flown regularly over a beach to deter coastal birds from feeding in an oil-affected area may also deter penguins from leaving their burrows to feed at sea, which may impact on their health. Due to the potential for localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning, the potential consequence from this activity have been identified as Minor (2).
ALARP Decision Context	**A**
Control Measure	**Source of good practice control measures**
Victorian OPEP	Maintaining the capability for oiled wildlife response is key for ensuring that the any response is implemented effectively and quickly. EPSs for this control measure are detailed in the OPEP.

Consultation	Consultation In the event of a spill will ensure that relevant government agencies support the OWR strategy thus minimising potential impacts and risks to sensitivities. EPSs for this control measure are detailed in the OPEP.		
Use of Existing Tracks and Pathways	Utilising existing tracks and paths where possible will ensure the disturbance footprint associated with the implementation of this response technique is reduced to ALARP. EPSs for this control measure are detailed in the OPEP.		
Likelihood	**Remote (E)**	**Residual Risk**	**Low**

6 Implementation Strategy

Cooper Energy retains full and ultimate responsibility as the Titleholder of the activity and is responsible for ensuring that the Gippsland Offshore Operation activities are implemented in accordance with the performance outcomes outlined in the EP.

The systems in place to ensure that environmental performance and the standards in the EP are met are summarised in this section.

6.1 Cooper Energy Management System

The HSEC MS is Cooper Energy's corporate system which provides the framework for the delivery of Cooper Energy's values, policies, standards and practices related to health, safety, environment and community. The HSEC MS applies to all:

- Workplaces, sites and activities operated by Cooper Energy and under Cooper Energy's management or control;
- Exploration, construction and development activities under Cooper Energy management or control; and
- Cooper Energy employees, contractors and visitors on Cooper Energy sites, in offices and on activities such as offshore inspections, construction and development projects.

All personnel are expected to be familiar with, and comply with, the requirements of the HSEC MS.

6.1.1 Contractor Management System

The Contractor and Supplier Management Standard details Cooper Energy's contractor management system which provides a systematic approach for the selection and management of contractors to ensure any third party has the appropriate safety and environment management system and structures in place to achieve HSEC performance in accordance with Cooper Energy's expectations.

The Standard applies to sub-contractors, Third Party Contractors (TPCs) and suppliers conducting work at Cooper Energy sites or providing services to Cooper Energy.

The Standard addresses operational HSEC performance of all contractors while working under a Cooper Energy contract or in an area of Cooper Energy responsibility or which may be covered under the HSEC Management System. The key HSEC steps in the Cooper Energy contractor management system include:

- Planning - HSEC assessment of potential contractors, suppliers and/or TPCs;
- Selection - Submission and review of contractors and/or TPCs HSEC management data;
- Implementation - Onsite contractors and/or TPCs HSEC requirements including induction and training requirements; and
- Monitoring, review and closeout - Ongoing review of contractors and/or TPCs HSEC performance including evaluation at work handover.

6.2 Emergency Response

Cooper Energy manages emergencies from the Gippsland Offshore Operations in accordance with the Cooper Incident Management Plan (IMP). The purpose of the IMP is to provide the

Cooper Energy Incident Management Team (IMT) with the necessary information to respond to an emergency affecting operations or business interruptions. Specifically, this plan:

- Describes the Emergency Management Process;
- Details the response process; and
- Lists the roles and responsibilities for the IMT members.

6.2.1 Emergency (Oil Spill) Response Arrangements and Capability

The Cooper Energy Offshore Victoria Oil Pollution Emergency Plan (the OPEP) (VIC-EPEREMP-0001) and Offshore Victoria Operational and Scientific Monitoring Plan (the OSMP) (VICER-EMP-0002) provide for oil spill response and monitoring arrangements for Cooper Energy's Offshore Victorian assets and provide for the activities covered under the EP.

A summary of the spill response capabilities of Cooper Energy applicable to the Gippsland Operations are outlined in Table 6-1.

Table 6-1: Cooper Energy Spill Response Capabilities

Response Strategy	Spill Response Capability
Source Control	Cooper Energy maintains the following agreements (or contractor pre-qualifications) to maintain source control capabilities: • Well Control Specialist (including capping stack capability) • ROV Contractors. • Subsea Engineering Company. • Well Engineering Contractor. • Cooper Energy Relief Well Readiness Form (verified every 2 months whilst drilling and every 6 months for operations), including Capping Stack Resources.
	Cooper Energy conducts annual source control desktop exercise.
Monitor and evaluate	Cooper Energy maintains the following agreements (or contractor pre-qualifications) to maintain operational response capabilities: • AMOSC membership (Aerial Observers, RPS-APASA Contract). • AMSA MoU. • Aviation support (pre-qualification assessment.) • Marine support services.
	An oil spill tracking buoy and instructions for deployment will be located offshore at all times during well-related activities.
Protect and Deflect	Cooper Energy maintains the following agreements to maintain shoreline assessment/protect and deflect capabilities: • AMOSC membership (equipment, personnel, CORE Group. Mutual aid). • AMSA MoU (equipment, personnel). • Scientific resource support agreement (GHD or equivalent). • Waste management contract.
Shoreline Clean-up	Cooper Energy maintains the following agreements to maintain shoreline assessment/clean-up response capabilities: • AMOSC membership (equipment, personnel, CORE Group. Mutual aid). • AMSA MoU (equipment, personnel).

Response Strategy	Spill Response Capability
	• Scientific resource support agreement (GHD or equivalent). • Waste management contract.
Oiled Wildlife Response	Cooper Energy maintains the following agreements to maintain OWR response capabilities: • AMOSC membership (equipment, personnel). • Waste management contract. • Vessel of Opportunity listing

Vessels will also operate under the vessel's Shipboard Marine Pollution Emergency Plan (SMPEP) (or equivalent appropriate to class) or spill clean-up procedures to ensure timely response and effective management of any vessel-sourced oil spills to the marine environment.

6.2.2 Oil Spill Response Competency & Training

Personnel will have the appropriate competencies and training to undertake their roles and responsibilities in emergency situations. Oil spill response training and competency records are maintained internally in accordance with Documented Information Standard Instruction (COE-MS-STI-0008).

6.2.3 Testing Oil Spill Response Arrangements

In accordance with Regulation 14 (8A) & (8C) of the OPGGS(E) Regulations and HSEC MS Standard 16: Crisis and Emergency Preparedness and Response, the response arrangements will be tested:

- When they are introduced;
- When they are significantly amended;
- Not later than 12 months after the most recent test;
- If a new location for the activity is added to the EP after the response arrangements have been tested, and before the next test is conducted – testing the response arrangement in relation to the new location as soon as practicable after it is added to the plan; and
- If a facility becomes operational after the response arrangements have been tested and before the next test is conducted – testing the response arrangements in relation to the facility when it becomes operational.

6.3 Chemical Assessment and Selection

Cooper Energy's Offshore Environmental Chemical Assessment Procedure (COE-MS-RCP-0042) requires that chemicals that will be or have the potential to be discharged to the environment are assessed and approved prior to use. This process is used to ensure the lowest toxicity, most biodegradable and least accumulative chemicals are selected which meet the technical requirements.

6.4 Management of Change

The MoC Procedure (COE-MS-PCD-003) and MoC Standard Instruction (COE-MS-STI-0013) describes the requirements for dealing with change management.

The objective of the MoC process is to ensure that changes do not increase the risk of harm to people, assets or the environment. This includes:

- Deviation from established corporate processes;
- Changes to offshore operations and/or status of infrastructure;
- Deviation from specified safe working practice or work instructions/procedures;
- Implementation of new systems; and
- Significant change of HSEC-critical personnel.

Environmentally relevant changes include:

- New activities, assets, equipment, processes or procedures proposed to be undertaken or implemented that have the potential to impact on the environment and have not been:
    - Assessed for environmental impact previously, in accordance with the relevant standard; and
    - Authorised in the existing management plans, procedures, work instructions or maintenance plans.
- Proposed changes to activities, assets, equipment (including change of well or infrastructure status that may be undertaken under another EP), processes or procedures that have the potential to impact on the environment or interface with the environmental receptor;
- Changes to the existing environment including (but not limited to) fisheries, tourism and other commercial and recreational uses, and any changes to protective matter requirements;
- Changes to the requirements of an existing external approval (e.g. changes to conditions of environmental licences);
- New information or changes in information from research, stakeholders, legal and other requirements, and any other sources used to inform the EP; and
- Changes or updates identified from incident investigations, emergency response activities or emergency response exercises.

For any MoC with identified environmental impacts or risks, an impact/risk assessment will be undertaken to ensure that impacts and risks from the change can be managed to meet the nominated EPOs set out in the accepted EP as well as be ALARP and of an acceptable level.

6.4.1 Revisions of the EP

In the event that the proposed change introduces a significant new environmental impact or risk, results in a significant increase to an existing risk, or through a cumulative effect of a series of changes there is a significant increase in environmental impact or risk, this EP will be revised for re-submission to NOPSEMA and DJPR.

Where a change results in the EP being updated, the change/s are to be logged in the EP Change Register.

In addition, the titleholder is obligated to ensure that all specific activities, tasks or actions required to complete the activity are provided for in the EP. Regulation 17(5) of the OPGGS(E) Regulations (Cwlth) and Regulation 20(2) of the OPGGS Regulations (Vic) require that where there is a significant modification or new stage of the activity (that is, change to the spatial or temporal extent of the activity) a proposed revision of the EP will be submitted to NOPSEMA and DJPR.

6.5 Incident Reporting

As per Cooper Energy's Incident Management Standard Instruction (COE-MS-STI-0020), Cooper Energy has a systematic method of incident reporting and investigation and a process for monitoring close out of preventative actions. The incident reporting and investigation procedure defines the:

- Method to record, report, investigate and analyse accidents and incidents;
- Legal reporting requirements to the regulators within mandatory reporting timeframes;
- Process for escalating reports to Cooper Energy senior management and the Cooper Energy Board;
- Methodology for determining root cause;
- Responsible persons to undertake investigation; and
- Classification and analysis of incident.

6.6 Environmental Performance Monitoring and Reporting

This section details the specific measures Cooper Energy will implement to ensure that, for the duration of the activity:

- the environmental impacts and risks of the activity continue to be 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 an acceptable level; and
- environmental performance outcomes and standards set out in the EP are being met.

6.6.1 Emissions and Discharges

Emissions and discharge monitoring and records required for operations and vessel-based activities are detailed in Table 6-2.

Copies of emission and discharge records will be retained in accordance with the Documented Information Standard Instruction (COE-MS-STI-0008).

Table 6-2: Discharge and Emissions Monitoring

ASPECT	MONITORING	FREQUENCY	REQUIREMENT
OPERATIONS			
Routine release of hydraulic fluid	Chemical Type Volume	Daily	Distributed Control System
OFFSHORE ACTIVITY			
Fuel Use	Volume	Daily	Daily report
Waste	Volume sent ashore	As required	Daily report

6.6.2 Reporting

As required by Regulation 26C OPGGS(E) Regulations and Regulation 31A OPGGS Regulations (Vic) Cooper Energy will submit an annual EP performance report to the regulator (NOPSEMA and DJPR). This reports compliance against each of the EPOs and EPSs of the EP and provides the results of monitoring as outlined in Table 6-2.

Cetacean observation data will be submitted to the DoEE via the Australian Marine Mammal Centre Data Portal.

6.6.3 Audit and Inspection

Environmental performance of offshore operations and activities will be audited and reviewed in several ways in accordance with Standard 18: Audit and Assessment to ensure that:

- Environmental performance standards to achieve the EPOs are being implemented and reviewed;
- Potential non-compliances and opportunities for continuous improvement are identified; and
- Environmental monitoring requirements are being met.

Non-compliance with the environmental performance standards outlined in the EP will be managed as per Section 6.6.4.

Opportunities for improvement or non-compliances noted will be communicated to relevant personnel at the time of the review/inspection/audit to ensure adequate time to implement corrective actions. The findings and recommendations of inspections or audits will be documented and distributed to relevant personnel for comment, and any actions tracked until completion.

6.6.3.1 EP Compliance

The following assurance arrangements will be undertaken annually:

- Audit of the performance outcomes and performance standards contained in the EP and the requirements detailed in the implementation strategy. This audit will be used to inform the annual EP performance report submitted to NOPSEMA and DJPR.
- Review the Victoria OPEP to ensure the arrangements are up to date and can be met.

6.6.3.2 Offshore Vessel Activities

The following arrangements review the environmental performance of offshore vessel activities:

- A premobilisation inspection will be undertaken for offshore vessels to ensure they will meet the requirements of the EP; and
- HSEC inspections will be undertaken throughout the offshore activity on a weekly basis to ensure ongoing compliance with relevant EP requirements. The scope of the inspections will include (but is not limited to):
  - Vessel spill readiness (i.e. provision spill kits and drills in accordance with vessel SOPEP/SMPEP);
  - Waste management in accordance with EP EPO and EPSs;
  - Chemical Inventory checks to ensure campaign chemicals are accepted via the COE chemical assessment process;
  - Maintenance checks for equipment identified within an EP EPS (e.g. OWS).

Non-compliance and improvement opportunities will be communicated to COE HSEC onshore for advice, tracking and reporting in accordance with EP requirements.

6.6.4 Management of Non-conformance

In response to any EP and environmental audits and inspections non-compliances, corrective actions will be implemented and tracked to completion as per the Incident management, Non-Conformity and Corrective Action Standard Instruction (COE-MS-STI-0020).

Corrective actions will specify the remedial action required to fix the breach and prevent its reoccurrence and is delegated to the person deemed most appropriate to fulfil the action. The action is closed out only when verified by the appropriate Manager and signed off. This process is maintained through the Cooper Energy corrective action tracking system.

Where more immediacy is required, non-compliances will be communicated to relevant personnel and responded to as soon as possible. Where relevant the results of these actions will be communicated to the offshore crew during daily toolbox meetings or at daily or weekly HSEC meetings.

Cooper Energy will carry forward any non-compliance items for consideration in future operations to assist with continuous improvement in environmental management controls and performance outcomes.

6.7 Records Management

In accordance with the Regulation 27 of the OPGGS(E) Regulations (Cwlth) and Regulation 32 of the OPGGS Regulations (Vic), Cooper Energy will store and maintain documents or records relevant to the EP in accordance with the Documented Information Standard Instruction (COEMS-STI-0008).

7 Stakeholder Consultation

Cooper Energy has undertaken stakeholder engagement in preparation of the Gippsland Offshore Operations EP. Stakeholder identification involved the following:

- Reviewing the social receptors identified in the existing environment section;
- Reviewing existing stakeholders identified as relevant and contained within the Cooper Energy stakeholder register (Gippsland Basin);
- Reviewing previous BMG, PB, Sole and drilling campaign consultation records;
- Conversing with existing stakeholders to identify potential new stakeholders or changes to stakeholder contacts or consultation preferences;
- Reviewing Commonwealth and State fisheries jurisdictions and fishing effort in the region; and
- Reviewing the Australian Government Guidance Offshore Petroleum and Greenhouse Gas Activities: Consultation with Australian Government agencies with responsibilities in the Commonwealth Marine Area.

Stakeholders identified and contacted for this activity, grouped by the categories listed under OPGGS(E)R Regulation 11A, are listed in Table 7-1.

Table 7-1: Stakeholders for the Gippsland Offshore Operations

Stakeholder	Reasoning	Stakeholder Category*
Department or agency of the Commonwealth to which the activities to be carried out under the EP may be relevant		
Australian Fisheries Management Authority (AFMA)	Activity is within a Commonwealth fishery area or will impact or potentially impact a Commonwealth fishery area or resource. Via previous consultation has recommended that engagement with CFA as the peak fishing industry body for commonwealth and that ABARES reports should be reviewed for fishery status. CFA is included in this table as a relevant stakeholder and the latest 2018 ABARES report was used to determine which Commonwealth fisheries have fishing effort within the activity area.	1
Australian Hydrological Service (AHS)	Via previous consultation have request to provide information at least three weeks prior to commencement of any oil and gas activity to allow for publication of notices to mariners.	2
Australian Maritime Safety Authority (AMSA)	Via previous consultation have provided shipping activities within the area of the activity. Requested AMSA-JRCC contacted 24-48 hours before activity commences to promulgate AUSCOAST warning and AHS contacted 4 weeks prior to activities for notice to mariners.	2
Each Department or agency of a State or the Northern Territory to which the activities to be carried out under the EP may be relevant		

Stakeholder	Reasoning	Stakeholder Category*
DJPR – Victorian Fishery Authority	Activity is within a Victorian fishery area or will impact or potentially impact a Victorian fishery area or resource.	1
DJPR - Transport Victoria - Marine Pollution Team	Responsible for Marine Pollution Response arrangements in Victoria.	1
DELWP - Marine National Parks and Marine Parks	Two State Marine Protected Areas (Beware Reef Marine Sanctuary and Point Hicks Marine National Park) intersect with the EMBA.	1
Transport Safety Victoria (Maritime Safety)	Manages safety of waterways in Victoria and prepare State Waters Notice to Mariners.	2
The Department of the responsible State Minister, or the responsible Northern Territory Minister		
DJPR – Earth Resources Regulation (ERR)	Regulate petroleum activities in Victorian State waters.	2
A person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the EP		
Fisheries:		
Abalone Victoria (Central Zone)[SIV]	Though activity is within the Victorian Eastern Abalone Zone stakeholder has requested information on Cooper Energy's activities. Based on water depths and habitat it is unlikely that abalone fishing occurs in the Operational Area. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018. Only response has been to provide their generic email address.	1
Australian Southern Bluefin Tuna Industry Association (Port Lincoln)	Activity is within the fishery management area but there is no fishing effort. Stakeholder requested to receive updates on Cooper Energy's activities.	3
Commonwealth Fisheries Association	Peak body representing commonwealth commercial fisheries. Activity overlaps with Commonwealth fisheries. AFMA recommended that engagement with CFA be undertaken as the peak fishing industry body for Commonwealth fisheries. CFA have been sent information regarding Sole and BMG activities during 2017 and 2018 with no reply.	1
Eastern Victoria Sea Urchin Divers Association	Activity is within the eastern zone of the Sea Urchin Fishery. Based on water depths and habitat it is unlikely that sea urchin fishing occurs in the Operational Area. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018 with no response.	3
Eastern Zone Abalone Industry Association	Activity is within the Victorian Eastern Abalone Zone. Based on water depths and habitat it is unlikely that abalone fishing occurs in the Operational Area. Stakeholder has been sent information	1

Stakeholder	Reasoning	Stakeholder Category*
	regarding Sole and BMG activities during 2017 and 2018 with no response.	
Eastern Victorian Rock Lobster Industry Association[SETFIA]	Activity is within the eastern zone of the Rock Lobster Fishery. The CEO of SETFIA is also the Executive Officer for the Eastern Victorian Rock Lobster Industry Association so engagement via SETFIA covers both organisations.	1
Lakes Entrance Fishermen's Society Co-operative Limited (LEFCOL)[SETFIA]	Activity overlaps with State fisheries who maybe members of the co-operative. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018 with no response. Have responded to previous information provided and Cooper Energy has previously meet with. Area of concern is restricting access to fishing areas.	1
Port Franklin Fishermen's Association[SIV]	Activity overlaps with State fisheries who maybe members of the association. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018 with no response.	1
Seafood Industry Victoria (SIV)	Activity overlaps with a number of State fisheries. SIV primary contact for State fishers. Cooper Energy has previously meet with SIV to discuss Cooper Energy's activities and ongoing engagement.	1
South-east Fishing Trawl Industry Association (SETFIA)	Activity overlaps with State fisheries which SETFIA represent (Southern Shark Industry Alliance, Eastern Rock Lobster and Small Pelagic Fishery Industry Association). Coper Energy has ongoing engagement with SETFIA and SETFIA provide a notification to fishers when activities being undertaken.	1
Southern Rock Lobster Ltd	Responsible for the management and co-ordination of research, development and extension in the Southern Rock Lobster Fishery which overlies the activity. Based on habitat it is unlikely that rock lobster fishing occurs in the Operational Area. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018 with no response.	1
Southern Shark Industry Alliance (SSIA)[SETFIA]	Activity is within the Southern and Eastern Scalefish and Shark Fishery management area where there is no fishing effort. Engagement is via SETFIA.	NA
Sustainable Shark Fishing Inc. (SSF)	Activity is within the Southern and Eastern Scalefish and Shark Fishery management area where there is no fishing effort. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018 with no response.	3
Victorian Recreational Fishers Association (VRFish)	Activity is within an area where they maybe low levels of recreational fishing as not features other than pipeline. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018 with no response.	1
Victorian Rock Lobster Association (VRLA)[SIV]	Activity is within the eastern zone of the Rock Lobster Fishery. Based on habitat it is unlikely that rock lobster fishing occurs in the Operational Area. Requested that consultation be undertaken via SIV.	NA
Victorian Scallop Fisherman's Association	Activity is within the Bass Strait Scallop Fishery. Via previous consultation are mainly concerned regarding seismic surveys. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018 with no response.	1

Stakeholder	Reasoning	Stakeholder Category*
Any other person or organisation that the Titleholder considers relevant		
Abalone Council Australia	Activity is within the Victorian Eastern Abalone Zone. Based on water depths and habitat it is unlikely that abalone fishing occurs in the Operational Area. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018 with no response.	3
Australian Oceanographic Services Pty Ltd	Interested in work being undertaken in the area. Stakeholder has requested information on Cooper Energy's activities. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018 and had some queries but no objections or claims raised.	3
San Remo Fishing Cooperative[SIV]	Activity does not overlap with area of fishing. Stakeholder has requested information on Cooper Energy's activities. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018 with no response.	3
Scuba Divers Federation of Victoria (SDFV)	Represent diving clubs in Victoria. Though unlikely diving occurs in the area of the activity stakeholder receives updates on Cooper Energy's activities. Stakeholder has been sent information regarding Sole and BMG activities during 2017 and 2018 with no response.	3

7.1 Provision of Information

7.1.1 Initial Consultation

An extensive program of stakeholder engagement commenced in August 2015 (as Santos) to support the Sole Development Project, covering onshore, State and Commonwealth waters. Engagement included public open forums and information sessions in Orbost and Marlo.

Commencing in 2017, Cooper Energy has provided regular campaign brochures to relevant stakeholders outlining upcoming activities in the Otway and Gippsland Basins.

Recently (November 2018) a brochure was provided to relevant stakeholders describing Cooper Energy's plans in the Otway and Gippsland Basins for 2019, including information on the Sole, PB and BMG operations.

Information relevant to stakeholders including brochures are available on the Cooper Energy website (http://www.cooperenergy.com.au/) for interested members of the public to access.

7.1.2 Ongoing Consultation

From the stakeholder consultation undertaken and documented in Table 7-1 and Table 7-3, the notifications and ongoing consultation required is detailed in Table 7-2.

Cooper Energy updates local fishers' plotters or initiates other 'awareness' activities based upon the results of a regular SETFIA Fisheries ALARP Assessment, a methodology developed in conjunction with SETFIA, which establishes through an assessment of risk factors, any increases in commercial fishing risk. Mitigation strategies are developed in conjunction with SETFIA which includes the identifying new vessel masters, new fishing vessels, increases in fishing activities or fishery closures. Cooper Energy maintains a register of fishing vessel and the currency of vessel ‘plotter information’ which is regularly maintained.

Approximately four (4) weeks prior to offshore activity commencing, Cooper Energy will provide relevant stakeholders further information including:

- Type of activity;
- Location of activity: coordinates and/or map;
- Timing of activity: start and finish date and duration;
- Vessel(s), vessels details including call sign and contact;
- Cooper Energy contact person.

Cooper Energy will continue to identify new or changes to relevant persons through ongoing consultation with established stakeholders including peak industry bodies.

Table 7-2: Ongoing Stakeholder Requirements

Ongoing Stakeholder Requirement	Timing	Stakeholder
Regulatory notification of start of an activity.	10 days prior to activity commencing.	DJPR – Earth Resources Regulation (ERR) NOPSEMA
Notification of start of activity for publication of AUSCOAST warning and notice to mariners.	3 weeks prior to activity commencing.	AHS Transport Safety Victoria (Maritime Safety)
	24-48 hours prior to activity commencing.	AMSA-JRCC
Provision of operational activity plans and Cooper Energy contact person flyer.	Annually	SIV to include in their magazine. SETFIA to send to members.
Notification to stakeholders of on-water activity. Notification to include: • Type of activity; • Location of activity: coordinates and/or map; • Timing of activity: start and finish date and duration; • Vessel(s), vessels details including call sign and contact; • Cooper Energy contact person.	4 weeks prior to activity commencing.	SETFIA, who will provide SMS to vessels fishing in the area.

Ongoing Stakeholder Requirement	Timing	Stakeholder
Notification to stakeholders of cessation of on-water activity.	Within 10 days of activity cessation.	
Regulatory notification of cessation of an activity.	Within 10 days of activity completion.	NOPSEMA DJPR – Earth Resources Regulation (ERR)
Notification of cessation of activity to cease warnings for an activity.	On vessel demobilisation from field.	AHS AMSA-JRCC Transport Safety Victoria (Maritime Safety)

7.2 Assessment of Claims and Feedback

Cooper Energy shall assess the merits of any new claims or objections made by a relevant stakeholder whereby they believe the activity may have adverse impacts upon their interest or activities. Cooper Energy shall finalise the assessment of merit of any claim or objection within 2 weeks of receipt of all pertinent information and undertake any resulting actions as soon as practicable.

In determining if a claim or objection has merit, evidence must be presented such as literature, scientific data, historical fishing data etc. In relation to objections or claims from commercial fishers, Cooper Energy will assess the possibility of placing temporal or physical exclusions, or other control measures if evidence can be supplied that by not implementing exclusions or other control measures, there will be a significant detrimental impact to fish populations or catch rates.

If the claim has merit, where appropriate, Cooper Energy shall modify management of the activity. The assessment of merit and any resulting actions shall be shared with the stakeholder.

7.3 Summary of Stakeholder Consultation

Stakeholder engagement has involved a combination of meetings, email exchanges and phone conversations.

A summary of stakeholder responses as they relate to Sole, Cooper Energy's assessment of any objections or claims and response or proposed response, are provided in Table 7-3.

Table 7-3: Stakeholder Feedback and Cooper Energy Assessment of Objections and Claims

Stakeholder	Summary of Historical Consultation	Information Provided for Gippsland Operations	Summary of Stakeholder Response	Cooper Energy Assessment of Objection or Claim	Cooper Energy Response
Abalone Council Australia	General activity updates provided in 2017 and 2018. Confirmed email to send correspondence.	General Update November 2018 Flyer.	None	NA	NA
Abalone Victoria (Central Zone) [SIV]	General activity updates provided in 2017 and 2018.	General Update November 2018 Flyer.	None	NA	NA
Australian Fisheries Management Authority	General activity updates provided in 2017 and 2018. Confirmed consultation steps and email for correspondence.	General Update November 2018 Flyer.	None	NA	NA
Australian Southern Bluefin Tuna Industry Association (Port Lincoln)	General activity updates provided in 2017 and 2018. Confirmed would like to receive general updates.	General Update November 2018 Flyer.	None	NA	NA
Australian Oceanographic Services Pty Ltd	General activity updates provided in 2017 and 2018. AOS have expressed general interest in COE offshore activities and have offered services of fishing vessels for offshore surveys.	General Update November 2018 Flyer.	None	NA	NA
Commonwealth Fisheries Association	General activity updates and notices provided in 2017 and 2018. No responses received.	General Update November 2018 Flyer.	None	NA	NA
Department of Economic Development, Jobs, Transport and Resources (Victorian Fishery Authority)	General activity updates and notices provided in 2017 and 2018. Contacts confirmed.	General Update November 2018 Flyer and email noting upcoming meetings and ongoing consultation and texts with SETFIA. Ongoing engagement on broader activities via Cooper attendance at Seafood and Petroleum Industry Consultation Workshop in Melbourne on 16 Nov 2018.	None	NA	NA
Department of Economic Development, Jobs, Transport and Resources (Marine Pollution Team)	Consulted in regard to reviewing OPEPs in 2017 and 2018. Provided review of VIC OPEP in 2017, and of BMG Well Abandonment OPEP in 2018. General activity updates and notices provided in 2017 and 2018. Emailed COE OPEP in Q1 2018.	General Update November 2018 Flyer. Provided a summary activities and status of the Vic OPEP. Provided opportunities to meet and discuss activities and response including at AMOSC Members forum 10/12/2018.	DEDJTR emailed to introduce new point of contact and set up meeting to make introductions and confirm arrangements with the State.	No objection or claim	COE responded to set up meeting in Melbourne early December 2018
		Meeting 06/12/2018: DEDJTR and COE discussed and confirmed arrangements and contact details for State agencies and Ports in the event of a spill. Confirmed process and triggers for Victorian Government reviews of OPEPs, in summary: • New OPEPs or significant modifications that require re-submission to NOPSEMA or DEDJTR ERR for approval: Cooper provide draft to EMD who will coordinate a State review and consolidate comments. Potential presentation of scenarios and Q&A with relevant people beforehand. • Vic OPEP updates where new assets are introduced (no significant changes to risk profile and not being resubmitted to NOPSEMA / ERR for approval): Cooper to provide updated OPEP for EMD review. EMD will involve Vic OPEP administrative / minor updates: Not needed to go to EMD. • First Strike & Tactical Response Plans: Cooper to provide to EMD for awareness once completed. DEDJTR also noted that the Marine Pollution Team would be moving to a new Department in January 2019, and that contact details would need to be updated in 2019. other State departments as relevant to the scenario.		No objections or claims	
		Cooper Energy responded to thank DEDJTR for their time and input, and to summarise the key points from the meeting.	DEDJTR responded to confirm key points and to note it was discussed it would be possible to collaborate on drills, and an additional point to suggest sharing information regarding personnel fulfilling particular roles	No objections and claims	Dialogue ongoing

Stakeholder	Summary of Historical Consultation	Information Provided for Gippsland Operations	Summary of Stakeholder Response	Cooper Energy Assessment of Objection or Claim	Cooper Energy Response
Department of Environment, Land, Water and Planning (Marine National Parks and Marine Parks)	General activity updates and notices provided in 2017 and 2018. Only received notification of thanks.	General Update November 2018 Flyer.	None	NA	NA
Eastern Victorian Rock Lobster Industry Association [SETFIA]	General activity updates and notices provided in 2017 and 2018.	General Update November 2018 Flyer.	EVRLIA/SETFIA confirmed contact for EVRLIA	No objection or claim.	COE confirmed they would use agreed contact going forward.
Eastern Zone Abalone Industry Association and Eastern Victoria Sea Urchin Divers Association [SIV]	General activity updates and notices provided in 2017 and 2018.	General Update November 2018 Flyer.	None	NA	NA
Lakes Entrance Fishermen's Society Cooperative Limited (LEFCOL) [SIV]	General activity updates and notices provided in 2017 and 2018. Previous concerns raised in relation to oil and gas activities including impacts from cumulative effect of oil and gas exclusion zones / infrastructure presence. Refer to SOL-EN-EMP-0007. Consultation has continued through 2018. Consultation includes periodic meetings and communications.	General Update November 2018 Flyer. Meeting planned in December 2018 with LEFCOL and SETFIA for general discussion regarding COE 2019 activities and consultation approach. Future fisheries tribunal meetings.	LEFCOL happy to meet with SETFIA and COE to discuss COE activities in December.	No objection or claim.	COE confirmed meeting location and timing.
Port Franklin Fishermen's Association [SIV]	Engaged / general activity updates provided in 2017 and 2018. No response received.	General Update November 2018 Flyer.	None	NA	NA
San Remo Fishing Cooperative [SIV]	Engaged / general activity updates provided in 2017 and 2018. No response received.	General Update November 2018 Flyer.	None	NA	NA
Scuba Divers Federation of Victoria	Engaged / general activity updates provided in 2017 and 2018. No response received.	General Update November 2018 Flyer.	None	NA	NA
Seafood Industry Victoria	General activity updates and notices provided in 2017 and 2018. Periodic Meetings on COE activities.	General Update November 2018 Flyer. Emails and calls in relation to COE 2019 activities and consultation approach.	SIV confirmed keen to meet with COE. No indication that COE activities were a cause for any concern. SIV provided v1 of their consultation policy. SIV are working to reduce consultation burden on fisheries from oil and gas activities generally.	No objection or claim.	COE and SIV discussed general consultation approach over phone on 14 November 2018 COE set up face to face meeting with SIV 26 November 2018 at SIV office.
		26/11/2018 - Meeting with SIV at SIV HQ in Melbourne. SIV and Cooper discussed each other's activities and approaches to consultation. SIV and COE agreed notification is appropriate for operational activities and could be communicated by an update in the SIV Profish magazine, nominally in December 2018 issue. COE 2019 drilling plans were discussed including potential impacts and controls. Agreed the main impact (albeit minor) was the potential for (temporary) displacement due to Rig presence. SIV and COE agreed to collaborate on a joint letter to licence holders who may be in the area - notably the Western Rock Lobster fishers and wrasse which are 'site-attached' to reef and therefore fished at specific locations. This would be mailed out by SIV as holder of the fishery licences. SIV suggested high level letter showing location and timing and offering further information. Recognition during meeting that drilling is unlikely to impact fishers unless they happen to fish at that specific location. SIV also provided some additional information for COE existing environment.		No objection or claim.	28/11/2018 - COE Emailed SIV with a summary of key points for meeting on 2611/2018. COE also provided the letter for mail-out by SIV regarding drilling activities.
		COE emailed Fisheries letter mailout to SIV for review / sending. COE emailed draft flyer for inclusion into PROFISH.	SIV emailed to say letter and flyer for PROFISH magazine were perfect, and to provide Cooper with process and expenses for how they would mail out to fishers, and also for flyer/magazine production	No objections or claims	Cooper agreed on process and to meet expenses in relation to magazine production and letter mailout.
South-East Trawl Fishing Industry Association	General activity updates and notices provided in 2017 and 2018. Previous objections made in relation to oil and gas activities including impacts from noise (particularly from seismic) and cumulative effect of oil and gas exclusion zones. Refer to SOL-EN-EMP-0007. Consultation has continued through 2018; this has included periodic meetings/communications, agreement and	Consultation on draft fisheries damages protocol October 2018. Discussed approach for regular text updates in October 2018. General Update November 2018 Flyer.	SETFIA requested fisheries damages protocol be extended to another fishery. SETFIA requested advice on timing of activity update TEXTS.	No objection or claim.	COE confirmed compensation protocol could be extended to cover other fisheries noted in correspondence. COE confirmed timing of regular TEXTs in the run-up to COE activities. COE confirmed meeting location and timing.

Stakeholder	Summary of Historical Consultation	Information Provided for Gippsland Operations	Summary of Stakeholder Response	Cooper Energy Assessment of Objection or Claim	Cooper Energy Response
	implementation of regular TEXT updates for COE activities, and provision of quarterly advice from SETFIA on fisheries activity in the region.	Meeting planned in December 2018 with LEFCOL and SETFIA for general discussion regarding COE 2019 activities and consultation approach. Future fisheries tribunal meetings.	COE to meet with SETFIA and LEFCOL to discuss COE activities in December.		
Southern Rock Lobster Ltd	Engaged / general activity updates provided in 2017 and 2018. No response received.	General Update November 2018 Flyer.	None	NA	NA
Southern Shark Industry Alliance [SETFIA]	General activity updates and notices provided in 2017 and 2018.	General Update November 2018 Flyer.	SSIA/SETFIA confirmed contact for EVRLIA	No objection or claim.	COE confirmed they would use agreed contact going forward.
Sustainable Shark Fishing Inc	Engaged / general activity updates provided in 2017 and 2018. No response received.	General Update November 2018 Flyer.	None	NA	NA
Transport Safety Victoria (Maritime Safety)	Engaged / general activity updates and notifications provided in 2017 and 2018. Provided notice to mariners for activities undertaken in Victorian Waters.	General Update November 2018 Flyer. Also noted notification requirements for TSV which COE had been following for their marine activities.	None	NA	NA
Victorian Recreational Fishers Association	Engaged / general activity updates provided in 2017 and 2018. No response received.	General Update November 2018 Flyer.	None	NA	NA
Victorian Rock Lobster Association [SIV]	Engaged / general activity updates provided in 2017 and 2018. No response received.	General Update November 2018 Flyer.	VRLA responded confirmed receipt of update flyer and noted that they did not consider this general update to be consultation. Noted that consultation should be conducted via their peak body SIV. Asked if Cooper Energy would be attending the Seafood and Petroleum Industry Regional Workshop in November 2018.	Objection to being emailed relates to broader frustration with the large amount of information from the oil and gas industry and associated burden. COE to engage further via peak bodies and industry forums to help resolve the over-burden.	COE responded to confirm they were consulting with SIV in relation to COE activities and oil and gas consultation. COE provided the VRLA the option of being removed from COE General Update mailing list. COE also confirmed they would attend the Seafood and Petroleum Industry Regional Workshop in November 2018.
Victorian Scallop Fisherman's Association	Engaged / general activity updates provided in 2017 and 2018. No response received.	General Update November 2018 Flyer.	None	NA	NA

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Appendix A: Environmental Impact and Risk Evaluation Methodology

For Cooper Energy activities, environmental aspects, impacts and risks are identified and assessed through the following steps:

- Establish the context for the assessment by defining the activity and associated environmental aspects;
- Identifying the impact or risk associated with the environmental aspects;
- Identifying the ecological and social receptors with the potential to be exposed to the hazard;
- Evaluate the potential impact or risk (consequence);
- Determine the ALARP decision context and identify control measures;
- Evaluate the likelihood of the impact or risk (consequence) occurring;
- Assigning residual risk rating (after control measures are implemented) utilizing the Cooper Energy qualitative risk matrix. In accordance with the Cooper Energy acceptance criteria, the impacts and risks continue to be reassessed until it is demonstrated the impact or risk is reduced to a level which is as low as reasonably practicable (ALARP) and is acceptable according to the Cooper Energy acceptance criteria; and
- Evaluate the acceptability of the potential impact or risk.

A.1 Monitor and Review

Monitoring and review activities are incorporated into the impact and risk management process to ensure that controls are effective and efficient in both design and operation. This is achieved through the environmental performance outcomes, standards and measurement criteria that are described for each environmental hazard. Additional aspects of monitoring and review are described in the Implementation Strategy include:

- Analysing and lessons learnt from events (including near-misses), changes, trends, successes and failures;
- Detecting changes in the external and internal context (e.g. new conservation plans issued); and
- Identifying emerging risks.

A.2 Definitions

The Regulations require the environment plan to detail the environmental impacts and risks for the activity; and that it comprises an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk.

In this section, Cooper Energy has provided a list of terminology and definitions that will be meet the requirements of Regulations:

- **Activity** - An activity refers to a component or task within a project which results in one or more environmental aspects.
- **Aspect** - An environmental aspect is an element or characteristic of an activity, product, or service that interacts or can interact with the environment. Environmental aspects can cause environmental impacts.

- **Impact or Risk** - An environmental impact (or risk) is a change to the environment that is caused either partly or entirely by one or more environmental aspects. An environmental aspect can have either a direct impact on the environment or contribute only partially or indirectly to a larger environmental change. The relationship between environmental aspects and environmental impacts is one of cause and effect.
- **Likelihood** – The likelihood of an impact is the change of the impact occurring.
- **Consequence** – The consequence of an impact is the outcome of the event on affected receptors. Consequence can be positive or negative.
- **Residual Risk** – Residual risk is the risk remaining after control measures have been applied (i.e. after risk treatment).

A.3 Evaluate the potential impact (consequence)

After identifying the potential impacts or risks; consequences were determined based on:

- The spatial scale or extent of potential impact or risk of the environmental aspect within the receiving environment;
- The nature of the receiving environment (from Section 3) (within the spatial extent), including proximity to sensitive receptors, relative importance, and sensitivity or resilience to change;
- The impact mechanisms (cause and effect) of the environmental aspect within the receiving environment (e.g. persistence, toxicity, mobility, bioaccumulation potential);
- The duration and frequency of potential effects and time for recovery; and
- The potential degree of change relative to the existing environment or to criteria of acceptability.

Consequence definitions are provided in Table A-1.

Table A-1: Definition of Consequence

Descriptor	Environment	Regulatory, reputation, community and media
5. Critical	Severe long-term impact on highly-valued ecosystems, species populations or habitats. Significant remedial/recovery work to land/water systems over decades (if possible at all).	Critical impact on business reputation &/or international media exposure. High-level regulatory intervention. Potential revocation of Licence/Permit. Operations ceased.
4. Major	Extensive medium to long-term impact on highly-valued ecosystems, species populations or habitats. Remedial, recovery work to land or water systems over years (~5-10 years).	Significant impact on business reputation and/or national media exposure. Significant regulatory intervention. Operations ceased.
3. Moderate	Localised medium-term impacts to species or habitats of recognized conservation value or to local ecosystem function. Remedial, recovery work to land/water systems over months/year.	Moderate to small impact on business reputation. Potential for state media exposure. Significant breach of regulations, attracting regulatory intervention.

Descriptor	Environment	Regulatory, reputation, community and media
2. Minor	Localised short-term impacts to species/habitats of recognised conservation value but not affecting local ecosystem functioning. Remedial, recovery work to land, or water systems over days/weeks. No significant impacts to third parties.	Some impact on business reputation and/or industry media exposure. Breach of regulations - event reportable to authorities.
1. Negligible	Temporary localised impacts or disturbance to plants/animals. Nil to negligible remedial/recovery works on land/water systems.	Minimal impact on business reputation. Negligible media involvement. No regulatory breaches or reporting.

A.4 Determine the ALARP decision context and identify control measures

In alignment with NOPSEMA's ALARP Guidance Note (N-04300-GN0166, Rev 6, June 2015), Cooper Energy have adapted the approach developed by Oil and Gas UK (OGUK) (formerly UKOOA; OGUK, 2014) for use in an environmental context to determine the assessment technique required to demonstrate that potential impacts and risks are ALARP (Figure A-1). Specifically, the framework considers impact severity and several guiding factors:

- Activity type;
- Risk and uncertainty; and
- Stakeholder influence.

A Type A decision is made if the risk is relatively well understood, the potential impacts are low, activities are well practised, and there are no conflicts with company values, no partner interests and no significant media interests. However, if good practice is not sufficiently well-defined, additional assessment may be required.

A Type B decision is made if there is greater uncertainty or complexity around the activity and/or risk, the potential impact is moderate, and there are no conflict with company values, although there may be some partner interest, some persons may object, and it may attract local media attention. In this instance, established good practice is not considered sufficient and further assessment is required to support the decision and ensure the risk is ALARP.

A Type C decision typically involves sufficient complexity, high potential impact, uncertainty, or stakeholder influence to require a precautionary approach. In this case, relevant good practice still must be met, additional assessment is required, and the precautionary approach applied for those controls that only have a marginal cost benefit.

In accordance with the regulatory requirement to demonstrate that environmental impacts and risks are ALARP, Cooper Energy has considered the above decision context in determining the level of assessment required. This is applied to each aspect described in Section 4.

The assessment techniques considered include:

- Good practice;
- Engineering risk assessment; and

- Precautionary approach.

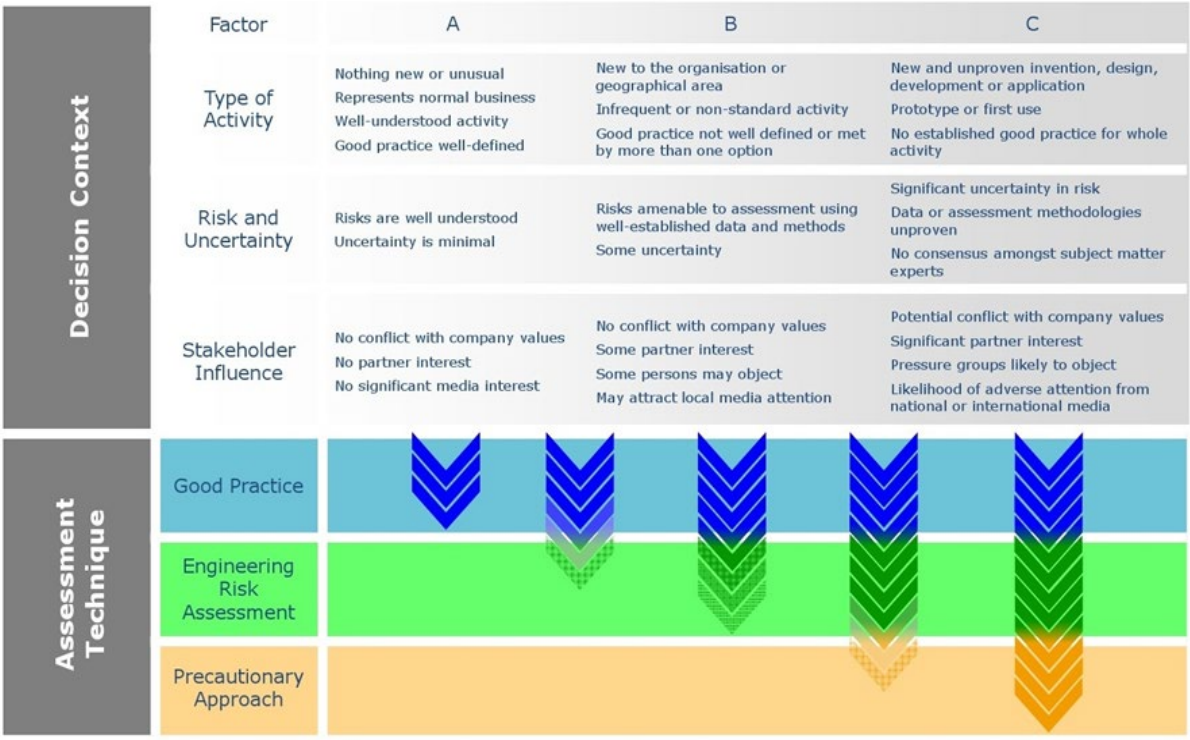

Figure A-1: ALARP Decision Support Framework (Oil & Gas UK 2014)

A.4.1 Good Practice

OGUK (2014) defines 'Good Practice' as:

The recognised risk management practices and measures that are used by competent organisations to manage well-understood hazards arising from their activities.

'Good Practice' can also be used as the generic term for those measures that are recognised as satisfying the law. For this Plan, sources of good practice include:

- Requirements from Australian legislation and regulations;
- Relevant Australian policies;
- Relevant Australian Government guidance;
- Relevant industry standards; and
- Relevant international conventions.

If the ALARP technique is determined to be 'Good Practice', further assessment ('Engineering Risk Assessment') is not required to identify additional controls. However, additional controls that provide a suitable environmental benefit for an insignificant cost are also identified at this point.

A.4.2 Engineering Risk Assessment

All potential impacts and risks that require further assessment are subject to an 'Engineering Risk Assessment'. Based on the various approaches recommended in OGUK (2014), Cooper Energy believes the methodology most suited to this activity is a comparative assessment of risks, costs, and environmental benefit. A cost–benefit analysis should show the balance between the risk benefit (or environmental benefit) and the cost of implementing the identified measure, with differentiation required such that the benefit of the risk reduction measure can be seen and the reason for the benefit understood.

A.4.3 Precautionary Approach

OGUK (2014) state that if the assessment, considering all available engineering and scientific evidence, is insufficient, inconclusive, or uncertain, then a precautionary approach to impact and risk management is needed. A precautionary approach will mean that uncertain analysis is replaced by conservative assumptions that will result in control measures being more likely to be implemented.

That is, environmental considerations are expected to take precedence over economic considerations, meaning that a control measure that may reduce environmental impact is more likely to be implemented. In this decision context, the decision could have significant economic consequences to an organisation.

A.5 Evaluating the likelihood of the impact (consequence) occurring

The likelihood of a defined consequence occurring was determined, considering the control measures that have been previously identified. Likelihood definitions are provided in Table A-2. Likelihood levels are determined according to the Cooper Energy qualitative risk matrix (Table A-3).

Table A-2: Definition of Likelihood

Descriptor	Description
A. Almost certain	Common event, expected to occur in most circumstances within Cooper Energy operations (i.e. several times a year).
B. Likely	Event likely to occur once or more during a campaign, ongoing operations or equipment design life.
C. Possible	Infrequent event that may occur during a campaign, ongoing operations or equipment design life.
D. Unlikely	Unlikely event but could occur at sometime within Cooper Energy operations (has occurred previously in similar industry).
E. Remote	Rare event. May occur in exceptional circumstances of Cooper Energy operations (not heard of in recent similar industry history).

A.6 Assigning residual risk rating

Based upon the identified consequence and likelihood levels, Cooper Energy use the qualitative risk matrix (Table A-3) to rate the residual risk level.

Table A-3: Cooper Energy Qualitative Risk Matrix

		CONSEQUENCE				
		1.Negligible	2.Minor	3.Moderate	4.Major	5.Critical
LIKELIHOOD	Almost Certain	M	M	H	H	H
	Likely	M	M	M	H	H
	Possible	L	M	M	H	H
	Unlikely	L	L	M	M	H
	Remote	L	L	L	M	M

A.7 Evaluate the acceptability of the potential impact and risk

Cooper Energy considers a range of factors when evaluating the acceptability of environmental impacts or risks associated with its activities. This evaluation works at several levels, as outlined in Table and is based on NOPSEMA's Guidance Notes for EP Content Requirements (N04750-GN1344, Rev 3, April 2016) and guidance issued in Decision-making – Criterion 10A(c) Acceptable Level (N-04750-GL1637, Rev 0, Nov 2016).

The acceptability evaluation for each aspect associated with this activity is undertaken in accordance with Table A-4.

Table A-4: Cooper Energy Acceptability Evaluation

Factor	Criteria / Test
Cooper Energy Risk Process	Is the level of risk High? (if so, it is considered unacceptable)
Principles of Ecologically Sustainable Development (ESD) [See below]	Is there the potential to affect biological diversity and ecological integrity? (Consequence Level Major [4] and Critical [5]) Do activities have the potential to result in serious or irreversible environmental damage? If yes: Is there significant scientific uncertainty associated with aspect? If yes: Has the precautionary principle been applied to the aspect?
Legislative and Other Requirements	Confirm that all good practice control measures have been identified for the aspect including those identified in relevant EPBC listed species recovery plans or approved conservation advices
Internal Context	Confirm that all Cooper Energy HSEC MS Standards and Risk Control Processes have been identified for this aspect
External Context	What objections and claims regarding this aspect have been made, and how have they been considered / addressed?

ESD Principles are:

A. Decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations

   This principle is inherently met through the EP assessment process. This principal is not considered separately for each acceptability evaluation).

B. If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. If there is, the project shall assess whether there is significant uncertainty in the evaluation, and if so, whether the precautionary approach should be applied

C. The principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

   The EP assessment methodology ensures that potential impacts and risks are ALARP, where the potential impacts and risk are determined to be serious or irreversible the precautionary principle is implemented to ensure the environment is maintained for the benefit of future generations. Consequently, this principal is not considered separately for each acceptability evaluation)

D. The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making

   Project to consider if there is the potential to affect biological diversity and ecological integrity)

E. Improved valuation, pricing and incentive mechanisms should be promoted (Not relevant to this EP).