Esso Australia Resources Pty Ltd (“Esso”)

BLACKBACK P&A ENVIRONMENT PLAN SUMMARY

REVISION HISTORY

Rev	Revision / Status	Date	Prepared
0	Issued for NOPSEMA review	30 November 2018	JA

Table of Contents

List of Figures

List of Tables

Abbreviations

ABWMIS	Australian Ballast Water Management Information System
AFFF	Aqueous Film-Forming Foam Concentrates
AFMA	Australian Fisheries Management Authority
AHT	Anchor Handling Tug
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre
AMSA	Australian Maritime Safety Authority
ANZECC	Australian and New Zealand Environment and Conservation Council
APASA	RPS Asia Pacific Applied Science Association
APPEA	Australian Petroleum Production and Exploration Association
AQIS	Australian Quarantine Inspection Service (now Department of Agriculture and Water Resources; DAWR)
ATBA	Area To Be Avoided
BBMT	Barry Beach Marine Terminal
BCR	Ballast Control Room
BHPB	BHP Billiton Petroleum (Bass Strait) Pty Ltd
BHKA	Bottom Hole Kickoff Assembly
BIA	Biologically Important Area
BKA	Blackback subsea facility
BOM	Bureau of Meteorology
BOP	Blow Out Preventer
BSCZSF	Bass Strait Central Zone Scallop Fishery
CGB	Completion Guide Base
CHARM	Chemical Hazard and Risk Management Model
CMMS	Computerised Maintenance Management System (Ocean Monarch)
CP	Cement Plug
Csg Hgr	Casing Hanger
CSS	Check-shot Survey
CVIT	Commonwealth Victoria Inshore Trawl
DAWR	Department of Agriculture and Water Resources (previously AQIS; also Ag. Dept.)
DEDJTR	Department of Economic Development, Jobs, Transport and Resources Victoria
DELWP	Department of Environment, Land, Water and Planning Victoria
Dmy Hgr	Dummy Hanger
DO	Diesel Oil
DoEE	Department of the Environment and Energy
DoIIS	Department of Industry, Innovation and Science
DSV	Dive Support Vessel
DWH	Deepwater Horizon
EAC	Element Acceptance Criteria
EAPL	Esso Australia Pty Ltd
EARPL	Esso Australia Resources Pty Ltd
EEZ	Exclusive Economic Zone
EMBA	Environment that May Be Affected (also see Operational ZPI)
ENVID	Environmental Hazard Identification workshops
EP	Environment Plan
EPA	Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation

ERA	Environmental Risk Assessment
ERM	Emergency Response Manual
ESD	Ecologically Sustainable Development
ESG	Emergency Support Group
EWMM	Esso Work Management Manual
EZSV	Easy Drill Subsurface Valve
FIMS	Facility Integrity Management System
FVO	First Valve On
GBJVOA	Gippsland Basin Joint Venture Operational Agreement
GEMS	Diamond Offshore GEMS Procedures (Global Excellence Management System)
GHG	Greenhouse Gases
GLV	Gas Lift Valve
GOR	Gas to Oil Ratio
HAZID	Hazard Identification workshops
HMCS	OSPAR Harmonised Mandatory Control Scheme (HMCS)
HOCNF	OSPAR Harmonised Offshore Chemical Notification Format (OCNS)
HP	High Pressure
ICS	Incident Control System
IMO	International Maritime Organisation
IOPP	International Oil Pollution Prevention certificate
IMT	Incident Management Team
JV	Joint Venture
KEF	Key Ecological Feature
KPI	Key Performance Indicators
LEFCOL	Lakes Entrance Fishing Co-operative Limited
LEL	Lower Exposure Limit
LMRP	Lower Marine Riser Package
LO	Lubricating Oil
LPG	Liquid Petroleum Gas
LMRP	Lower Marine Riser Package
LOWC	Loss of Well Control
LWD	Logging While Drilling
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships
MAOP	Maximum anticipated shut-in surface pressure
MASIP	maximum anticipated surface operating pressure
MDO	Marine Diesel Oil
MDRT	Measured Depth from Rotary Table
MEPC	(IMO) Marine Environment Protection Committee
MES	Monitoring, Evaluation and Surveillance
MLWL	Mean Low Water Level
MODU	Mobile Offshore Drilling Unit (rig)
MOL	Main Oil Line
MMSCFD	Million Standard Cubic Feet per Day
MT	Metric Ton
SDS	Safety Data Sheet (previously Material Safety Data Sheet, MSDS)
MSL	Mean Sea Level
NEBA	Net Environmental Benefit Analysis (see OPEP)
NEPM	National Environment Pollution Measures
NM	Nautical Mile
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NSW	New South Wales
OCNS	Offshore Chemical Notification Scheme (CEFAS 2017)
OI	Operations Integrity
OGUK	Oil and Gas UK (previously UKOOA)

OICSS	Offset Installation Capping Stack System
OIE	Offset Installation Equipment
OIMS	Operations Integrity Management System
OIW	Oil-In-Water
OWS	Oil-water separators
OSMP	Operational and Scientific Monitoring Program
OSPAR	OSPAR Commission - manages Harmonised Mandatory Control Scheme (HMCS)
OSRA	Oil Spill Resource Atlas
OSRL	Oil Spill Response Limited
OSV	Offshore Support Vessel
OPEP	Oil Pollution Emergency Plan
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006
OPGGS(E) Regs	Offshore Petroleum and Greenhouse Gas Storage Environment Regulations 2009
ORCA	Oil spill Resources Company of Australia
OSR	Oil Spill Response
OSTM	Oil Spill Trajectory Modelling
PEC	Predicted Environmental Concentration
PFAS	Per- and poly-Fluoroalkyl Substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanoic sulfonate
PMS	Diamond Planned Maintenance System
PNEC	Predicted No Effect Concentrations
PIC	Person In Charge
PSZ	Petroleum Safety Zone
RA	Risk Assessment
RAMSAR	Convention on Wetlands of International Importance
RC	Required Competencies
RO	Reverse Osmosis
ROV	Remotely Operated Vehicle
RRT	Regional Response Team
SBF	Synthetic Based Fluid
SCB	Source Control Branch
SEMS	Safety and Environmental Management System (Ocean Monarch)
SESSF	Southern and Eastern Scale-fish and Shark Fishery
SETF	South Eastern Trawl Fishery
SFRT	Subsea First Relief Toolkit
SIV	Seafood Industry Victoria
SMART	Special Monitoring of Applied Response Technologies
SMC	Subject Matter Contact
SOOB	Summary of operational boundaries
SSHE	Safety, Security, Health, Environment
SSSV	Sub-Surface Safety Valve
TD	Total Depth
TH	Tubing Hanger
TSS	Traffic Separation Scheme
VICSS	Vertical Installation Capping Stack System
VSP	Vertical Seismic Profiling
WBM	Water Based Mud
WCDS	Worst Credible Discharge Scenario
WMP	Waste Management Plan
WOMP	Well Operations Management Plan
WWC	Wild Well Control
Operational ZPI	Zone of Potential Impact

1 Introduction

1.1 Overview

This Environment Plan (EP) Summary has been prepared in accordance with the requirements of the Commonwealth Offshore Petroleum and Greenhouse Gas Storage Act 2006 and the Offshore Petroleum and Greenhouse Gas Storage (Environment) (OPGGS(E)) Regulations 2009, per the amended Act and Regulations as at 01 January 2015. The EP development was guided by N04750-GN1344 Environment Plan Content Requirements (NOPSEMA 2016).

The scope of the EP is to manage the environmental impacts and risks associated with all activities relating to the permanent plugging and abandonment (P&A) of the Blackback A-1A, Blackback A-2 and Blackback A-3 subsea wells to be completed by a Mobile Offshore Drilling Unit (MODU). Activities included in the scope of this EP include mooring activities, well abandonment, well suspension, anchor handling, guard and support vessels, ROV activities and use of helicopters.

The Blackback subsea facility is located approximately 90 km off the Victorian coastline in Permit Area VIC/L20 and the P&A activities are scheduled to commence in the first half of 2019 and take around 70 days. The Blackback operational area within Block VIC/L20 consists of the 2 NM buffer zone around the wells, and the AHTs and guard vessel when supporting the MODU.

The EP was accepted by NOPSEMA on the 20th November 2018.

1.2 Titleholder

VIC/L20 is operated by Esso Australia Resources Pty Ltd (EARPL) for and on behalf of the Gippsland Basin Joint Venture (GBJV) between EARPL and BHPB.

For the administration of Part 4 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006, EARPL is the Licence Operator as defined therein, details as below:

Esso Australia Resources Pty Ltd (ACN 091 829 819)
Level 9, 664 Collins Street
Docklands, 3008
Telephone: +61 3 9261 0000

The environmental contact for this activity is:

Carolyn Thomas
Esso Australia Pty Ltd for and on behalf of Esso Australia Resources Pty Ltd
Risk, Environment and Regulatory Supervisor
Telephone: (03) 9261 0260
Email: carolyn.y.thomas@exxonmobil.com

EARPL receives services, including personnel, from its wholly owned subsidiary, Esso Australia Pty Ltd (EAPL).

2 Description of the Activity

2.1 Location

The Blackback subsea facility is located within Production Area VIC/L20, approximately 90 km off the Gippsland coast in approximately 400 m of water depth (Figure 2-1). The coordinates for the subsea facility are provided in Table 2-1. The Blackback subsea facility consists of three subsea oil wells (A-1A, A-2, A-3), connected to the Mackerel platform (MKA) via the 23.2 km BKA-MKA200 production pipeline and gas lift secondary line (MKA-BKA65) along with an umbilical connection to MKA.

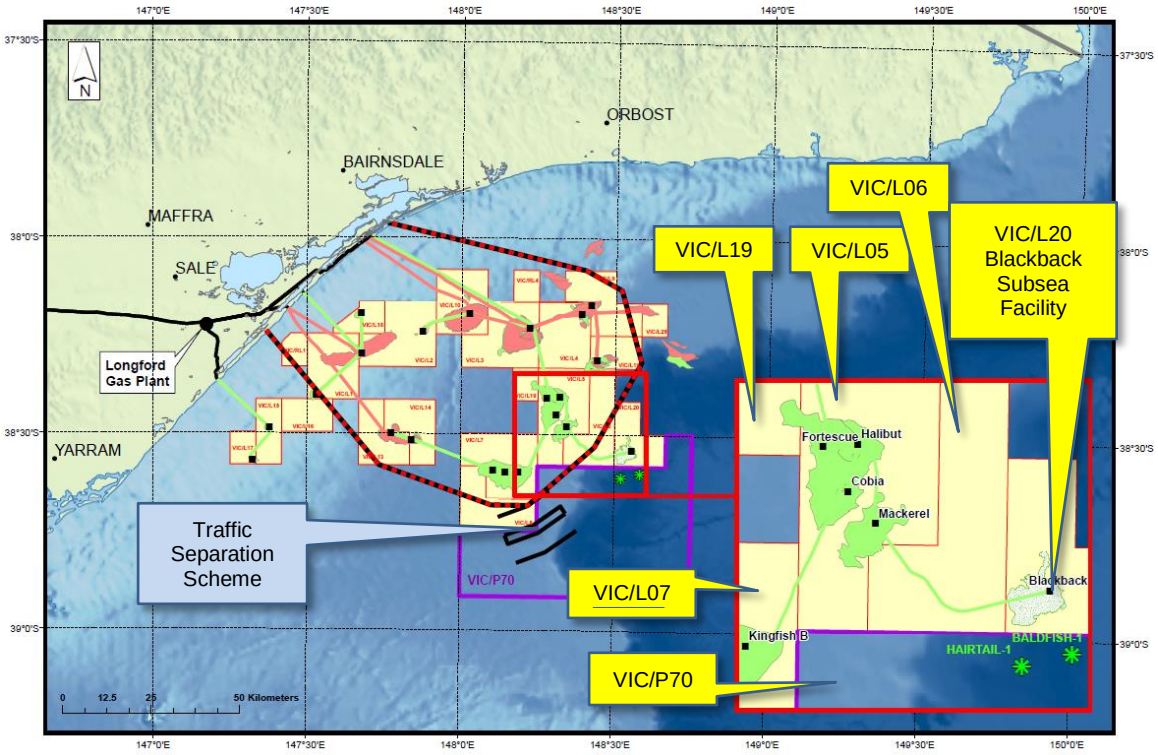


Figure 2-1 The Blackback subsea facility location in VIC/L20, Gippsland Basin

Table 2-1 Location of Blackback subsea facility

Production Licence No.	Facility Name	Latitude	Longitude	Depth (m)
VIC/L20	Blackback subsea facility	38° 32' 26" south	148° 33' 16" east	~400
	BKA A-1A	38° 32' 26.1" south	148° 33' 15.7" east	
	BKA A-2	38° 32' 25.8" south	148° 33' 16.2" east	
	BKA A-3	38° 32' 25.3" south	148° 33' 16.5" east	
	Umbilical Termination Assembly (UTA)	38° 32' 27.1" south	148° 33' 15.5" east	
	Pipeline Termination Assembly (PTA)	38° 32' 26.8" south	148° 33' 15.2" east	

2.2 Blackback Operational Area

A temporary fairway was established in February 2018 (NTM 126(T)/2018 of 9 February 2018) around the Baldfish, Hairtail and Blackback wells allowing for a 2 NM buffer around each of the wells. However, due to the proximity of the Basker-Manta Gummy (BMG) field in VIC/L25, VIC/L26, VIC/L27 to the temporary fairway, a clearance of only 0.6 – 1.25 NM could be provided to the NW of the three Blackback wells, in order to avoid vessel interaction with the BMG field. A temporary 500m petroleum

safety zone (PSZ) around the Blackback subsea facility will also be established for the duration of P&A activities (Figure 2-2).

The Blackback P&A operational area applicable to the scope of this EP consists of the 2 NM radius buffer zone around the Blackback wells in Block VIC/L20, as established by AMSA, and the AHT and guard vessels when supporting the MODU. Note that the buffer zone encompasses the PSZ and the mooring spread of the anchors.

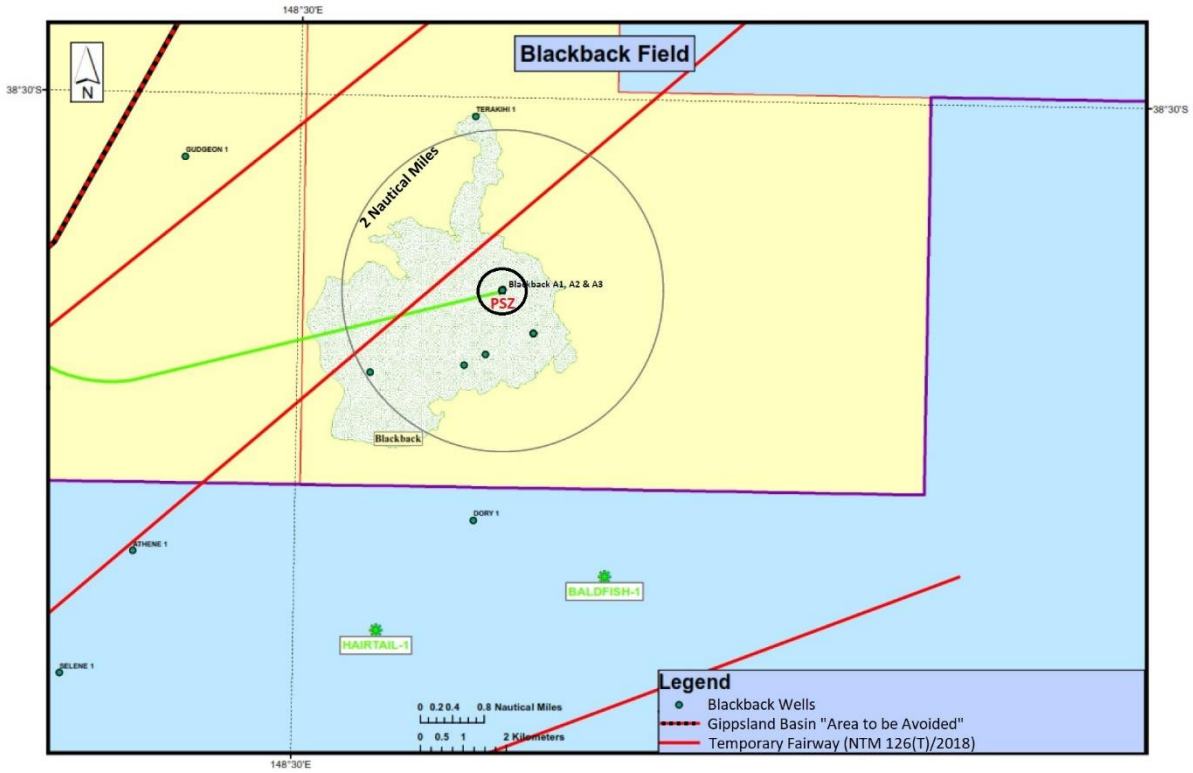


Figure 2-2 The Blackback well locations relative to Temporary Fairway and Area to be Avoided

2.1 Timing

P&A activities in the Blackback operational area are scheduled over an estimated 71 day period, including 15% contingency, commencing in the first half of 2019.

2.2 Blackback Operations history

2.2.1 Blackback Subsea Facility

The three Blackback subsea wells are connected in a daisy-chain with bundled 200 mm / 65 mm flexible jumpers, from the Pipeline Termination Assembly (PTA) to Tree A-1A, A-1A to A-2 and A-2 to A-3 (Figure 2-3). All three subsea wellheads are connected to a mothballed 23.2 km, 200 mm insulated production line (BKA-MKA200) that runs south-east of the MKA platform. On shutdown, the BKA oil export and gaslift pipelines were de-pressured and filled with inhibited seawater.

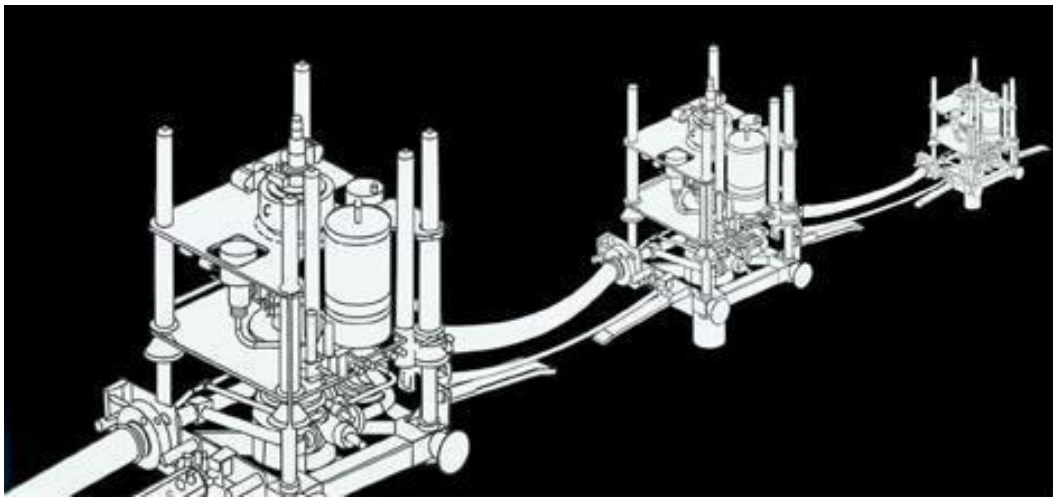


Figure 2-3 Blackback subsea wells - daisy chain configuration.

The three BKA wells have 4 $^{1}/_{2}$" production tubing in the wells (BKA A-1A has a combination $4^{1}/_{2}$" x $2^{7}/_{8}$" tubing string), which is inside $10^{3}/_{4}$" x $9^{5}/_{8}$" production casing. The depth of the production SSSV is between 996 m and 1,015 m measured depth, and an annular SSSV is also fitted to a short section of tubing independent of the production tubing on each well, at 414 m to 415 m measured depth. All wells are classified as oil producers. Well schematics are provided in Figure 2-5, Figure 2-6 and Figure 2-7.

A single umbilical from MKA provided control of the subsea wells along with the capacity for injection of chemicals for hydrate control.

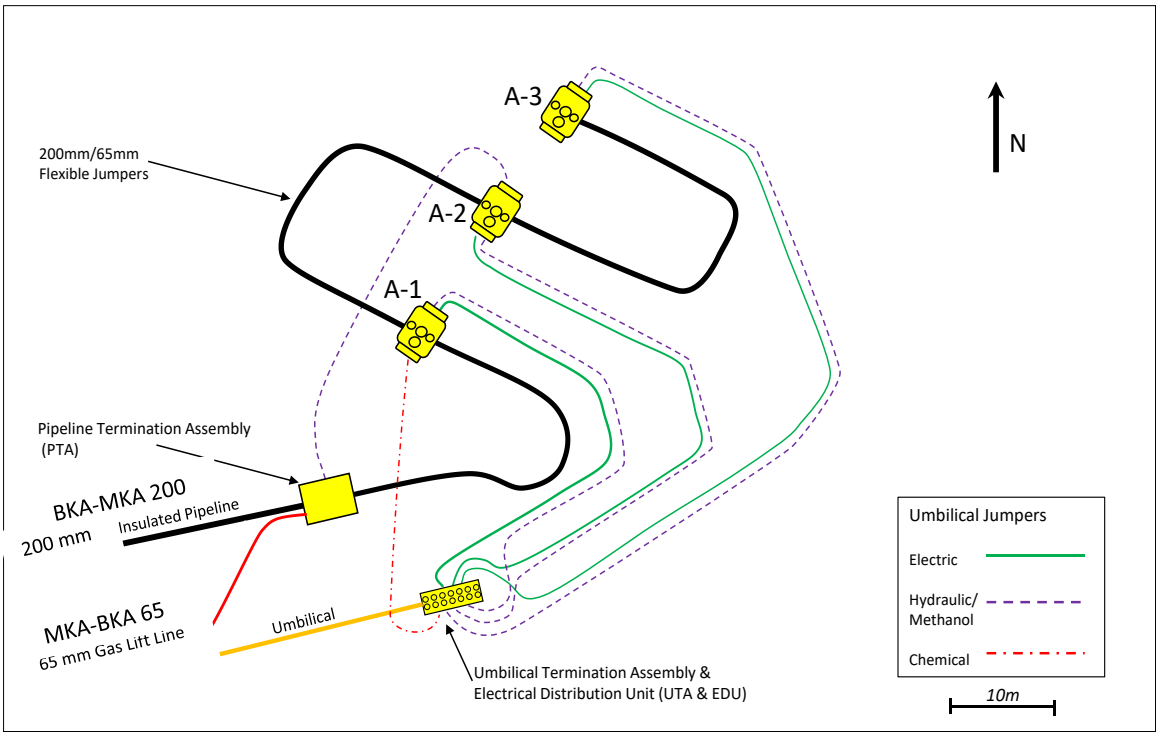


Figure 2-4 Blackback pipeline and wells layout

Table 2-2 Licenced pipelines connected to BKA

Licence No.	Name	Length (km)	DN (mm)	MAOP (kPa)	Approximate Flow Rate	Between	Product
VIC/PL29	BKA-MKA200	23.2	200	24,400	No flow	BKA and MKA	Crude oil
^	MKA-BKA65	23.2	65	24,400	No flow	MKA and BKA	Gas lift

^ Secondary lines are not petroleum pipelines and therefore do not have separate petroleum pipeline licences.

2.2.2 Blackback – Production History

Production from Blackback started up in 1999 and continued until 2010. BKA A-1A produced oil between 1999 and 2004, when the well was shut in due to a leaking production master valve. A well kill was performed on the well in 2005. The BKA A-2 well was shut in in 2005 due to a failure in the tubing retrievable sub-surface safety valve (TRSSV). In 2010, the production master valve on BKA A-3 was found to be leaking and the well was shut in. By that time, the well had been flowing at an oil rate of approximately 600 stb/day for over a year with water cut at approximately 90%.

In 2010, due to pipeline integrity concerns the BKA-MKA200 pipeline was shut in and a well kill was performed on BKA A-2 and BKA A-3 wells from MKA via the gaslift pipeline. This was done by pumping kill-weight calcium carbonate pills through the gas-lift gas pipeline, then separately into and across the perforations in each well. The procedure was successful in A2, however in A3 later diagnostics detected pressure up to ~12 MPa at the wellhead above both the Production and Annulus Master.

In summary, BKA A-1A & A-2 have been killed (i.e. all hydrocarbons in the tubing displaced back into the reservoir and replaced with kill weight fluid which overbalances the reservoir pressure). BKA A-3 remains live (i.e. hydrocarbons in the tubing and reservoir pressure not overbalanced by kill weight fluid).

Communication with the wellheads was lost in 2015 due to umbilical and/or subsea control systems failure/s. A recent ROV survey (April 2018) found no evidence of integrity failure; i.e. there was no evidence of leaks to the environment. There were no well workovers during the life of the field due to the high cost of subsea intervention.

The plug and abandonment of the BKA A-1A, BKA A-2 and BKA A-3 is being pursued to manage well integrity risks however this does not preclude future redevelopment of the Blackback field. It is proposed to use the Ocean Monarch MODU as a “rig of opportunity” to mitigate the known integrity risk in the BKA A-3 well as a matter of priority, and also to plug and abandon the A1-A and A-2 wells while the rig is there. Future plans for further development in the Blackback title area, or decommissioning of other equipment on the title such as the pipeline and flowlines, have not yet been developed.

2.3 Plug and Abandon Activities

2.3.1 Design of existing Blackback wells

A description of the design of the three Blackback wells is provided below.

- A Subsea Tree is attached to the Completion Guide Base, LPWHH (30" Low Pressure Well Head Housing), HPWHH (20" High Pressure Well Head Housing), 4 ½" TH (Tubing Hanger), 10 ¾" Casing Hanger, 13 ⅜" Casing Hanger and Temporary Guide Base.
- 30" Structural Casing is cemented in place to 487 m depth. A 20" Conductor is cemented in place to 682 m depth, with a Surface Casing cemented in place to 1,195 - 1,302 m MD (Measured Depth).
- A 10 ¾ x 9 ⅝" Production Casing is in place to reservoir, with a seal assembly at 2,842 – 3,572 m MD and a production packer at 2,848 - 3,577 m MD, below which casing is slotted or perforated.
- A SSSV (Sub-Surface Safety Valve) and GLV (Gas Lift Valve) are in place within the production tubing, as well as a DHPG (Downhole Pressure Gauge) immediately above the seal assembly and production packer. The casings are filled with Petrofree NADF, $CaCl_2$ and NaCl (see below). Production tubing runs from subsea tree to reservoir, as well as an electrical line to the DHPG

Schematics of the three Blackback wells as they currently exist and as planned following the plug and abandon activities are shown in Figure 2-5, Figure 2-6 and Figure 2-7.

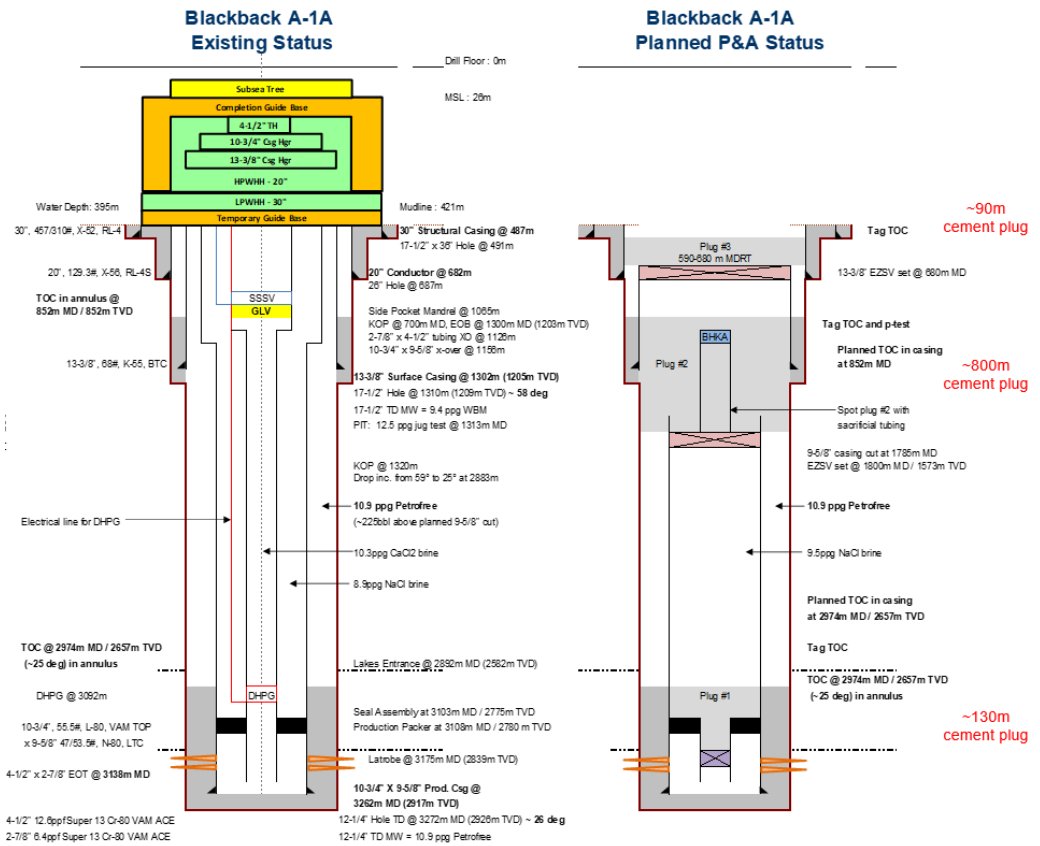


Figure 2-5 **Blackback A-1A: Diagram of existing status and on completion of P&A (Stage 4)**

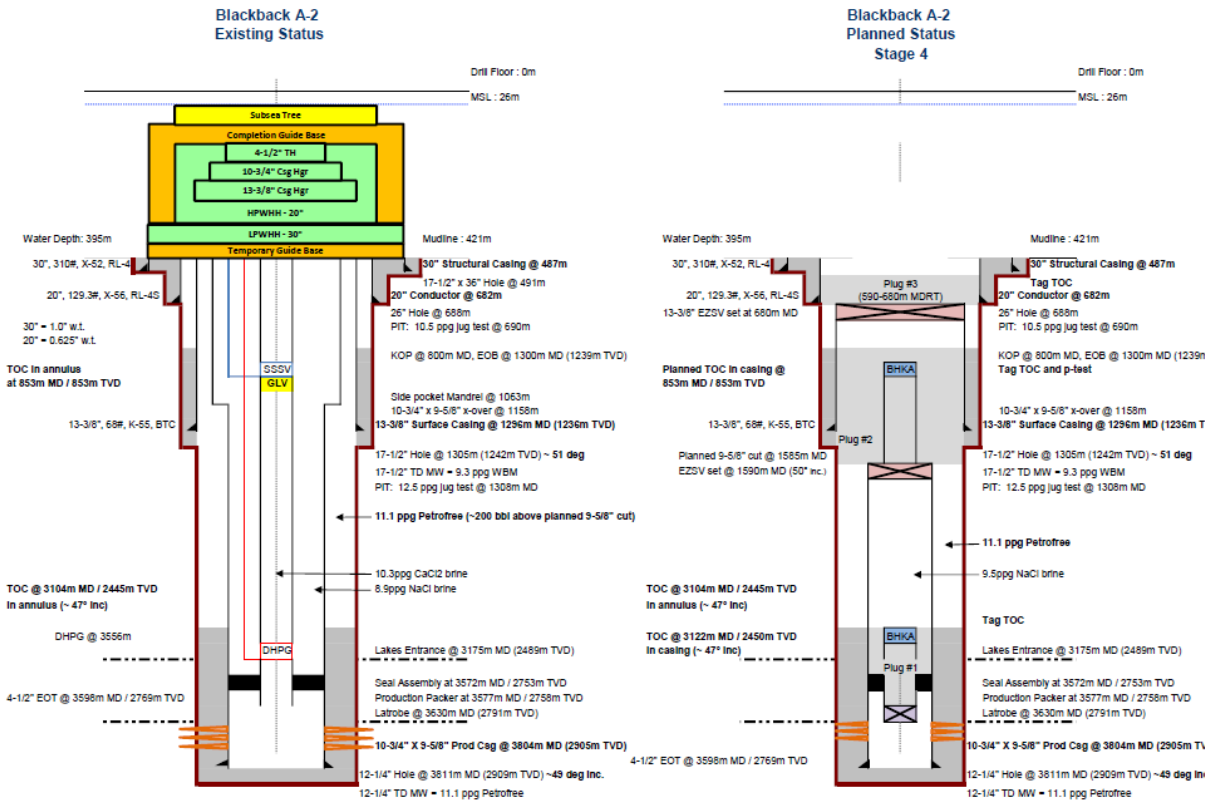


Figure 2-6 **Blackback A-2: Diagram of existing status and on completion of P&A (Stage 4)**

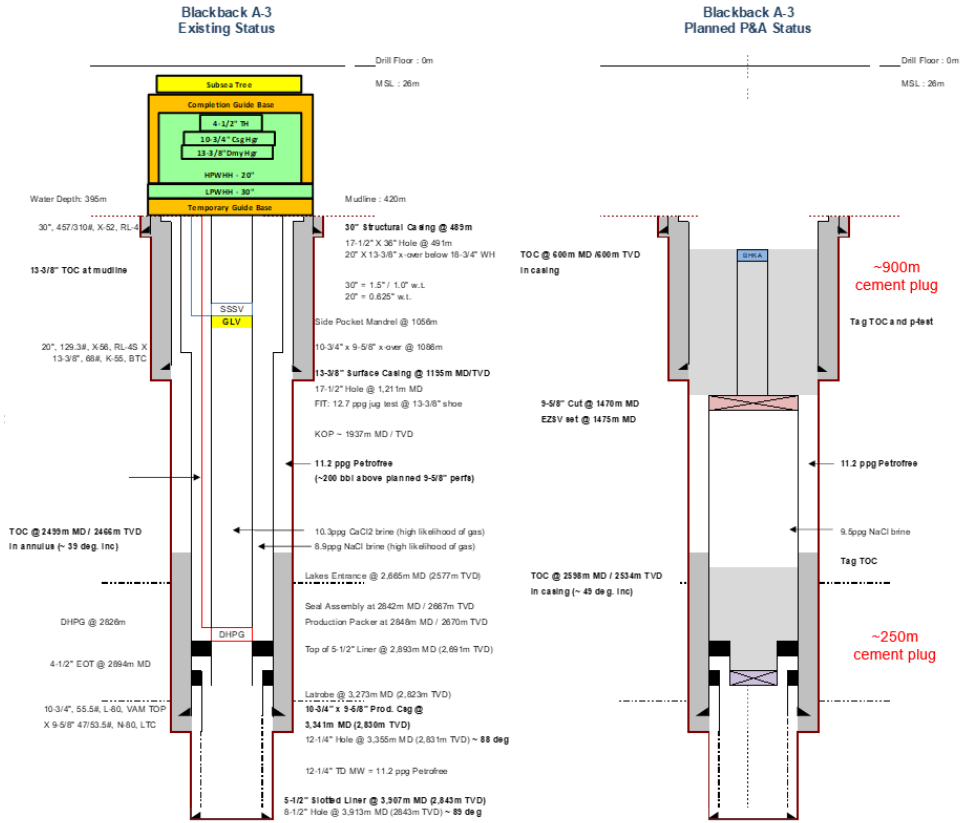


Figure 2-7 **Blackback A-3: Diagram of existing status and on completion of P&A (Stage 4)**

2.3.2 Plug and abandon sequence

Blackback plug and abandon activities are expected to take approximately 20-26 days per well, including 15% NPT, a total of 71 days. Some stages may be completed in batch mode on each well, before moving onto the next stage. Each well operational sequence will be dependent on multiple issues including: completion design, scale levels and production casing cement quality and quantity; however, below is a generic sequence of work that will be followed for the abandonment of each well:

Stage 1:

Position MODU over the BKA wells and set the anchors

1. Remove tree cap with tree cap retrieval tool (TCRT)
2. Run workover riser
3. Bullhead tubing with kill-weight-fluid (KWF) (9.5 ppg NaCl)
4. Set plug in end of tubing (EOT) and pressure test
5. Punch tubing above production packer and circulate production annulus (PA) to fluids handling package
6. Perform tubing cut (A2 and A3 only)
7. Set plug in tubing hanger, set plug in PA stub, rig down wireline

Stage 2:

8. Retrieve subsea tree to surface
9. Retrieve guide posts on the Completion Guide Base (CGB)
10. Disconnect flowlines and retrieve CGB
11. Run the drilling blowout preventer (BOP) and drilling riser
12. Perform connector test and pump open tubing plug,

Stage 3:

13. Run tubing hanger running tool (THERT). Release tubing hanger and pull production tubing - $4^{1}/_{2}$" (x $2\text{-}^{7}/_{8}$")
14. Run in hole with cement stringer
15. Set cement plug (#1) across Lakes Entrance shale. Wait on cement (WOC). Tag top of cement (TOC).
16. Run in hole with bridge plug and set plug in $9^{5}/_{8}$" casing just below planned cut
17. Run in hole with ASRT and pull the $10^{3}/_{4}$" MS-1 seal assembly
18. Run in hole with cutter/spear assembly, cut above the bridge plug, check if free with $9^{5}/_{8}$" spear. Circulate NADF behind casing with NaCl brine
19. Run in hole with $10^{3}/_{4}$" spear, pull $9^{5}/_{8}$" x $10^{3}/_{4}$" casing & $10^{3}/_{4}$" hanger (and $13^{3}/_{8}$" dummy hanger on A-3)
20. Spot cement plug #2 above bridge plug with BHKA (Bottom Hole Kickoff Assembly). WOC. Tag TOC.
21. A1A & A2: run in hole with bridge plug and set in $13^{3}/_{8}$" casing just below planned cut
22. A1A & A2: Pull $13^{3}/_{8}$" MS-1 hanger seal assembly
23. A1A & A2: Cut and pull $13^{3}/_{8}$" casing just above 20" shoe (3m below ML for A3); spot cement plug #3

Stage 4:

24. Displace riser and wellbore to seawater
25. Unlatch riser and BOP stack
26. Cut 20" and 30" casing strings, recover wellhead and Temporary Guide Base (TGB)
27. Pull anchors and move MODU to location of next well / demobilise MODU

2.3.3 Venting Gas

All the Blackback wells have been bullheaded / circulated to kill weight fluid and as a result minimal hydrocarbons should be present. Any gas remaining in the production annulus will be processed through the fluids handling package on the MODU before being cold vented to the atmosphere.

2.3.4 Displacement of Fluid from the Annulus

The annulus between the production tubing and the 9$^{5}/_{8}$" casing contains NaCl brine (8.9 ppg) with minor quantities of corrosion inhibitor. This fluid will be processed through the fluids handling package on the MODU to separate out any residual hydrocarbons before being discharged overboard. An estimated 80,000 L to 112,000 L (400 bbls to 700 bbls) of fluid will be discharged from each well.

2.3.5 Disconnection of Connectors and Flowlines

The electrical, hydraulic and chemical connections from the umbilical termination assembly and electrical distribution unit to the wellheads will be disconnected from the wellheads. The hydraulic and chemical lines have dry-break couplings that will seal the lines and prevent any loss of containment. The hydraulic and chemical lines consist of 3 x 25.4mm ND methanol hoses, 2 x 19mm NB chemical lines (Pour Point Depressant and Corrosion Inhibitor) and 4 x 12.7mm NB hydraulic hoses (Aqualink 325).

The flexible flowlines between the three wells are required to be disconnected to allow the completion guide base to be removed and the BOP and riser to be installed. An ROV will be used to disconnect the connections and the flexible flowlines (or flexible jumpers). Before the flowlines are disconnected the PTA valves for the BKA-MKA 200 and MKA-BKA 65 pipelines (also containing inhibited seawater) will be closed by ROV to prevent further loss of the contents of the pipelines upstream of the PTA. Whilst the valves are expected to be operational, plugs will be installed on the flowlines preventing any potential further loss of contents. Installation of the plugs will occur under the existing Central Fields Environment Plan and within 12 months of the completion of the Blackback P&A activity.

The electrical and hydraulic connections will be recovered by the ROV to the MODU for appropriate onshore disposal and the chemical connections will be secured and left in situ so they can be looped back to the umbilical termination assembly and allow the umbilical to be flushed in the future. This activity will occur under the existing Central Fields Environment Plan. The flowlines will remain in situ.

When disconnection occurs, the contents of the flowlines will be released to sea. Each section of flowline will lead to a discharge of approximately 1700L of inhibited seawater containing corrosion inhibitor and biocide.

2.3.6 Cementing Fluids

Cement plugs are installed at specific depths in the well to act as permanent barriers. Cement is transported as dry bulk to the MODU by the support vessels and is mixed with water and chemicals in the cementing unit onboard the MODU to form concrete slurry immediately prior to use. The concrete slurry is then injected down to the well by high pressure pumps. Excess slurry and cement washings are planned to be discharged overboard.

2.3.7 Displacement of Non Aqueous Drilling Fluids

Non aqueous drilling fluid (NADF) is currently contained between the 9$^{5}/_{8}$" x 10 ¾" outer production casing and annulus in each well. As part of P&A activity the NADF is circulated out from cut depth with NaCl brine through the riser and onboard the MODU. Whole NADF will be collected onboard the MODU tanks before being transported to shore for appropriate disposal. Interface fluid containing brine and NADF will be processed to remove NADF to acceptable levels and the residual brine will be discharged overboard. The NADF is Petrofree ranging from 10.9 ppg (1.31 kg/L) in A1-A, to 11.1 ppg (1.33 kg/L) in A-2 and 11.2 ppg (1.34 kg/L) in A-3.

2.3.8 Removal of Wellheads

The process of physically removing the three Blackback trees and wellheads occurs in stages and requires specialised tools for removal, cutting (where required) and retrieval. These actions are monitored and aided as needed by an ROV deployed from the MODU.

The tree cap retrieval tool is used to remove the tree cap. The tree cap cavity contains seawater. The workover riser will then be installed and the remaining steps in the sequence under Stage 1 (Section 2.4.2) are performed including setting the temporary plugs, the displacement of the fluids from the annulus, internal cut of the 4 $^{1}/_{2}$" production tubing by chemical cutter and installation of tubing head plugs. These steps occur without any planned subsea discharges.

The subsea tree is then disconnected from the wellhead (in Stage 2, Section 2.4.2). This process will result in approximately 150-200L of NaCl brine to be released from the subsea tree cavity. After the subsea tree is retrieved, the guide posts on the completion guidebase will be retrieved. The next operation will have the flowlines disconnected, followed by the retrieval of the completion guidebases.

The BOP is then installed and tested and all the steps under Stage 3 (Section 2.4.2) of the sequence are performed with the drilling riser in place preventing any subsea discharges including removal of the 4 $^{1}/_{2}$" production tubing, setting cement plugs, removal of the 10 ¾" seal assembly, cutting/ spearing the 9 $^{5}/_{8}$" tubing to displace the NADF and cutting and removing the remaining 9 $^{5}/_{8}$", 10 ¾" and 13 $^{3}/_{8}$" tubing and hangers. With all the barriers for P&A in place and tested in accordance with the BAP WOMP and the wellbore displaced to seawater, the BOP is disconnected.

A wellhead severance tool run on drillpipe is then landed on the wellhead and the 20" and 30" casing strings are cut below the mudline using a mechanical cutter. Seawater is the fluid used in this operation. Metal shavings and cement cuttings will be generated during this process and will settle on the seafloor. Should the initial retrieval attempt be unsuccessful, an additional cut will be made at a shallower depth. This process will continue until the cut depth is no shallower than 1 m below the mudline (seabed). In the unlikely event that the wellhead system is not able to be retrieved it will be left in situ. Once cut free, the remaining wellhead equipment is removed, including the high pressure wellhead housing, low pressure wellhead housing, 30" conductor/cement stub and 20" conductor/cement stub is then recovered to surface followed by the temporary guidebase. The MODU is then moved to the next well.

2.4 The Ocean Monarch MODU

The Ocean Monarch (Figure 2-8) is a Keppel FELS Enhanced Victory Class conventionally moored semi-submersible mobile offshore drilling unit (MODU), which has been classified by the American Bureau of Shipping (ABS) as A1, "Column Stabilised Drilling Unit".

Details of Ocean Monarch registration and classification are shown in Table 2-3.

Table 2-3 Facility Registration Details

Item	Description
Facility name	Ocean Monarch
Type of rig	Column stabilised semi-submersible drilling unit
Owner	Diamond Offshore Services Company
Class	ABS, A1, Column Stabilised Drilling Unit
IMO number	8751368
International call sign	V7IY3
Registration	Majuro, Republic of Marshall Islands
Maximum Accommodation	150 Persons on board (POB)
Builder, prime build	Nylands Verksted A.S
Location of build	Oslo, Norway (1973-74)
Builder, facility conversion	Keppel Fels, Ltd
Location of Refit	Singapore (2008)

The Ocean Monarch was originally designed and constructed in the Nylands Verksted shipyard in Oslo, Norway, and delivered in 1974. The most recent and relevant major modification to convert the facility

into its current configuration began in 2006. The purpose of this modification was to upgrade the facility to a moored column stabilised drilling unit compliant with the International Maritime Organization (IMO) Code for the Construction and Equipment of Mobile Offshore Drilling Units 1989 (MODU Code 1989).

Table 2-4 General Information on Storage Capacities

Material	Capacity	
Water ballast	19,686 m^3	123,820 bbl
Diesel oil (*See Table 2-5 for details)*	1,097 m^3 (two main tanks)	6,901 bbl
Helifuel	5.68 m^3	35.7 bbl
Lubrication oil	3.59 m^3	22.6 bbl
Hydraulic / gear oil	6.76 m^3	42.5 bbl
Potable water	462 m^3	2,904 bbl
Liquid mud	1,582 m^3	9,949 bbl
Cement	311 m^3	1,959 bbl
Barite / bentonite	265 m^3	1,667 bbl
Sewage	24.5 m^3	154 bbl
Sack storage	6,000 sacks	
Drill pipe, outfitted	14,066 m	46,148 ft
Riser, outfitted	2,035 m	6,675 ft

The facility is equipped with eight electric anchor winches. The winches hold a combination of wire rope and chain specifically designed for deepwater anchoring purposes. Each of the eight main anchor legs consists of a 15.0 MT Stevpris anchor, 975 m of 82.6 mm R5 stud link anchor chain with a breaking strength of 712 MT and 700 m of 95.3 mm diameter independent wire rope core (IWRC) wire with a breaking strength of 785 MT. These specifications are subject to change in line with Safety Case provisions.

The range of the anchor pattern depends on water depth. Each of the anchors will reach 1,800 – 2,100 m from the MODU.

Figure 2-8 Ocean Monarch MODU

Ocean Monarch is owned by Diamond Offshore Services Company and operated by Diamond Offshore General Company (Diamond).

2.4.1 MODU Layout

The Ocean Monarch is a semi-submersible column stabilised drilling unit. The facility consists of four pontoons (two major and two outriggers). From each main pontoon two main columns and two minor columns rise to support the main deck. From each outrigger pontoon two major columns rise to support the main deck. Horizontal and diagonal braces support the major and minor columns.

The four main columns on the outriggers house chain lockers for the mooring system which extend to the column top at an elevation of 36.6 m (120 ft). The upper hull contains all marine and drilling systems for operation. The upper hull consists of the main deck, drill floor, accommodation module, helideck, mud house, shaker house and cranes.

The deck is arranged with the substructure and drill floor centred marginally aft of midships and on the centreline. Drill pipe is stored on the starboard of the facility at an elevation of 43.8 m (144 ft) and casing and riser at the aft of the facility at main deck elevation. Both areas are served by two deck cranes with an overhead gantry crane servicing the riser deck and a pipe handling knuckle boom crane servicing the pipe deck.

The main deck of the facility is located at 39.0 m (128 ft) above base line. Key compartments are located on the main deck level (Figure 2-9). The moonpool area is located at midships beneath the drill floor.

The substructure supports the drill floor at 48.8 m elevation. The engine room is located on the port side of the Ocean Monarch on the main deck level. The engine room houses the main diesel engines and generators and the auxiliary machinery pit. The mechanical office, workshop and store are also located within the structural envelope of the engine room.

There are two designated control stations on board the facility where critical emergency functions are available, the Ballast Control Room (BCR) and the Driller's cabin. The BCR is the primary or central control station for all marine related activities and emergency systems.

A total crew compliment of up to 150 persons is provided for by 51 two-man berths and 12 four-man berths. The accommodation module is located at the port of the facility and is comprised of three levels.

Diesel fuel tank capacities are summarised in Table 2-5, with the location of the two major diesel fuel tanks shown in Figure 2-10.

2.4.2 Diesel Oil

The facility has two diesel oil (DO) tanks, totalling 1,059 m^3, one located in each of the inboard pontoons (Table 2-5; Figure 2-10). These tanks can be filled through 102 mm deck connections, located at both the port and starboard loading stations. The tanks are equipped with sounding tubes and pressure transducers for fluid level monitoring and vent lines. The DO storage tanks are fitted with high and low suction tail pipes.

Table 2-5 Ocean Monarch Diesel Fuel Tank Capacities

Lower Hull (Inboard only)		Main Deck Tanks	
CPT-3	530 m^3 (90%: 475 m^3)	Box Girder-	34.15 m^3
CST-3	530 m^3 (90%: 475 m^3)	Box Girder Overflow	3.64 m^3
		Day Tank	12.4 m^3
Lifeboats			
#1 Lifeboat	0.215 m^3	#3 Lifeboat	0.215 m^3
#2 Lifeboat	0.215 m^3	#4 Lifeboat	0.215 m^3

The DO transfer system is operated from the BCR via the pump and valve control panel. There are two rotary gear type positive displacement DO transfer pumps, located one in each pontoon pump room. These pumps are used primarily to transfer fuel to the main engine room DO settling tanks.

The DO service tank is located in the box girder between the two aft engines and five forward engines and feeds the DO purifiers and are discharged into the DO day tank located on the aft bulkhead of the engine room. The DO day tank supplies fuel to the seven diesel engines that power the facility. The DO service and day tanks are equipped with inspection man-ways, vents and spill containment coamings. The DO day tank is also equipped with a level gauge. The DO settling tank and DO day tank overflow back into the pontoon storage tanks via the DO overflow tank.

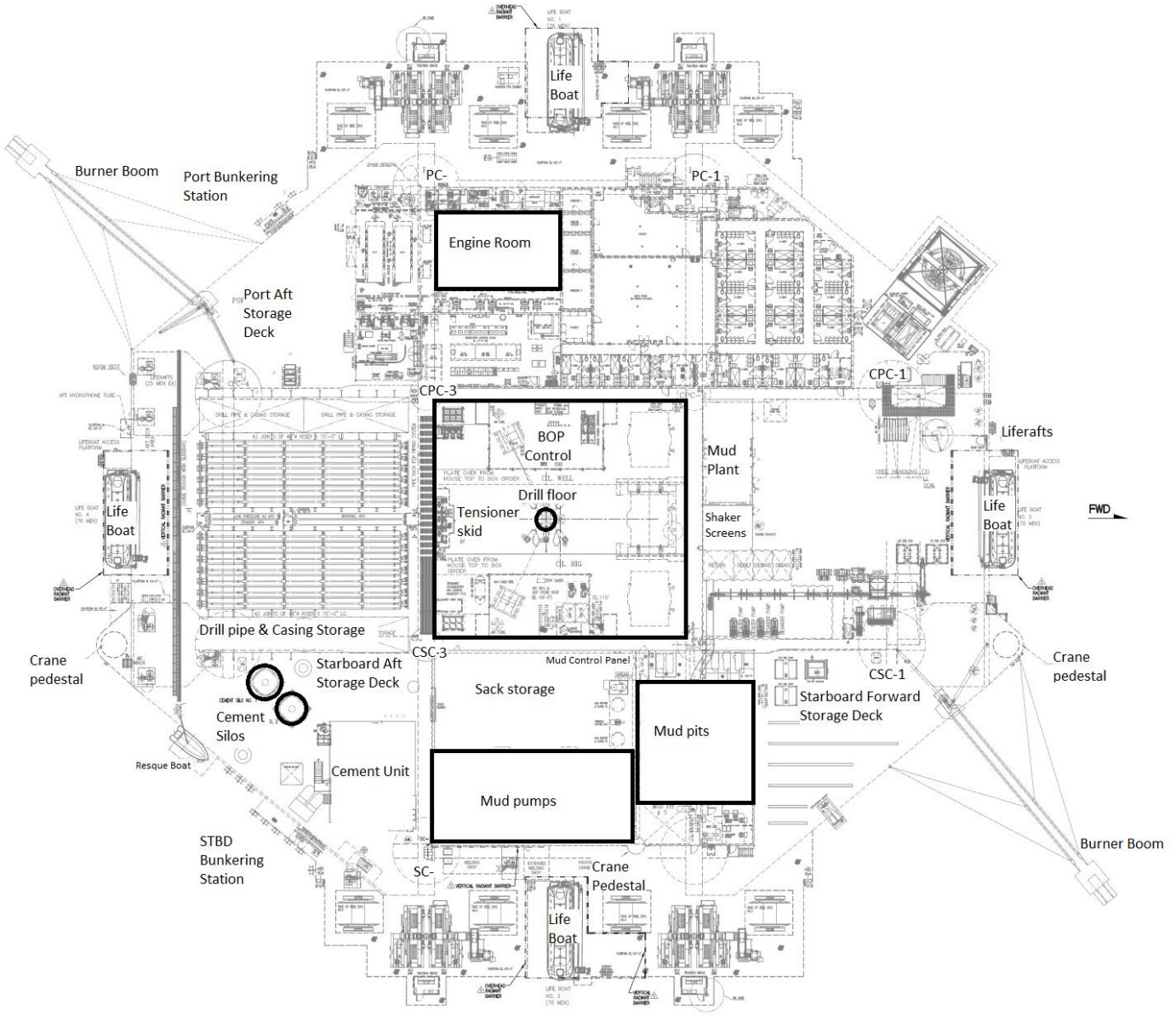


Figure 2-9 General Arrangement – Main Deck

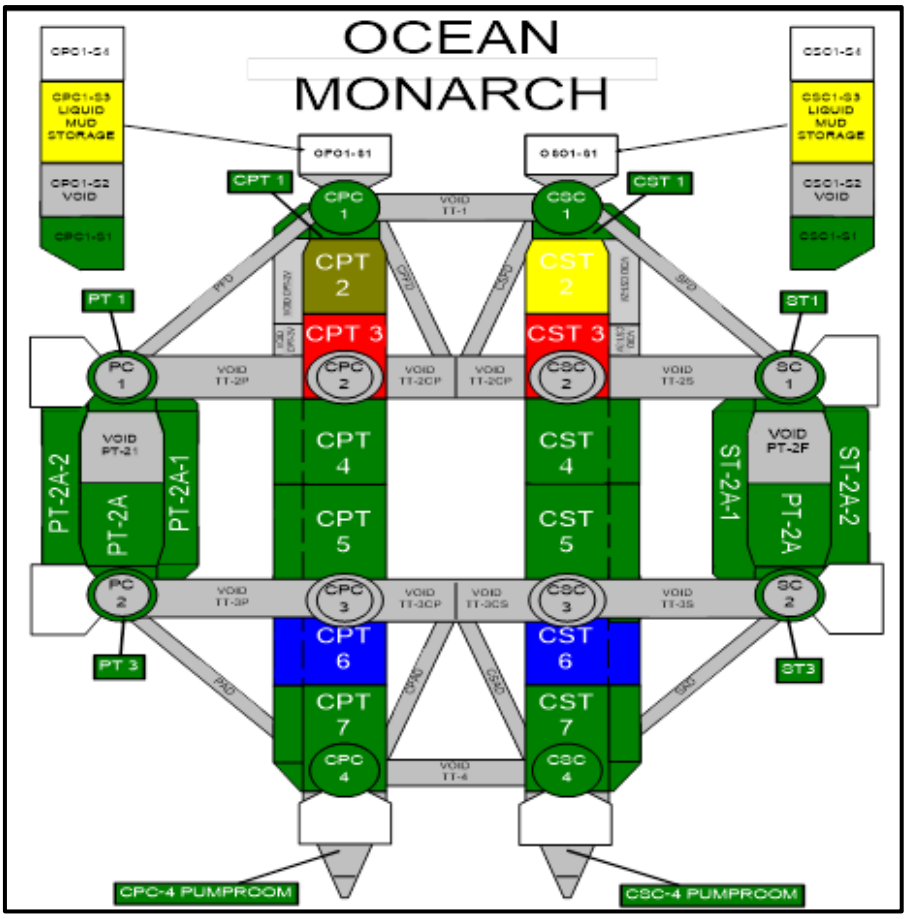


Figure 2-10 Pontoon and Column Layout and location of diesel fuel tanks (CPT3 and CST3)

2.4.3 Bunkering

The Barge Supervisor, or his nominee, is responsible for all bunkering operations on the facility. Diesel bulk hoses are suspended, when not in use, on purpose built saddles at the bunkering stations for ease of connection to the crane and transfer to attendant support vessels. Bunkering is carried out in accordance with the Diamond Offshore GEMS procedures that stipulate all the necessary safety and environmental pre-bunker checks. Bunkering hoses are fitted with dry break coupling and a valved weak link.

The Barge Supervisor is responsible for ensuring that there is adequate spare capacity available in the facility's storage tanks and prepares a detailed loading plan. The bunkering is controlled and monitored from the BCR with CCTV cameras mounted at both bunkering stations and the tank contents master panel. The bunkering station and the BCR are always manned when receiving fuel and communication is established and maintained with the supplying vessel. The bunkering can be stopped either from the bunkering station or from the BCR.

Metering of fuel taken on board is carried out using the facility's tank gauging system and verified by hand sounding as necessary.

2.4.4 Lubricating Oil

There is one 2.13 m^3 main engine lubricating oil (LO) storage tank. One tank provides satisfactory capacity to change out the oil on all seven engines at one time. The main engine LO tank is located between the bank of five engines and the auxiliary machine pit. The main engine LO tank is equipped with vents, tank level indication, inspection man ways and coamings for the purpose of oil spill

containment. The tank suction valves are equipped with a means of remote closure from the pneumatic DO and LO shut off system for the main engines that is located outside the aft door to the engine room.

Fresh oil is gravity fed to the main engines from a reservoir on each engine. Oil in the engines can be gravity drained to a dirty oil tank next to the LO tank. Waste oil can be pumped out using the waste oil pump to a deck connection on main deck for offloading into approved containers.

Lube oil to the emergency generator is gravity fed from a reservoir on the emergency generator. Oil in the engine sump is gravity drained into buckets and emptied into the dirty oil tank.

There is a 1.46 m^3 capacity oil storage tank in the mud pump room to provide make up and change oil for the four high-pressure triplex mud pumps. The mud pump sumps are pumped out into drums which are either drained to the dirty oil tank on deck level 7 from a drain connection on the upper deck or pumped into tote tanks to be shipped ashore.

2.4.5 Drain, Effluent and Waste Systems

The drainage and effluent systems and associated environmental pollution control systems on the MODU include:

- Bilge water collection tanks, headers and bilge oil / water separator
- Domestic waste segregation and disposal
- Drill floor drilling mud spill drains and rain water collection system
- Domestic grey water drainage
- Black water drainage and sewage treatment plant
- Galley waste disposal including macerator
- Helideck drainage and containment system
- Equipment bunding
- Rain and wash down drainage
- Scuppers for fuel at oil loading stations.

The effluent and waste disposal systems on the MODU include:

- Different types of waste are segregated onboard in containers for transport by supply vessels for onshore disposal by contracted waste disposal or recycling companies.
- Grey water is disposed of to sea, as is sewage water following treatment by an Omnipure marine sewage treatment plant.
- Garbage is compacted by a pneumatic Enviro-Pak unit and shipped ashore for disposal and compliant with MARPOL requirements.
- Biodegradable food scraps are macerated and disposed of to sea by a Tuff-Gutt grinder compliant with MARPOL requirements.
- Hazardous area drains, including rig floor drains, bilges and equipment coaming drains, are processed by the oil / water separator and the water is discharged overboard.
- Nonhazardous drains including the deck scupper system are discharged directly overboard.

2.4.6 Deck Drainage and Waste Oil

Drainage of non-hazardous water from the decks passes through a scupper system directly to the sea by way of piping chutes or dumps.

Drainage from separate higher risk collection areas, where the fluids may contain mud, are passed through the barite separator from where the fluid phase is led directly to the inlet of the three section skimmer tank on the forward cellar deck. From the third stage of this unit, the fluid is directed to an

adjacent automatic oily water separator (OWS). The OWS processes the fluid, passing the clean phase with less than 15 ppm oil directly to the sea and any oil is forced to the dirty oil tank for eventual disposal to shore facilities. Any discharge detected with higher than 15 ppm oil is redirected back to the skimmer tank. Equipment with the potential to leak hazardous materials have coamings fitted to contain any potentially polluting fluids and these are either drained to drain tanks or emptied manually into storage containers for disposal.

The drainage from engine room and auxiliary machine pit bilges is collected in the 5.31 m^3 dirty oil tank for eventual onshore transfer for disposal. Spent grease and lubricants for other equipment is collected in storage drums and stored in a designated hazardous storage area away from potential sources of heat or flames. All fuel and bulk lubricant disposal is fully documented using an oil record book.

2.4.6.1 Sewage Treatment

The Ocean Monarch is equipped with an Omnipure 12MX marine sewage treatment plant (Certified to MARPOL IMO Resolution MEPC.2 (VI)) which treats both black and grey water. The black and grey water is collected from toilets, sinks, showers, urinals and associated sanitary waste systems and is gravity fed into the sewage collection tank. It is then pumped by a macerator pump through an electrolytic cell which utilises electrolysed seawater to generate hypochlorite and then into a residence tank. In the residence tank the treated water is aerated and retained for an appropriate amount of time to ensure any remaining bacteria are destroyed. It is then discharged overboard. Regular sample testing of the discharge water is carried out to confirm correct operation.

2.4.6.2 Segregation and Storage of Waste

The different types of waste onboard are, where possible, segregated and placed in containers for onshore disposal by contracted waste disposal / recycling companies.

Garbage that remains onboard is packaged for disposal and a full record is kept using a garbage management log. Every package or item that leaves the facility must be fully documented. Garbage is compacted by an Enviro-Pak pneumatic garbage compactor and then shipped onshore for disposal. Biodegradable food scraps are macerated and discharged directly into the sea from the Tuff-Gutt food macerator.

2.4.7 Mud System

Drilling mud will be circulated from the well as part of the P&A activity. Whole mud will be segregated and transferred to shore for disposal. Interface fluids will be diverted to settling tanks where NADF and brine will be separated until retort tests show that residual brine meets the oil in water discharge criteria before being discharged overboard.

2.4.8 Cement System

The cement unit and associated equipment are supplied by a third party on campaign-specific basis to meet the specific needs of the clients well construction program. The cement unit is primarily used to pump cement into the well bore to cement casing into position or to set cement plugs. The cement unit interfaces with the high pressure mud system through the cementing manifold and interconnecting hoses or through the test connectors at the choke manifold.

Cements are transported as dry bulk to the MODU by support vessels. The dry bulk storage tanks on the MODU vent excess compressed air to atmosphere. This venting process carries small amounts of cement which is discharged below the MODU (maximum volume approximately 10 MT per well).

At the end of each cementing job the cementing pump, piping and blending tanks are washed with seawater to prevent curing and the tank washings discharged overboard. In addition, the remaining cement contained within the batch mixer, tanks and spacers is discharged overboard, resulting in a release of approximately 20 bbl (4m^3) of cement contaminated water to the ocean per well.

2.4.9 Fluids Handling System

A temporary fluids handling package will be installed on the rig to deal with any fluids returned to the rig during the P&A activities. The fluids handling package is designed and validated (under the Ocean Monarch's activity specific safety case revision) to handle controlled volumes of hydrocarbons. Any gas present will be vented in a controlled manner via the MODU's cold vent system. Any oil present will be transferred to fit-for-purpose transport tanks for return to shore.

2.4.10 Blowout Preventer (BOP)

The BOP system serves as a secondary means of well control. When a formation influx occurs during drilling, one or more BOP preventers are activated to seal the annulus, or wellbore, to "shut in" the well. Denser or heavier mud is then circulated into the wellbore to re-establish primary well control. Mud is pumped down the drill string, up the annulus, out the choke line at the BOP stack, and then up the high-pressure lines on the riser and through the choke manifold until the downhole pressure is controlled and the influx is circulated out of the well. Once this "kill weight" mud extends from the bottom of the well to the top, the well is back in balance and has been "killed". The primary functions of the BOP stack include:

- Confining well fluid to the wellbore
- Providing a means to add fluid to the wellbore
- Allowing controlled volumes of fluid to be withdrawn from the wellbore.

While performing these primary functions, the BOP stack also:

- Regulates and monitors wellbore pressure
- Centralises and hangs off the drill string in the wellbore
- Seals the annulus between the drill pipe and the casing to shut in the well
- Prevents additional influx from the reservoir into the wellbore
- Seals the well by completely closing off the wellbore if no pipe is in the hole
- Allows stripping drill-pipe
- Severs the drill pipe to seal the well in emergencies.

The BOP systems on Ocean Monarch have redundancy integrated inherently within the design of the system.

The BOP stack consists of two units that are stacked on top of one another, the upper unit is the Lower Marine Riser Package (LMRP) and the lower unit is the Blowout Preventer (BOP). The BOP stack sits atop the wellhead and is connected to the riser through the connection at the top of the LMRP. When the riser needs to be disconnected due to a situation arising such as impending rough weather, and the BOP is required to remain in place to secure the well, the drill string is typically pulled back into cased hole and hung off on the closed BOP rams. The LMRP is then disconnected from the BOP and either retrieved to surface or left suspended on the riser until the situation has passed and it can be reconnected so that drilling operations can continue.

As well as the LMRP and BOP, the BOP stack also houses all the subsea control equipment necessary to control the LMRP and BOP functions. This control equipment takes signals from the surface from the two MUX cables and the hot line which are connected to pods attached to the BOP stack. The LMRP and the BOP also house ROV intervention panels to allow ROVs to control some of the critical functions of the BOP stack if communication with the surface is lost.

The choke and kill manifold is used to control the pressures encountered during a well kick. The Ocean Monarch has a maximum working pressure of 1,034 bar (15,000 psi). The choke manifold is rated for H_2S service.

The facility is equipped with a hydrostatic test unit. The unit is rated for generating pressures up to 2,068 bar (30,000 psi) and flow rates up to 21.6 L/min (5.70 gpm).

There are two ROV intervention panels located on the BOP stack, one on the LMRP and one on the BOP. The panels allow ROVs to manually open and close specific valves on the stack in the event that communication with the surface is lost.

2.4.11 MODU Communication and Navigation Systems

Ocean Monarch is fitted out with extensive communication and navigation aids in accordance with Safety Case requirements, including normal and emergency communications facilities to allow communications between the facility and aircraft, vessels, shore base and emergency response entities as required.

The emergency communication systems are designed to fulfil the current capabilities of a Global Maritime Distress and Safety System (GMDSS) and the system is designed to work in all areas between approximately 70°N and 70°S. The facility is equipped with the following GMDSS and other external communication equipment:

- Two Global Maritime Distress and Safety System (GMDSS) stations, each consisting of:
    - Marine medium frequency / high frequency single side band transceiver
    - Marine very high frequency (VHF) digital selective calling (DSC) radio telephone
    - Mini-C Inmarsat C transceiver
    - Marine VHF DSC radio telephone
- Six Standard VHF DSC radios with AIS and GPS receiver
- 20 Standard portable marine VHF transceivers
- Four portable marine VHF GMDSS radios
- Single IP66 EC aeronautical radio beacon transmitter
- Three aeronautical VHF transceiver
- Iridium satellite communication system
- Satellite broadband data system
- Distress alarm panel
- Six search and rescue transponders (SART)
- GMDSS emergency position indicating radio beacons (EPIRB)
- Marine asset tracking system.

In addition to the above external communications equipment, the lifeboats are also equipped with a variety of communications equipment.

Additionally, the MODU is equipped with an automatic tracking system for identifying and locating vessels by electronically exchanging data with other nearby ships, Automatic Identification System (AIS) base stations and satellites. AIS information supplements marine radar on PSV/AHV, which is the primary method of collision avoidance for water transport. Information provided by AIS equipment, such as unique identification, position, course and speed, can be displayed on a screen or an electronic chart display and information system.

AIS is intended to assist MODU officers and allow maritime authorities to track and monitor vessel movements. Vessels fitted with AIS transceivers and transponders can be tracked by AIS base stations located along coast lines or, when out of range of terrestrial networks and through a growing number of satellites that are fitted with special AIS receivers which are capable of deconflicting a large number

of signatures. The AIS is fitted to the Ocean Monarch in accordance with IMO International Convention for the Safety of Life at Sea (SOLAS) (IMO 1974) requirements.

In addition to the abovementioned navigation tools, Diamond agreed with the installation of additional Navaids as a result from the Safety Case Revision workshop (February 2018) and in discussion with AMSA .These include:

- **A Kongsberg BS 610 AIS base station**: The base station provides slot management and integrity monitoring of the AIS AtoN. All AIS AtoN and AIS base stations are to be identified in accordance with the most recent edition of Recommendation ITU-R M.585.

  If the AIS AtoN is not within VHF radio range of an existing AIS base station, then a new AIS base station should be established within the VHF radio range of the AIS AtoN to ensure the integrity of the FATDMA reservations and monitoring of the AIS AtoN.

  Since the MODU will be operating at distances greater than 100NM from any existing AIS infrastructure, it has selected the Kongsberg BS 610 base station to satisfy the regulatory requirement.

  There is a brief process required for relocating the MODU and ensuring the AIS is configured correctly. The required AMSA forms will be completed by Diamond Offshore, with assistance from AMS Maritime. This process establishes communication with NOPSEMA, AMSA and other support and Search and Rescue authorities. Requisite notice to mariners through the Australian Hydrography service will also be triggered through this process.

- **AMEC Mando 303 AIS AtoN**: The AIS AtoN will transmit Random Access Time Division Multiple Access (RATDMA). The AtoN will be configured so all vessels receiving the transmission are provided correct and accurate platform information including dimensions, position, etc. The system will be completely configured prior to delivery and will in essence be “plug and play” assuming the platform will have infrastructure as detailed post site survey.

  AIS can be used on offshore structures and facilities to assist with positive identification by transiting and service vessels. AIS may also be used to assist those operating offshore facilities to monitor vessel traffic in their vicinity including potential and real incursions into exclusion or restricted areas.

  Given many AIS transmitters may be used in any one area, a level of control, integrity and protection of the AIS VDL is required in accordance with IMO Resolution MSC.347 (91). AMSA monitors the use of the AIS VDL and issues all Australian MMSI numbers, AIS licences and FATDMA time slots to owners of non-shipborne AIS transmitters to ensure there is no interference from co-located services and provide a level of control to ensure integrity and protection of the AIS VDL.

  Offshore facilities marked with AIS AtoN will use the appropriate Message 21 coding as contained in the most recent version of Recommendation ITU-R M.1371.

  FPSOs and MODUs are considered fixed offshore facilities, however, as they are SOLAS vessels, they should change their AIS navigational status when they are connecting to a riser or the seabed, to indicate “moored” or “at anchor”. This status will also apply when using dynamic positioning to conducting undersea operations.

  AIS AtoN has full functionality of the Type 3 AMS Mando unit to satisfy the requirement under IEC 62320-2.

- **CNS Horizon Software and Charting**: Horizon provides a complete AIS interface that includes the ability to view and track all vessels, display specific vessel information, and send and receive safety related text messages. Horizon’s interface and display of AIS related information offers a substantial leap forward in the ability to communicate and interact with

vessels. Indicative incursion/exclusion zones are displayed as rings with the MODU in the centre. These rings are configurable.

- **Racon:** A Tideland Seabeacon 2 frequency agile Racon has been established on the Ocean Monarch. The Racon is a receiver/transmitter device operating in the maritime radar frequency bands (9 and 3 GHz) that enhance the detection and identification of the Ocean Monarch on the radar of passing ships. The Racon responds to the presence of a ship's radar by sending a characteristic pulse train. The response appears as a coded mark on the ship's radar display that highlights the range and bearing of the racon. The displayed mark has a length on the display corresponding to a few nautical miles and uses a Morse character for identification. The Racon on the Ocean Monarch has been designated Morse Code "M (- -)" by AMSA. When the racon receives a radar pulse from a passing ship, it responds with a signal on the same frequency which leaves an image on the radar display of the passing ship. This takes the form of two dashes forming the Morse character "M", radiating away from the location of the beacon on the normal plan position indicator radar display.

  The Racon operates on the 9320 MHz to 9500 MHz marine radar band (X-band), and the 2920 MHz to 3100 MHz marine radar band (S-band). The Racon is frequency-agile; meaning it has a wide-band receiver that detects the incoming radar pulse, tunes the transmitter and responds with a 25 microsecond long signal within 700 nanoseconds.

  The Racon is also fitted with dual-token sidelobe suppression which enables the Racon to accurately measure frequency and pulsewidth of the main pulse and use amplitude values to block responses to sidelobes. This function prevents interference, particularly on nearby vessels such as the Safety Standby vessels, and ensures the Racon does not saturate or adversely affect the radar of these vessels.

  The Racon is compliant with IALA Recommendation R-101 on Marine Radar Beacons (RACONS) Edition 2 December 2004, and IMO SOLAS Chapter V. The Racon has been registered with AMCA and AMSA, and the location of the Ocean Monarch and transmitting Racon is updated by way of AUSCOAST warning.

2.5 Support Vessels

P&A operations will be supported by at least two Anchor Handling Tugs (AHTs). The AHTs supporting Ocean Monarch in Bass Strait will have comparable specifications to the *Far Statesman* and *Far Saracen*. Additionally, an Offshore Support Vessel (OSV) has been engaged to patrol the temporary fairways, to deliver supplies to the MODU and to return wastes to shore.

2.6 Helicopter Support

Helicopter support will be from a suitable helicopter base. While it is likely that helicopter activities will be from the Esso helicopter base in Longford, another heliport may be chosen for operational and commercial reasons.

2.7 Remotely Operated Vehicle (ROV) Support

The MODU and one or more of the support vessels will be equipped with remotely operated underwater vehicle (ROV) systems. ROVs are usually deployed using an A-frame from a dedicated vessel. ROVs are linked to the vessel by either a neutrally buoyant tether or often when working in rough conditions or in deeper water, a load-carrying umbilical cable is used along with a tether management system.

A hydraulic pump is used to power equipment such as torque tools and manipulator arms on the ROV. The ROV will be used to undertake subsea surveys and observations, subsea infrastructure cleaning / cutting, remote operation of subsea equipment and post-campaign removal of subsea debris.

3 Description of the Environment

3.1 Zone of Potential Impact

The Operational ZPI (as shown in Figure 3-1) is based on the maximum credible hydrocarbon spill event that might occur during petroleum activities and the maximum extent of hydrocarbon exposures above low thresholds. The ZPI is based on stochastic modelling results (APASA 2018b) and does not represent the zone of exposure from a single event but shows the furthest extent from the release location of the trajectories of all 100 modelled scenarios. The images (Figure 3-1 and Figure 3-2) below from the oil spill simulation do not represent a realistic scenario. They show 100 simulations under different weather conditions and without any response action taken.

The Operational ZPI extends along the eastern Victoria coastline and around Cape Howe extending northwards into waters off the southern NSW coast. No shore line exposure was predicted above the impact thresholds, except at the ANZECC reference value for entrained hydrocarbons.

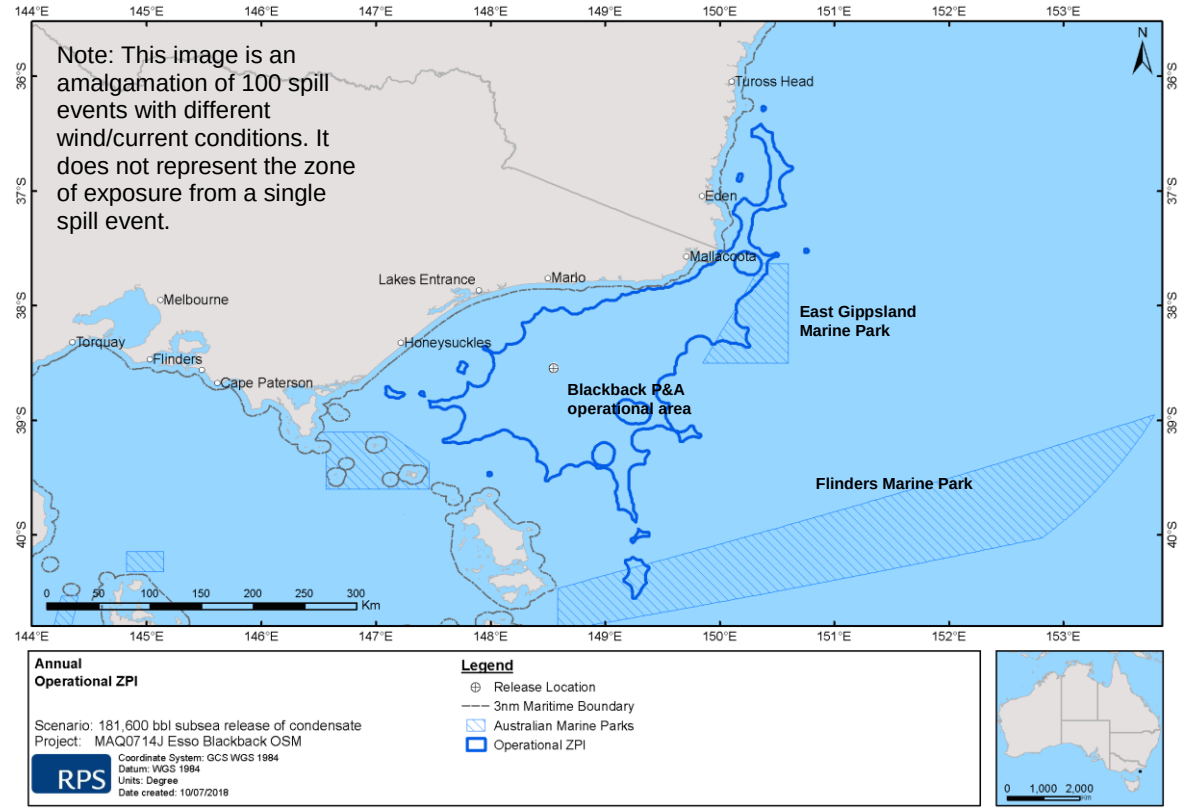


Figure 3-1 Operational ZPI (APASA 2018b)

The project has also used ANZECC reference criteria for entrained hydrocarbons as a basis to define the geographical extent of any wider potential ecological impact (Figure 3-2). This zone has been named the "Environmental Monitoring ZPI".

At this highly conservative threshold it is unlikely that entrained hydrocarbons will be measurable in the water column with standard laboratory methodology, and impacts on even the most sensitive biota and ecosystems would most likely not be detectible with conventional scientific methods. Oil spill response outside the Operational ZPI would be restricted to monitoring, evaluation and surveillance (MES), as the Operational ZPI does not include shoreline contact. Other tools for oil spill response are not feasible or practicable at these very low concentrations.

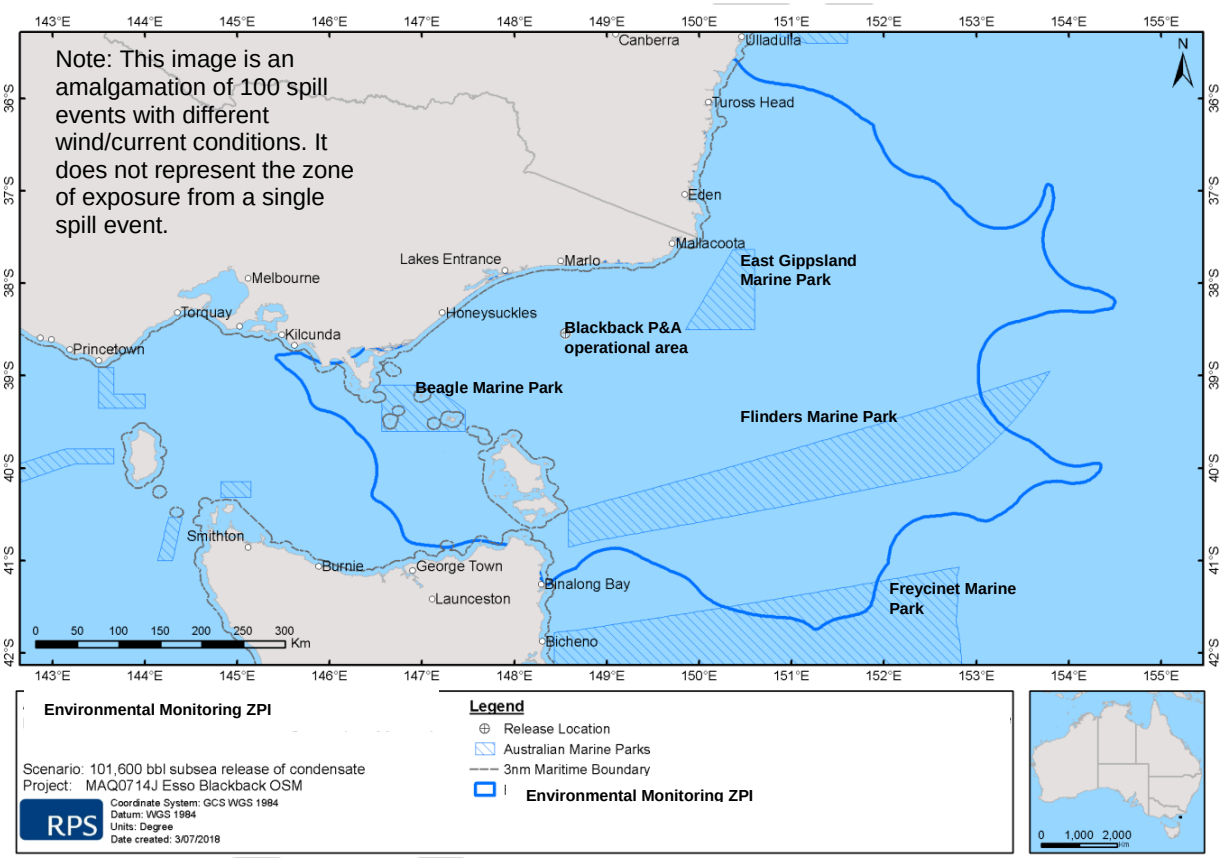


Figure 3-2 **Environmental Monitoring ZPI: geographic extent of potential impacts from entrained hydrocarbons at ANZECC reference level 672 ppb.hrs (7 ppb, 96 hrs) (APASA 2018b)**

3.2 Physical Environment

Bass Strait is the region of the continental shelf that separates mainland Australia from Tasmania. The Blackback wells A1-A, A-2 and A-3 are located at the edge of the continental shelf in approximately 400 m of water depth.

Bass Strait has a reputation for high winds and strong tidal currents (Jones 1980).

Average monthly rainfall along the Gippsland coast (Yarram Airport) ranges from 38 mm in January (highest 112 mm) to 60 mm in June (highest 174 mm). Offshore (on Deal Island in central Bass Strait) monthly rainfall ranges from 41 mm in January (highest 162 mm) to 78 mm in June (highest 247 mm) and shows a similar pattern to the coastal region with slightly higher winter rainfall (BOM 2017).

Currents in the Gippsland Basin are tide and wind driven. Tidal movements predominantly have a northeast–southwest orientation. Tidal flows come from the east and west during a rising (flood) tide, and flow out to the east and west during a falling (ebb) tide. Tidal streams are dominated by the lunar tidal constituent, which has a period of 12.4 hours. The main tidal components vary in phase by about three to four hours from east to west. Most of this phase change occurs between Lakes Entrance and Wilsons Promontory. Timing of the high tide, for example, can vary by up to three hours across this region. Tides in the area from Lakes Entrance to Gabo Island are, however, relatively weak in comparison to other areas of Bass Strait (GEMS 2005).

Temperatures in the subsurface waters of the operational area range from about 13°C in August/September to 16°C in February/March. Surface temperatures can exceed 20°C at times in late summer due to the warmer waters of the East Australia Current entering the strait. Water temperatures in the operational area are expected to follow this pattern (Jones 1980).

The area around the Blackback P&A operational area is a high energy environment exposed to frequent storms and significant wave heights. High wave conditions are generally associated with strong west to southwest winds caused by the eastward passage of low pressure systems across Bass Strait. Storms

may occur several times a month resulting in wave heights of three to four metres or more. In severe cases, southwest storms can result in significant wave heights of greater than six metres (Jones 1980).

Water depth across the Blackback field varies dramatically, from less than 300m near Blackback-3 to more than 600m in the bottom of an east-west trending seafloor channel (the Blackback Canyon) which overlies much of the central part of the field. Block VIC/L20 is at the edge of the Bass Canyon, bordering a steep slope into the Bass Canyon in the east (Black *et al*. 1991). The Blackback P&A operational area lies in approximately 402 m water depth.

3.3 Values and Sensitivities

3.3.1 Protected Matters within the Operational and Environmental Monitoring ZPIs

The following table provides details of the features present within the Operational ZPI for those receptors identified by Regulation 13(3) of the OPGGS(E) Regulations 2009. Note, the Operational ZPI overlaps two Australian Marine Parks, however no internationally (Ramsar) or nationally important wetlands, or World, National or Commonwealth heritage places occur within the Operational ZPI. Descriptions of the features or species and species habitats is provided in Sections 3.5.3 to 3.11.2 (see references within Table 3-1).

Table 3-1 Summary of conservation values and sensitivities within the Operational ZPI

Receptor Type	Value and Sensitivities	Features present within the Operational ZPI
Commonwealth Marine Area (Section 3.5.3)	Key Ecological Features	Big Horseshoe Canyon Upwelling East of Eden
Commonwealth Parks & Reserves (Section 3.5.3)	Australian Marine Parks	Flinders Marine Park East Gippsland Marine Park
Aquatic Vegetation (Section 3.6.6)	Threatened ecological community	Giant Kelp Marine Forests of South East Australia
Fish (Section 3.6.1)	Threatened and/or migratory species	Two threatened fish species or species habitat present (Australian grayling, Black rockcod)
Sharks & rays (Section 3.6.1)	Threatened and/or migratory species	Three threatened (Grey nurse shark, Great white shark, Whale shark) and four migratory (Great white shark, Shortfin mako shark, Porbeagle shark, Whale shark) shark species or species habitat present
Marine Reptiles (Section 3.6.2)	Threatened and/or migratory species	Five threatened and migratory marine turtle species or species habitat present (Loggerhead turtle, Green turtle, Leatherback turtle, Hawksbill turtle, Flatback turtle)
Seabirds and Shorebirds (Section 3.6.3)	Threatened and/or migratory species	Numerous threatened (25) and migratory (56) species or species habitat present (including various albatross, petrel, plover, sandpiper, shearwater and tern species)
Marine Mammals (Section 3.6.4	Threatened and/or migratory species	Five threatened whale species or species habitat present (Sei whale, Blue whale, Fin whale, Southern right whale, Humpback whale); and ten migratory whale species or species habitat present. One migratory dolphin species or species habitat present (Dusky dolphin)

Table 3-2 provides details of the additional values present within the Environmental Monitoring ZPI for those receptors identified by Regulation 13(3) of the OPGGS(E) Regulations 2009. Descriptions of the features or species and species habitat is provided in Sections 3.5.3 – 3.11.2 (see references within the Table).

Table 3-2 Summary of additional conservation values and sensitivities within the Environmental Monitoring ZPI

Receptor Type	Value and Sensitivities	Features present within the Environmental Monitoring ZPI
Commonwealth Marine Area (Section 3.8.2)	Key Ecological Feature	Canyons on the eastern continental slope Shelf rocky reefs Seamounts south and east of Tasmania
Wetland (Section 3.5.5)	Wetland of international importance	Gippsland Lakes Ramsar site Corner Inlet Ramsar site Logan Lagoon East Coast Cape Barren Island Lagoons
Commonwealth Parks & Reserves (Section 3.5.3)	Australian Marine Parks	Beagle Marine Park Freycinet Marine Park
Cultural Heritage (Section 3.11)	Commonwealth heritage place	Gabo Island Lighthouse Eddystone Point Lighthouse Goose Island Lighthouse Montague Island Lighthouse Swan Island Lighthouse
Protected Areas (Section 3.5.4)	State parks and reserves	Tollgate Islands (Batemans Marine Park) Murramurang Eurobodalla Montague Island Mimosa Rocks Bournda National Park Ben Boyd Croajingolong National Park & Nadgee Cape Howe Cape Conran Coastal Park The Lakes National Park Wilsons Promontory Cape Liptrap Coastal Park Devils Tower (Curtis Group) East Moncouer Island West Moncouer Island Hogan Group North East Isle (Kent Group) Strzelecki Mount William
Fish (Section 3.6.1)	Threatened and/or migratory species	One additional fish species listed as critically endangered (Red handfish)
Sharks and Rays (Section 3.6.1)	Threatened and/or migratory species	No additional species
Marine Reptiles (Section 3.6.2)	Threatened and/or migratory species	One additional migratory species or species habitat present (Giant manta ray)
Seabirds and Shorebirds (Section 3.6.3)	Threatened and/or migratory species	Twenty additional threatened and 32 additional migratory species or species habitat present (including several snipe and godwit species, the Australasian bittern and the Orange bellied parrot)
Marine Mammals (Section 3.6.4)	Threatened and/or migratory species	No additional species

3.3.2 Commonwealth Parks and Reserves

Six marine regions have been identified in Commonwealth waters around Australia. The operational area, Operational ZPI and Environmental Monitoring ZPI lie within the South-east Marine Region.

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

- Features with high biodiversity and productivity, such as the east Tasmania subtropical convergence zone, Bass Cascade, Upwelling east of Eden, Seamounts south and east of Tasmania and Bonney coast upwelling.
- Breeding and resting areas for Southern right whale.
- Migration areas for Blue, Fin, Sei, Southern right and Humpback whales.
- Foraging areas for Australian sea-lion, White shark, Harrison's dogfish, Killer and Sei whales, Australasian gannet, Fairy prion, Black-faced cormorant, Little penguin, Crested tern, and several species of seal, penguin, albatross, petrel, shearwater and gulls.
- Wrecks of MV City of Rayville, SS Cambridge and ketch Eliza Davies.
- 10 provincial bioregions and 17 seafloor types are represented in the network (DoEE, 2017a)

3.3.2.1 Australian Marine Parks

Within each region is a series of Australian Marine Parks; and the reserves are managed for the primary purpose of conserving the biodiversity found in them, while also allowing for sustainable use of natural resources. As shown in Figure 3-1 and Figure 3-2 , the Operational Monitoring ZPI intersects the Flinders Marine Park and East Gippsland Marine Park, the Environmental Monitoring ZPI also overlaps the Beagle Marine Park and Freycinet Marine Park.

East Gippsland Marine Park

The East Gippsland Marine Park covers 4,137 square kilometres and is located approximately 200 km east north-east of the operational area. The reserve contains representative samples of an extensive network of canyons, continental slope and escarpment in depths from 600 metres to deeper than 4,000 metres.

The East Gippsland Marine Park includes both warm and temperate waters and free-floating aquatic plants or microscopic plants (i.e., phytoplankton) communities. The reserve supports a diverse phytoplankton community and other sea life. The area may also include foraging area for Wandering albatross (DoEE 2017n).

Flinders Marine Park

The Flinders Marine Park comprises an area of 27,043 km^2 and is located approximately 230 km south-east of the operational area. The reserve covers a depth range from about 40 metres on the shallow continental shelf to abyssal depths of 3,000 metres or more to the edge of the Exclusive Economic Zone. In summer, incursions of the warm East Australian Current and large scale eddies contribute to increased biodiversity.

Sea bottom dwelling habitats include sheer rocky walls and large rocky outcrops that support a rich diversity of small seabed animals such as lace corals and sponges. These and the large expanses of sandy and muddy sediments are habitats to a wide variety of fish, including school shark (AFMA 2014a) and gulper sharks (Harrison's dogfish and southern dogfish) which have been listed as threatened species (DoEE, 2017j), and to populations of the giant crab. Another prominent feature is a large offshore seamount, seamounts are generally considered to be important centres of deep ocean biodiversity. The large seamounts to the east of Tasmania are believed to be individually important providing habitat to species that may be unique to each seamount, however presently little is known about the fauna of these seamounts.

The shallower part of the Flinders Marine Park includes habitat important to the White fronted tern, Australian gannet, Black faced cormorant, Common diving petrel, Fairy prion, Little penguin, Shy albatross, Silver gull, Crested tern, Short tailed shearwater, and White faced storm petrel (DoEE, 2017b).

Beagle Marine Park

The Beagle Marine Park is located approximately 150 km south-west of the operational area with its north-western edge abutting Victorian waters to the south-east of Wilsons Promontory. The reserve covers an area of 2,928 square kilometres.

The Beagle Marine Park is a shallow reserve that surrounds a collection of Bass Strait islands. The deep rocky reefs support a rich array of life, and the area provides homes and feeding grounds for seabirds, Little penguins and Australian fur seals. The reserve encloses the Kent Group Marine Reserve and the Hogan and Curtis Island groups which are important breeding areas for the Fairy prion, Shy albatross, Silver gull, Short tailed shearwater, Black faced cormorant, Australian gannet, Common diving petrel and Little penguins (DoEE, 2017u).

Freycinet Marine Park

Freycinet Marine Park follows a similar trajectory to Flinders Marine Reserve but at a lower lattitude. Comprising of 57,942 km^2 it starts in water depths of approximately 40 metres east of Bicheno (Tasmania) extending to the edge of Australia's exclusive economic zone. (DoEE 2017q).

The reserve spans the continental shelf and deeper water ecosystems and is adjoined to a large offshore saddle. It also includes large offshore seamounts with expected high biodiversity as it is believed that they are situated in depths that are unable to have been fished. It is an important migration area for Humpback and Southern right whales and an important foraging area for Wandering, Black-browed and Shy albatross, Cape petrel and Fairy prion, Sei whales and Killer whales (DoEE, 2018g). Great white shark also forage in the reserve.

3.3.2.2 Key Ecological Features

Key Ecological Features (KEF) are elements of the Commonwealth marine environment that are considered to be of regional importance for either a region's biodiversity or its ecosystem function and integrity. Three KEFs, identified in the Conservation Values Atlas (DoEE 2015c), intersect with the Operational ZPI and the Environmental Monitoring ZPI overlaps the southerly edge of one additional KEF, the shelf rocky reefs (Figure 3-3).

Big Horseshoe Canyon

The steep, rocky slopes of the Big Horseshoe Canyon provide hard substrate habitat for attached large megafauna. Sponges and other habitat forming species provide structural refuges for benthic fishes, including the commercially important pink ling.

The Big Horseshoe Canyon is the largest south eastern canyon sampled for benthic biodiversity (Williams *et al*. 2009). It has a total area of 319 km^2 in 1500-m depth that supports a rich, abundant, filter-feeding benthic megafauna, including large sponges in dense beds of large individuals at 120 m and at 300–400 m, dense stands of the stalked crinoid *Metacrinus cyaneus* in 200–300 m, and many species of octocoral (especially gold corals) at depths >700 m (Kloser *et al*., 2001). The conservation value of this feature is highlighted by this being the type locality for *M. cyaneus* and it is only known location off south eastern Australia.

Big Horseshoe Canyon lies south of the coast of eastern Victoria. This feature is the eastern most arm of the Bass Canyon system so the spatial boundary of this KEF, as defined in the Conservation Values Atlas, was identified using the Geoscience Australia geomorphic features dataset (DoEE 2015a).

Upwelling East of Eden

The Upwelling East of Eden is designated a KEF for the high productivity and aggregations of marine life. Dynamic eddies of the East Australian Current cause episodic productivity events when they interact with the continental shelf and headlands. Phytoplankton blooms, resulting from mixing and nutrient enrichment, are the basis of productive food chains including zooplankton, copepods, krill and small pelagic fish (DoEE 2015a).

The upwelling supports high primary productivity that supports higher trophic levels, including top order predators, marine mammals and seabirds. The area supports foraging Blue and Humpback whales, known to arrive when significant krill aggregations form. The area is also important for other cetaceans, seals, sharks and seabirds.

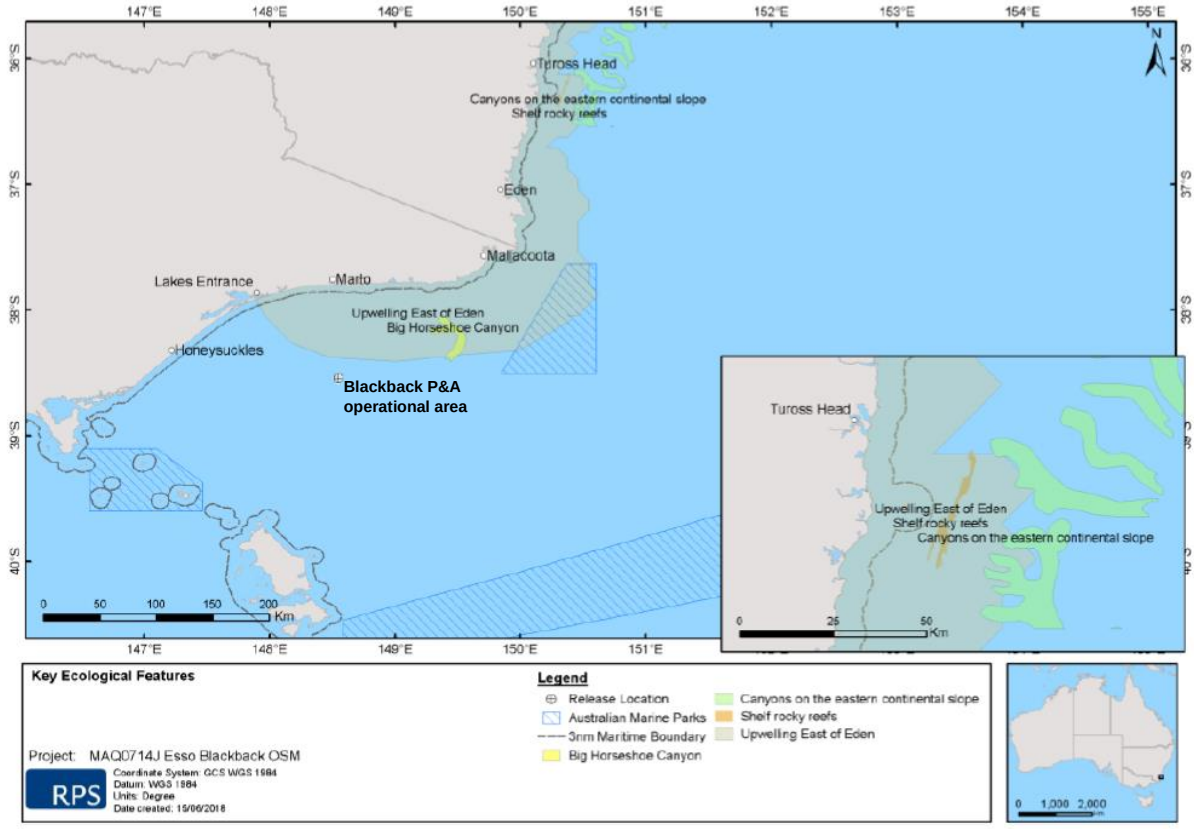


Figure 3-3 Key Ecological Features

Canyons of the eastern continental shelf

The canyons on the eastern continental slope provide habitat (through changes in topography and productivity) that supports a diverse range of benthic, demersal and pelagic species. The canyons on the eastern continental slope are defined as a KEF as they are a unique seafloor feature with enhanced ecological functioning and integrity, and biodiversity, which apply to both its benthic and pelagic habitats (DoEE, 2015a).

Shelf rocky reefs

Rocky reefs and hard grounds are located in all areas of the South-east Marine Region continental shelf including Bass Strait, in 50 m to 150–220 m water depth. They support macroalgae and sessile invertebrates and provide habitat and shelter for fish and are important for aggregations of biodiversity and enhanced productivity (DoEE, 2015a).

Seamounts south and east of Tasmania

These seamounts are a chain or cluster of seamounts rising from the abyssal plain, continental rise or plateau situated 200 km or more from shore (east of Flinders Island to south east of southern Tasmania). The seamounts south and east of Tasmania are defined as a key ecological feature as they are an area of high productivity and aggregations of marine life. Seamounts can sometimes influence and intensify currents, creating localised upwelling and turbulent mixing. Accelerated water flows are thought to create upwellings of nutrient rich waters from the seafloor (DoEE, 2015a).

3.3.3 State Parks and Reserves

State parks and reserves which include marine protected areas and terrestrial protected areas are declared under each individual state's legislation and are managed by state authorities. A number of state marine protected areas intersect the Environmental Monitoring ZPI. A number of other state marine and terrestrial protected areas, as described below, are located inshore of the Operational and Environmental Monitoring ZPIs see Figure 3-4.

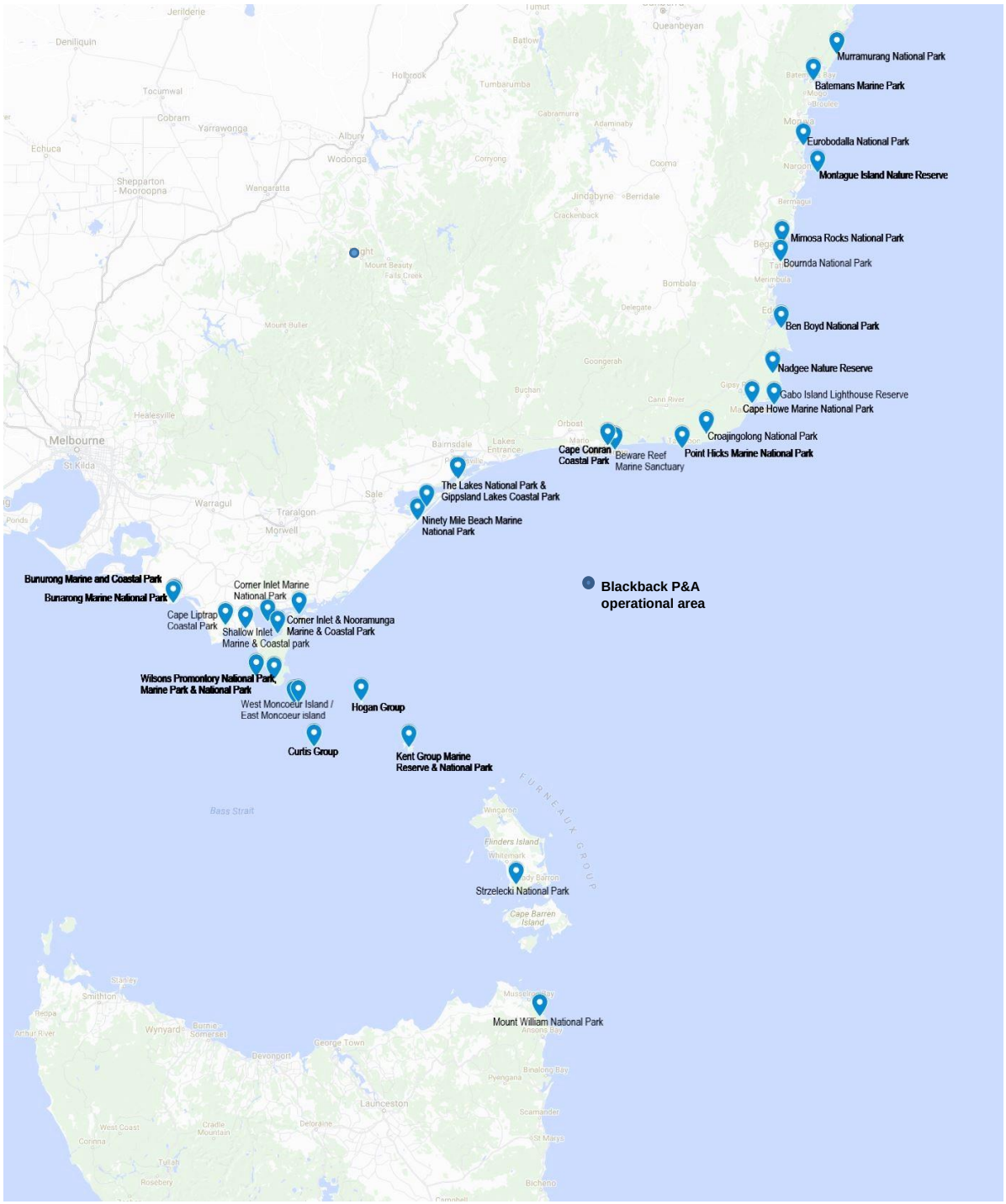


Figure 3-4 State parks and reserves

3.3.3.1 Batemans Marine Park

The Batemans Marine Park was established in 2006 and covers approximately 85,000 hectares, extending from the north end of Murramarang Beach near Bawley Point to Wallaga Lake in the south. It includes all of the seabed and waters from the mean high water mark on the coast to three nautical miles offshore. It includes all estuaries, creeks, rivers and lakes (except Nargal Lake) to the limit of tidal influence. Scuba diving, snorkelling, beach going, whale, seal and other wildlife watching, fishing, swimming, surfing and boating are all popular pastimes.

The park covers a range of habitats, including continental shelf sea floor along with sponge gardens, beaches, rocky shores, kelp beds, coralline algal banks, rocky reefs, islands, seagrass, mangroves and estuarine habitats.

The Montague Island Nature Reserve, within the Marine Park, is a breeding and nesting place for over 40,000 sea birds including Shearwaters, Little penguins, Crested terns and Silver gulls and is a haul out site for Australian and New Zealand fur seals. Both Montague Island and the Tollgate Islands (also within the park) are aggregation sites for Grey nurse sharks.

Local Aboriginal communities have strong links to the area within and adjoining the Marine Park. The local Aboriginal communities within the Yuin Nation are actively involved in consultation on park issues affecting traditional use (DPI, 2018).

3.3.3.2 Murramurang National Park

Murramurang National Park spans 44 km of coastline on the NSW south coast and supports more than 90 species of bird including gannets, shearwaters, White-faced storm petrels, Sooty oystercatchers and Little penguins. The forest of spotted gums stretches right to the ocean (NPWS, 2018).

3.3.3.3 Eurobodalla National Park

Eurobodalla National Park contains a range of aquatic environments including lagoons, lakes, estuaries, sheltered and wild beaches that protect a wide variety of plants and animals. The National Park provides an important habitat for a wide variety of birds with 131 bird species having been recorded in the the park. Estuaries and headlands are important over-wintering areas for migratory birds, including 17 species of waders, and the Hooded plover and Little tern nest on the sand islands, sandspits and dunes.

Water based activities such as boating, fishing and swimming are all popular in the park (NPWS, 2018).

3.3.3.4 Mimosa Rocks National Park

Mimosa Rocks National Park takes its name from the Paddle Steamer Mimosa that wrecked in 1863 afetr running aground on rocks at the northern end of the park. The rocks of the park have distinctive castle-like features that are the result of geological folds, faults and intrusions.

The park provides important habitat for many migratory birds, including Hooded plovers and Pied oystercatchers, that nest along the coastline. The Bar tailed godwit rests briefly here in Summer months during its migration from Alaska to New Zealand.

The park is popular for fishing, surfing, snorkelling and birdwatching. From May to November, the headlands are excellent whale watching vantage points (NPWS, 2018).

3.3.3.5 Bournda National Park

Bournda has been a special place for the Dhurga and Yuin people for thousands of years and its name means ‘place of tea tree and kangaroos’. The estuarine wetlands provide roosting and feeding areas for a large variety of waders and waterfowl including threatened species such as Little tern, Hooded plover and Pied oystercatcher (NPWS, 2018).

3.3.3.6 Ben Boyd National Park

The Ben Boyd National Park is comprised of three sections, extending approximately 45 km along the coast north and south of Twofold Bay near Eden. The park’s vegetation reflects its location in the driest, windiest part of the state’s coastline. Open forest and woodland cover most of the park. The park’s varied habitat supports a highly diverse bird population and about 50 species of mammal including a number of threatened species. Migrating whales can often be seen from the coast between late May and December and the former Davidson Whaling Station located on Twofold Bay is a tourist attraction (NPWS 2017b).

3.3.3.7 Croajingolong National Park & Nadgee Nature Reserve

The Croajingolong National Park follows the far-eastern coastline of Victoria for 100 km and together with the adjoining Nadgee Nature Reserve in New South Wales is classified as a UNESCO World Biosphere Reserve. Over 1000 species of native plants have been recorded in the park including 90 species of orchids. The park also contains areas of cool temperate and warm temperate rainforest, eucalypt forest and coastal heathland.

Of the 52 mammal species recorded in the park, arboreal mammals, such as possums, gliders and bats are common. Seals, whales and dolphins occur in coastal waters adjacent to the park. The islands and ocean beaches attract migratory seabirds and waders, the wetlands are habitat for a diversity of waterfowl and the coastal woodlands are favoured habitat for birds of prey. Significant populations of reptiles and amphibians also occur within the park.

The park's secluded coastal camping locations make it popular for beach walks, bird watching, boating and fishing (ParksVic 2017h).

The Skerries, offshore from Wingan Inlet, is home to a major seal breeding colony with an estimated population of 11,500 representing approximately 12% of the national population.

Dry open forest areas occur widely throughout Nadgee Nature Reserve with patches of rainforest occurring in creek catchments and low shrubby heaths being encountered at Mt Nadgee and along the coast. Nadgee Nature Reserve also contains examples of both fresh and salt water wetlands.

The near-coastal areas are significant breeding and foraging habitat for the Eastern bristlebird and seabirds such as the Short-tailed shearwater, Crested tern and Gannet. Most of the park's beaches support a breeding pair of Hooded plovers. Sea caves support important invertebrate 'guano' communities.

The reserve is largely undisturbed by recreational development and contains the only coastal Wilderness Area in NSW (NPWS 2017a).

3.3.3.8 Cape Howe Marine National Park

The Cape Howe Marine National Park is situated in the far east of Victoria alongside the border with New South Wales. The habitats found in the park include kelp forests, granite and sandstone reefs, sandy beaches and soft sediments. The marine life of the area is particularly diverse because species of both warm and cool areas can reside here. Whales pass by Cape Howe on their migration from Antarctica and are sometimes followed by a pod of orcas. Little penguins also forage at the rook on Gabo Island. (ParksVic 2017l).

3.3.3.9 Gabo Island Lighthouse Reserve

Gabo Island is considered to be of State zoological significance due to the presence of one of the largest breeding colonies of Little penguins in the world. Short-tailed shearwaters also breed on Gabo Island.

Common species of whale sighted from the island include Southern right whales, Humpback whales and Killer whales. Whales pass Gabo Island on their annual migration south to feed in Antarctic waters from late winter to early spring and then again during autumn on their northern migration to calve in tropical areas. Pods of dolphins are also regularly sighted from Gabo Island. Species include Common dolphins and Bottlenose dolphins. Australian and New Zealand Fur Seals are also often seen on the rocks surrounding the island.

The lighthouse was constructed from 1858 to 1862 and is the only operating lighthouse in Victoria (ParksVic, 2017p).

3.3.3.10 Point Hicks Marine National Park

The Point Hicks Marine National Park is located alongside Croajingolong National Park, East Gippsland. Many creatures found here are not found further west because the water is too cold, for example the large black sea urchin. The National Park is approximately 4,000 ha in area, with fauna including intertidal and shallow subtidal invertebrates, diverse sessile invertebrates living on subtidal reefs, kelps and small algae, and a high diversity of reef fish. In addition to the subtidal reef, the marine environment around Point Hicks includes intertidal rock operational areas and offshore sands (ParksVic 2017a). Point Hicks Marine National Park is also a popular location for recreational divers. Remains of two shipwrecks can be encountered in the National Park (see Section 3.11.2).

3.3.3.11 Beware Reef Marine Sanctuary

The Beware Reef Marine Sanctuary is a State marine protected area, IUCN Category II, located approximately 5 km southeast of Cape Conran and to the north-east of the operational area, comprises a granite outcrop covering an area of 220 ha and extending for a distance of approximately 500 m from the edge of the exposed reef. It rises from a depth of approximately 30 m and is exposed at low tide, providing a resting area for Australian fur seals. The reef is covered by outcrops of Bull kelp (*Durvillaea* sp.) and supports a range of marine life, including seahorses and leafy seadragons (ParksVic 2017b).

Beware Reef is a popular location for recreational divers and the remains of numerous shipwrecks can be encountered in the sanctuary (see Section 3.11.2).

3.3.3.12 Cape Conran Coastal Park

The Cape Conran Coastal Park extends from Sydenham Inlet in the east to Point Ricardo near Marlo. The park includes ocean beaches and is a popular park for water activities - swimming, diving, boating, fishing and rock pooling.

Many birds feed on the nectar rich plants of the heathlands and banksia woodlands including the threatened Ground parrot (*Pezoporus wallicus wallicus*). Lizards and large lace monitors are common around Cape Conran (ParksVic 2017i).

3.3.3.13 Ninety Mile Beach Marine National Park

Located 30 km south of Sale and adjacent to Gippsland Lakes Coastal Park, the Ninety Mile Beach Marine National Park covers 5 km of coastline. The huge subtidal sandy expanses characteristic of the area exhibit particularly high species diversity including tube building worms, small molluscs and many tiny crustaceans. Many pelagic fish species feed on the benthos, and young Great white sharks have also been observed feeding in the area (ParksVic 2017c).

3.3.3.14 The Lakes National Park and Gippsland Lakes Coastal Park

The Gippsland Lakes are a group of large coastal lagoons in eastern Victoria, separated from the sea by sand dunes and fringed on the seaward side by Ninety Mile Beach. The main lakes - Wellington, Victoria and King cover an area of 340 km^2 and have a shoreline of 320 km. The lakes are fed by a number of river systems. The largest of the rivers are the Latrobe River and the Avon River (flowing into Lake Wellington), and the Mitchell River, Nicholson River and Tambo River (flowing into Lake King). The system is linked to the sea by an artificial entrance near the eastern end, opened in 1889, where the town of Lakes Entrance is now situated (ParksVic 2017j,k).

The Lakes National Park covers 2390 ha bounded by Lake Victoria, Lake Reeve and the township of Loch Sport. Gippsland Lakes Coastal Park is a narrow coastal reserve covering 17,600 ha along approximately 90km of Ninety Mile Beach from Seaspray to Lakes Entrance. The Lakes National Park contains large areas of diverse and relatively undisturbed flora and fauna communities representative of the inner barrier of the Gippsland Lakes system. Gippsland Lakes Coastal Park takes in extensive coastal dune systems, woodlands and heathlands, as well as water bodies such as Lake Reeve and Bunga Arm (ParksVic 2017k).

The Gippsland Lakes system is listed under the Convention on Wetlands of International Importance (Ramsar). The Gippsland Lakes provide important feeding, resting and breeding habitat for approximately 80 waterbird species (ParksVic 2003, 2017j,k), and the lakes, and associated swamps and morasses, regularly support approximately 40,000 to 50,000 waterbirds.

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

3.3.3.15 Corner Inlet and Nooramunga Marine and Coastal Parks

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

Thirty two species of migratory waders have been recorded, including the largest concentrations of Bar tailed godwit and Great knot in south eastern Australia. In summer, the ocean beaches and sand spits are also used as nesting sites by shorebirds like the Pied oyster catcher, Crested tern, Caspian tern, Fairy tern, Hooded plover and the endangered Little tern. Fringing the saltmarshes and mangroves on the mainland and islands are stands of swamp paperbark and coast tea-tree, and further inland woodlands of coast banksia and manna gum. These are home for a variety of animals including the

New Holland mouse, swamp *antechinus*, Orange-bellied parrot, Ground parrot and White-bellied sea eagle. The parks are recognised as wetlands of international importance under the Ramsar convention (ParksVic 2017d and 2017e).

3.3.3.16 Corner Inlet Marine National Park

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

3.3.3.17 Wilsons Promontory Marine National Park, Wilsons Promontory Marine Park and Wilsons Promontory National Park

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

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

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

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

3.3.3.18 Shallow Inlet Marine and Coastal Park

Shallow Inlet Marine and Coastal Park is located between Waratah Bay and Wilsons Promontory. Shallow Inlet is a large tidal bay enclosed from the sea by a sand barrier complex. The western side of the inlet is dominated by a salt marsh terrace. Shallow Inlet and the adjacent ocean beaches are significant areas for breeding shorebirds. Over 180 species of birds have been recorded in the park. Many migratory wading birds including Pied oystercatchers and Red-capped plovers nest in the dunes and on the spit. Extensive seagrass meadows are located offshore (ParksVic, 2018).

3.3.3.19 Cape Liptrap Coastal Park

Cape Liptrap is a narrow ppeninsula formed by the spine of the Hoddle Range running out to sea. It consists of steep cliffs flanked by rock pinnacles and wave cut platforms. Between Venus Bay and Cape Liptrap the coast varies between cliffs of dune limestone and rock stacks and pebble beaches to broad sandy beaches backed by high dunes.
The Gunai/Kurnai and Boonwurry people have inhabited this area for over 6000 years. Middens mark the location of camps along the coast.
Along the coast Pacific Gulls, Silver gulls, Sooty oystercatchers and herons feed on the beach and rock platforms, and cormorants and Australian gannets forage for fish (ParksVic, 2018).

3.3.3.20 Bunurong Marine and Coastal Park and Bunurong Marine National Park

The Bunurong group of parks stretches along 17 km of coastline. The Bunurong Marine National Park is 2,100 ha in size and adjoins the Bunurong Marine Park and Bunurong Coastal Reserve.

The coastal waters protect a remarkable range of habitats including intertidal reefs, subtidal rocky reefs, algal gardens and seagrass beds. The coastal waters share the cool waters of Victoria's central and western coasts but, unlike those shores, are relatively protected from the oceanic south-westerly swell by the position of distant King Island. The gently sloping rocky seafloor is also unusual in Victoria.

The marine life of the region is considered special due to the unusual set of environmental conditions. The intertidal sandstone reefs of the area boast the highest recorded diversity of intertidal and subtidal invertebrates in eastern Victoria. The range of seaweed species is also large and includes greens, blue-greens, browns and encrusting, coralline reds.

Seagrass meadows and sandy bays are also important habitats within the area. The diversity of habitats supports many marine animals including seastars, featherstars, crabs, snails, Port Jackson Sharks and up to 87 species of fish.

The coastal area is home to the Hooded plover which breeds on the beaches (ParksVic, 2018).

3.3.3.21 Kent Group National Park and Kent Group Marine Reserve

The six islands and islets of the Kent Group comprise Tasmania's northernmost National Park. Surrounding the largest of the islands, the Kent Group Marine Reserve covers 29,000 ha of marine habitat including deep and shallow reefs as well as extensive sponge beds (TPWS 2017a). The waters around the Kent Group include the southernmost strongholds of several fish species including the violet roughy, mosaic leatherjacket and Wilson's weedfish, and the southern limit of distribution of Maori wrasse, one spot puller and Bank's shovelnose. The Marine Protected Area (MPA) is made up of a sanctuary zone which is a 'no take' zone, and a habitat protection zone which allows for lower impact fishing (e.g. abalone and rock lobster fishing, hand line fishing).

The North East Isle is a 32.62 ha unpopulated granite island with a peak elevation of 125 m above sea level. Recorded breeding seabird and wader species include Little penguin, Short-tailed shearwater, Fairy prior, Common diving petrel, Pacific gull and Sooty oystercatcher (Brothers *et al*., 2001).

3.3.3.22 Curtis Island Nature Reserve and Devils Island Nature Reserve

Curtis Island, part of the Curtis Group, is a granite island with an area of 150 ha lying in northern Bass Strait between the Furneaux Group and Wilsons Promontory. It is a nature reserve and supports up to 390,000 breeding pairs of Short-tailed shearwaters. Other recorded breeding seabird and wader species include Little penguin, Fairy prion, Pacific gull and Sooty oystercatcher.

Other islands in the Curtis Group are Cone Islet, Sugarloaf Rock and Devils Tower. Devils Tower comprises two small granite islands with a combined area of 4.77 ha. It is a nature reserve and recorded breeding seabird species include Short-tailed shearwater, Fairy prion and Common diving-petrel. The island is also used as a regular haul-out site for Australian fur seals (Brothers *et al*., 2001)

3.3.3.23 Hogan Group

Hogan Island, the largest island in the Hogan Group, is a 232 ha granite island located in northern Bass Strait between the Furneaux Group and Wilsons Promontory. Recorded breeding seabird and wader species include Little penguin, Short-tailed shearwater, Pacific gull, Silver gull and Sooty oystercatcher (Brothers *et al*., 2001)

3.3.3.24 West Moncoeur Island and East Moncoeur Island

West Moncoeur Island and East Moncoeur Island are part of Tasmania's Rodondo Group lying in northern Bass Strait south of Wilsons Promontory. The islands are granite islands ringed by steep cliffs. Recorded breeding seabird and wader species include Little penguin, Short-tailed shearwater, Fairy prion, Common diving petrel, Pacific gull and Sooty oystercatcher. Both islands are considered important breeding sites for seabirds (Brothers *et at*., 2001). West Moncoeur Island holds an important breeding colony of Australian fur seals and is a nature reserve (DPIPWE, 2000).

3.3.3.25 Strzelecki National Park

Strzelecki National Park covers 4216 hectares in the south-western corner of Flinders Island. Flinders is the main island in the Furneaux Group, a group of 54 islands in Bass Strait off the north-east coast of mainland Tasmania.

The national park protects rich and varied ecosystems as well as spectacular coastal and granite mountain landscapes. Strzelecki forms an area where plant and animal species found on mainland Australia and Tasmania overlap, making the park of important biogeographic significance. The park is also home to a high number of endemic species, rare flora and fauna and significant vegetation communities.

Flinders Island has particular significance as an important stop-over point for bird species migrating between the Australian mainland and Tasmania. A number of rare and threatened species occur in the park, including the Swift parrot, Forty-spotted pardalote, Grey-tailed tattler, and the Hooded plover (Tas Parks, 2018).

3.3.3.26 Mt William National Park

Mt William National Park located in the far north-east corner of Tasmania is an important area for the conservation of Tasmania's coastal heathlands and dry sclerophyll plants. Being a coastal park, Mt. William is an excellent area for observing sea birds. Gulls, terns, gannets, and albatrosses can be seen, as well as both the Pied and Sooty oystercatcher. Although not common, both the White-bellied sea eagle and the Wedge-tailed eagle can sometimes be spotted soaring overhead. Mt William is also the first and last stop off point for some migratory birds such as shearwaters (Tas Parks, 2018).

3.3.4 Wetlands

3.3.4.1 Wetlands of International Importance

Under the Ramsar Convention, wetland types have been defined to identify the main wetland habitats represented at each site. The classification system uses three categories (with a number of wetland types within each): (i) Marine/Coastal Wetlands; (ii) Inland Wetlands; and (iii) Human-made Wetlands. Two marine/coastal Wetlands of International Importance are located immediately inshore of the Operational and Environmental Monitoring ZPIs (Figure 3-5) and two coastal, estuarine wetlands are located within the Environmental Monitoring ZPI.

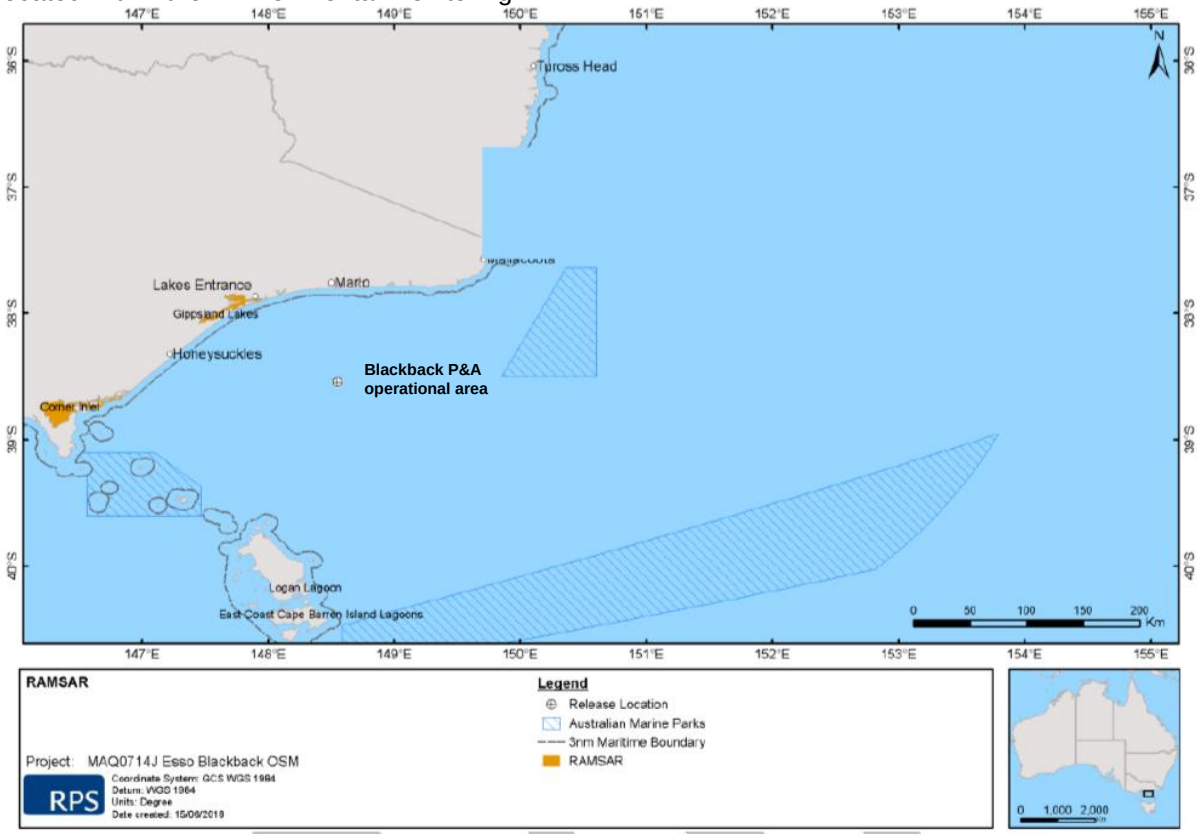


Figure 3-5 Ramsar wetlands

Gippsland Lakes Ramsar Site

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

The Gippsland Lakes Ramsar Site meets six of the Ramsar criteria (DoEE 2017s):

- Criterion 1: Contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
- Criterion 2: Supports vulnerable, endangered or critically endangered species or threatened ecological communities.
- Criterion 4: Supports plant and/or animal species at a critical stage in their life cycles or provides refuge during adverse conditions.
- Criterion 5: Regularly supports 20,000 or more waterbirds.
- Criterion 6: Regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.
- Criterion 8: Is an important source of food for fish, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere.

The Gippsland Lakes is a particularly good representative example of a natural or near-natural wetland, characteristic of the biogeographical region. It forms one of the largest coastal lagoon systems in the Drainage Division and contains a distinctive landscape of wetlands and flat coastal plains. The site supports a broad range of wetland types in close proximity to each other, including periodically inundated palustrine marshes, permanently inundated palustrine marshes, shallow lacustrine (lake) features, deep lacustrine features, lagoons with narrow inlets, and broad embayments.

The site supports several nationally threatened wetland fauna species at various stages of their life-cycle including two nationally threatened frog species (green and golden bell frogs and growling grass frogs), the vulnerable Australian painted snipe, a vulnerable fish species (the Australian grayling) and three nationally vulnerable and endangered wetland-associated flora species (dwarf kerrawang, swamp everlasting and metallic sun-orchid).

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

The Gippsland Lakes have been identified as being of outstanding importance for waterbirds, regularly supporting more than 20,000 waterfowl. Waterbird species which are considered to have met the one per cent population threshold are: Red-necked stint, Black swan, Sharp-tailed sandpiper, Chestnut teal, Musk duck, Fairy tern and Little tern.

Gippsland Lakes provides important habitats, feeding areas, dispersal and migratory pathways, and spawning sites for numerous fish species of direct and indirect fisheries significance. These fish have important fisheries resource values both within and external to the site.

Currently, parts of the Lakes system are heavily used for commercial and recreational fisheries and boating activities, while the immediate hinterland has been developed for agricultural use, and limited residential and tourism purposes (DoEE, 2017s).

The Lakes are protected as a Ramsar site by the Lakes National Park and the Gippsland Lakes Coastal Park (see Section 3.5.4.8).

In the context of the Blackback P&A project scope, and predicted geographical extent of the Environmental Monitoring ZPI, critical components as described by the ecological character description (ECD) of the Gippsland Lakes Ramsar Site (DSEWPAC 2010) that may be affected by a major spill event include Marine sub-tidal aquatic beds (C1), Coastal brackish or saline lagoons (C2), Waterbird breeding (P2), Threatened species (S1) and Fisheries resource values (S2).

Corner Inlet Ramsar Site

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

The Corner Inlet Ramsar Site also meets six of the Ramsar criteria (DoEE 2017r): 1, 2, 4, 5, 6 and 8 (as described above).

Corner Inlet is a very good example of a wetland enclosed by barrier islands in Victoria and contains the most extensive intertidal mudflats in Victoria. The area contains the only extensive bed of the Broad-leafed seagrass in Victoria. The islands of Corner Inlet, although not rich in plant diversity, are of high biogeographical significance as a result of their geological history and connectivity to the mainland during ice ages. The islands also contain significant areas of saltmarsh and mangroves, both of which are communities of very limited distribution. These communities filter pollutants, stabilize sediments and protect the shoreline from erosion.

Corner Inlet provides breeding habitat for a variety of waterbirds, including several species listed as threatened at the State level and/or occurring in significant numbers and habitat for significant aggregations of waterbirds during post-breeding, and as a refuge during adverse environmental conditions. Corner Inlet regularly supports well over 20,000 waterbirds including species such as the Eastern curlew, Curlew sandpiper, Bar-tailed godwit, and Double-banded plover.

The Corner Inlet Ramsar Site has regularly supported more than one per cent of the population of the Pied oystercatcher, Sooty oystercatcher, Pacific gull, Fairy tern, Red knot, Red necked stint and Chestnut teal.

Corner Inlet supports the nationally critically endangered Orange bellied parrot as well as several other vulnerable and endangered species, including the growling grass frog and Australian grayling. The Southern right whale, Leathery turtle, Swift parrot and Shy albatross have all also been recorded at the site.

Corner Inlet provides important habitats, feeding areas, dispersal and migratory pathways, and spawning sites for numerous fish species. Some of these include King George whiting, Australian salmon, greenback flounder, southern garfish, leatherjackets (several species), short-finned eel and gummy shark.

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

The site is protected as a Ramsar site by the Nooramunga and Corner Inlet Marine and Coastal Parks, and by part of it lying within the Corner Inlet Marine National Park (Section 3.5.4.10).

In the context of the Blackback P&A project scope, and predicted extent of Environmental Monitoring ZPI, critical components described by the ecological character description (ECD) of the Corner Inlet Ramsar Site (DSEWPAC 2010) that may be affected by a major spill event include Seagrass, mangroves, saltmarshes and intertidal and subtidal waters (C1), Waterbird breeding (P1), Threatened species (S1) and Fish abundance (S2).

Logan Lagoon Ramsar Site, Flinders Island

The Logan Lagoon Ramsar site is enclosed within the Logan Lagoon Conservation Area and is located on the south-east corner of Flinders Island in Bass Strait, Tasmania.

Logan Lagoon meets five of the Ramsar Criteria: 1, 2, 3, 4 and 6.

The Logan Lagoon Ramsar site is in the Tasmanian Australian Drainage Division. It contains two sites listed on the Tasmanian Geoconservation Database; Logan Lagoon Holocene Shorelines and Planter Beach Coastal Barrier System. Logan Lagoon, with other lagoons and dunes in the area, provides a representative and outstanding example of the development of Holocene shorelines for the local region. Planter Beach Coastal Barrier System, partly within the site, is a representative and outstanding example of how offshore bars formed with Holocene sea level rise and barrier growth has enclosed the coast, forming large lagoons. Logan Lagoon is recognised as a wetland in near pristine condition.

The nationally threatened Northern leek orchid occurs within the Logan Lagoon Ramsar site (DoEE, 2017e). The nationally threatened subspecies of the Common wombat (Bass Strait) also occurs on the site and is restricted to Flinders Island.

Logan Lagoon supports species and communities threatened in the Tasmania Drainage Division, particularly *Callitris rhomboidea* forest and the rayless starwort. The site provides breeding habitat for two beach nesting shorebirds that are threatened in the region, the Fairy tern and Little tern.

The Logan Lagoon Ramsar site is an important area for birds migrating between south-eastern Australia and Tasmania. The lagoon supports five migratory bird species, the Red-necked stint, Curlew sandpiper, Sharp-tailed sandpiper, Common greenshank, and Little tern. The site also regularly supports one percent of the global or regional populations of: Hooded plover, Fairy tern, Musk duck, and Chestnut teal (DoEE 2017x).

East Coast Cape Barren Island Lagoons Ramsar Site

The East Coast Cape Barren Island Lagoons Ramsar site is located on the east coast of Cape Barren Island, one of the Furneaux Group of islands which lie in Bass Strait to the north-east of Tasmania. The site extends from just north of Tar Point down to Jamieson's Bay and extends westwards from the coast for a distance varying from one to four kilometres (DoE 2017y). The site meets two of the Ramsar Criteria: 1 and 3.

The East Coast Cape Barren Island Lagoons site is significant as it forms a representative sample of coastal lagoons in the Flinders Biogeographic Region and is relatively undisturbed. The Cape Barren Dunes, within the site, are a geoconservation site in Tasmania. Thirsty Lagoon is a hypersaline lagoon and is a Tasmanian estuary of critical conservation significance. Three of the lagoons within the site, Flyover Lagoon 1, Flyover Lagoon 2 and Little Thirsty Lagoon, have been assessed as near pristine wetlands for Tasmania.

The Ramsar site is an important habitat for a number of plant species and vegetation communities. Thirteen threatened species listed in Tasmania occur on the site, including the Furze hakea and horny cone bush. The site represents the only known reserve in Tasmania for the threatened pink bladderwort. The White-bellied sea eagle, listed as vulnerable in Tasmania, and the Ruddy turnstone, listed under international migratory conservation agreements, also occur within the site.

This area is of cultural importance to the local Indigenous community, who manage the freehold title to part of Cape Barren Island, including the Ramsar site. Access is currently restricted, keeping the site largely undisturbed (DoEE 2017y).

3.3.4.2 Wetlands of National Importance

A classification system based on that used by the Ramsar Convention, but modified to suit the Australia, has been used to classify Wetlands of National Importance. The classification system uses three categories (with a number of wetland types within each): (i) Marine and Coastal Zone wetlands; (ii) Inland wetlands; and (iii) Human-made wetlands. Wetlands of National Importance located along the Gippsland Coast adjacent to the Environmental Monitoring ZPI include Ewing's Marsh, Lake Bunga, Mallacoota Inlet Wetlands, Sydenham Inlet Wetlands and Tamboon Inlet Wetlands.

3.4 Biological Environment

3.4.1 Fish, sharks and rays

3.4.1.1 Fish

Fish species listed under the EPBC Act that may occur in the Blackback P&A operational area, Operational ZPI and Environmental Monitoring ZPI are given in Table 3-3. One species listed as 'critically endangered', the Red handfish, may occur within the Environmental Monitoring ZPI. There are less than forty Red handfish known to exist with a second (secret) location only recently discovered along the east coast of Tasmania (ABC 2018).

Two fish species potentially occurring within the Operational ZPI and Environmental Monitoring ZPI were listed as 'vulnerable' under the EPBC Act; the Australian grayling (*Prototroctes maraena*) and the Black rockcod (*Epinephelus daemelii*) (DoEE 2017a). The Australian Grayling is a small to medium-sized, slender, silvery fish with soft-rayed fins. It is endemic to south-eastern Australia, including Victoria, Tasmania and New South Wales, and is a migratory species that inhabits estuarine waters and coastal seas as larvae/juveniles, but spend most of their lives in freshwater, inhabiting rivers and streams as adults (DSE, 2008). The Black cod's range includes warm temperate and subtropical waters of the southwestern Pacific, including south-eastern Australia and the North Island, Kermadec Islands

and Poor Knights Islands of New Zealand. Black cod generally inhabit near-shore rocky and offshore coral reefs at depths down to 50 m. In coastal waters juveniles are often found in estuary systems with adults moving into rock caves, rock gutters and on rock reefs (DoE, 2012a).

No EPBC Act listed species were found to occur within the operational area (DoEE 2018a,b,c).

Pipefishes, seahorses and seadragons, as listed under the EPBC Act, require a permit to remove them from the area. Generally, the pipefishes, seahorses and seadragons are associated with vegetation in sheltered to moderately exposed reef areas at a range of depths from 0 to 50 m, depending on the species (Edgar 1997), but usually at depths of between 5 and 25 m. Given that these species normally inhabit shallow reefs and kelp beds, they are not commonly found within the Blackback P&A operational area itself but occur around adjacent shorelines in the Environmental Monitoring ZPI (Kuiter 2000). Four additional species of pipefish and seadragon are listed as may occur within the Environmental Monitoring ZPI.

A review of data collected in 1998 and 1999 by Neira (2005) suggested that the presence of Bass Strait offshore production facilities (and subsea infrastructure) within and near the Gippsland Basin Exclusion Zone provides additional habitat for early life stages of a large suite of teleost fish families. However, it is likely that both species composition and abundance around the Blackback P&A Operational ZPI are closely linked to the ichthyofauna inhabiting hard/soft megahabitats off the Gippsland coastline and, to a lesser extent, those at the south-east corner of mainland Australia (e.g. Howe/Gabo complex).

Table 3-3 EPBC Act listed fish potentially occurring in the Blackback P&A operational area, Operational ZPI and Environmental Monitoring ZPI

Common Name	Scientific Name	Status	Likelihood of Occurrence		
			Environmental Monitoring ZPI	Operational ZPI	Operational Area
Australian grayling	*Prototroctes maraena*	V	LO	MO	-
Australian long-snout pipefish	*Vanacampus poecilolaemus*	L	MO	MO	-
Australian spiny pipehorse	*Solegnathus spinosissimus*	L	MO	MO	-
Big-belly seahorse	*Hippocampus abdominalis*	L	MO	MO	-
Black rockcod	*Epinephelus daemelii*	V	MO	MO	-
Briggs' crested pipefish	*Histiogamphelus briggsii*	L	MO	MO	-
Brushtail pipefish	*Leptoichthys fistularius*	L	MO	MO	-
Bullneck seahorse	*Hippocampus minotaur*	L	MO	MO	-
Deep-bodied pipefish	*Kaupus costatus*	L	MO	MO	-
Double-ended pipehorse	*Syngnathoides biaculeatus*	L	MO	MO	-
Hairy pipefish	*Urocampus carinirostris*	L	MO	MO	-
Halfbanded pipefish	*Mitotichthys semistriatus*	L	MO	MO	-
Javelin pipefish	*Lissocampus runa*	L	MO	MO	-
Knife-snout pipefish	*Hypselognathus rostratus*	L	MO	MO	-
Leafy seadragon	*Phycodrus eques*	L	MO	MO	-
Lord Howe pipefish	*Cosmocampus howensis*	L	MO	-	

Mother-of-pearl pipefish	*Vanacampus margaritifer*	L	MO	MO	-
Mollison's pipefish	*Mitotichthys mollisoni*	L	MO	-	-
Port Phillip pipefish	*Vanacampus phillipi*	L	MO	MO	-
Pugnose pipefish	*Pugnaso curtirostris*	L	MO	MO	-
Red handfish	*Thymichthys politus*	CE	MO	-	
Red pipefish	*Notiocampus ruber*	L	MO	MO	-
Rhino pipefish	*Histiogamphelus cristatus*	L	MO	MO	-
Ringback pipefish	*Stipecampus cristatus*	L	MO	MO	-
Robust ghostpipefish	*Solenostomus cyanopterus*	L	MO	-	-
Robust spiny pipehorse	*Solegnathus robustus*	L	MO	MO	-
Sawtooth pipefish	*Maroubra perserrata*	L	MO	MO	-
Short-head seahorse	*Hippocampus breviceps*	L	MO	MO	-
Shortpouch pygmy pipehorse	*Acentronura tentaculata*	L	MO	-	-
Smooth pipefish	*Lissocampus caudalis*	L	MO	MO	-
Spotted pipefish	*Stigmatopora argus*	L	MO	MO	-
Trawl pipefish	*Kimblaeus bassensis*	L	MO	MO	-
Tucker's pipefish	*Mitotichthys tuckeri*	L	MO	MO	-
Upside-down pipefish	*Heraldia nocturnda*	L	MO	MO	-
Weedy seadragon	*Phyllopteryx taeniolatus*	L	MO	MO	-
White's seahorse	*Hippocampus whitei*	L	MO	MO	-
Widebody pipefish	*Stigmatopora nigra*	L	MO	MO	-

Status Key:
L–Listed marine species
V-Vulnerable (threatened)

Likelihood of Occurrence Key:
KO–Species or species habitat known to occur within area
LO–Species or species habitat likely to occur within area
MO–Species or species habitat may occur within area

3.4.1.2 Sharks and Rays

Shark and ray species listed under the EPBC Act that may occur in the Blackback P&A operational area, Operational ZPI and Environmental Monitoring ZPI are given in Table 3-4. Three shark species potentially occurring were listed as 'threatened' under the EPBC Act; the Grey nurse shark (east coast population) (*Chacharias taurus*), the Great white shark (*Carcharodon carchari*) and the Whale shark (*Rhincodon typus*) (DoEE 2018b). The Great white shark was also identified as known to occur within the Blackback P&A operational area (DoEE 2018a,b,c). The Giant manta ray, is listed as species or species habitat known to occur within the Environmental Monitoring ZPI.

The **Grey nurse shark** (east coast population) (*Chacharias taurus*) is commonly found in coastal waters off southern Queensland and along the entire NSW coast (Environment Australia, 2002). The species is rarely found travelling in the northern section of the Commonwealth south-east marine bioregion (DoEE 2015) and is uncommon in Victorian, South Australian and Tasmanian waters. Not much is known about the migratory habits of Grey Nurse Sharks in Australian waters, however evidence suggests migrational movement is up and down the east coast. The sharks are found mainly in warmer waters, in water depths of 15 to 40 m but also down to 230 m on the continental shelf and generally occur either alone or in small to medium sized groups (Environment Australia 2002). The Grey Nurse

Shark is likely to occur within the Environmental ZPI (DoE 2018a,b,c), which overlaps the biologically important area[1] (BIA) for migration.

The **Great white shark** (*Carcharodon carcharias*) is normally found in nearshore waters around the areas of rocky reefs and seal colonies. Studies of great white sharks indicate that they are largely transitory. Observations of adult sharks are more frequent around seal and sea lion colonies, at onshore locations including Wilson's Promontory and the Skerries. There is a tendency for juveniles to occur in different areas to adults and these are most likely pupping grounds. In Victoria the areas off Portland and Ninety Mile Beach are seasonally important to juveniles and are frequented between the months of December and June (Holliday 2003). A breeding BIA is located adjacent to the Gippsland coastline, west of Lakes Entrance. Given their transitory nature and the proximity of known congregation areas (and foraging BIAs) it is likely that Great white sharks may transit the Blackback P&A operational area on occasion.

Whale sharks (*Rhincodon typus*) are generally found in warmer oceanic waters (where temperatures range from 21 to 25°C) and mainly occur in waters off the Northern Territory, Queensland and northern Western Australia. However, there have been a few isolated reports of immature male whale sharks in New South Wales and Victoria (Last & Stevens 1994). The Whale sharks are not likely to occur in the Blackback P&A operational area.

Two other species of shark, Shortfin Mako (*Isurus oxyrinchus*) and Porbeagle or Mackerel Shark (*Lamna nasus*), are listed as migratory marine species under the EPBC Act, likely to occur in the operational area, Operational ZPI and Environmental Monitoring ZPI.

The **Giant manta ray** (*Manta birostris*) (Australian Museum, 2014) is the largest species of ray in the world. The Manta ray lives in tropical waters but is also found occasionally in temperate seas. In Australia it is recorded from south-western Western Australia, around the tropical north of the country and south to the southern coast of NSW, where Environmental Monitoring ZPI impinges on its habitat. The Manta ray feeds on plankton which are filtered from the water through the gills (DoEE, 2018i).

Table 3-4 EPBC Act listed sharks and rays potentially occurring in the operational area and ZPI

Common Name	Scientific Name	Status	Likelihood of Occurrence		
			Environmental Monitoring ZPI	Operational ZPI	Operational Area
Great white shark	*Carcharodon carcharias*	V, MM	BKO	BKO	KO
Grey nurse shark (east coast population)	*Chacharias taurus*	CE	LO	LO	-
Mackerel shark	*Lamna nasus*	MM	LO	LO	LO
Whale shark	*Rhincodon typus*	V, MM	MO	MO	-
Shortfin mako	*Isurus oxyrinchus*	MM	LO	LO	LO
Giant manta ray	*Manta birostris*	MM	KO	-	-

Status Key:
MM–Migratory marine species
V–Vulnerable (threatened)
CE – Critically Endangered

Likelihood of Occurrence Key:
BKO–Breeding known to occur within area
FKO-Foraging, feeding or related behaviour known to occur
KO–Species or species habitat known to occur within area
LO–Species or species habitat likely to occur within area
MO–Species or species habitat may occur within area

3.4.2 Marine reptiles

Reptiles listed under the EPBC Act that may occur in the operational area, Operational ZPI and Environmental Monitoring ZPI are given in Table 3-5. Three threatened species of turtle, the Loggerhead turtle (*Caretta caretta*) (endangered and migratory), the Leatherback turtle (*Dermochelys*

[1] Biologically important areas (BIAs) are spatially defined areas where aggregations of individuals of a species are known to display biologically important behaviour such as breeding, foraging, resting or migration. Biologically important areas are a new data construct designed to assist decision-making under the EPBC Act http://environment.gov.au/marine/marine-species/bias.

coriacea) (endangered and migratory) and the Green turtle (*Chelonia mydas*) (vulnerable and migratory) are listed as potentially having habitat in the operational area, Operational ZPI and Environmental Monitoring ZPI (DoEE 2017e and 2017d). In addition to these species, the Hawksbill turtle (*Eretmochelys imbricata*) (vulnerable and migratory) and the Flatback turtle (*Natator depressus*) (vulnerable and migratory) are likely, or known, to occur in the Operational and Environmental Monitoring ZPI.

The **Loggerhead turtle** occurs in Australian waters of coral and rocky reefs, seagrass beds and muddy bars throughout eastern, northern and western Australia. Nesting is mainly concentrated in southern Queensland and from Shark Bay to the North West Cape in Western Australia, which are not in the Operational ZPI. Foraging areas are more widely distributed, but also not expected to be present in the Operational ZPI (DoEE 2017d).

The **Leatherback turtle** is a pelagic feeder found in tropical, sub-tropical and temperate waters. The species is regularly found in the high latitudes of all oceans including waters offshore from NSW, Victoria, Tasmania and Western Australia. Bass Strait is considered to have one of the three largest concentrations of feeding leatherback turtles in Australia; however, even though they have not been seen anecdotally in the operational area in the last five years, they may occur in the operational area. No major nesting areas have been recorded in Australia, although scattered isolated nesting occurs outside the Operational ZPI in southern Queensland and the Northern Territory (DoEE 2017j).

The **Green turtle** are mostly known to nest, forage and migrate across tropical northern Australia. Their distribution in Australia is concentrated around Queensland, the Northern Territory and Western Australia. Green turtles can migrate more than 2,600 km between their feeding and nesting grounds.

The **Hawksbill turtle** (*Eretmochelys imbricata*) typically occurs in tidal and sub-tidal coral and rocky reef habitats throughout tropical waters, extending into warm temperate areas as far south as northern New South Wales. In Australia the main feeding area extends along the east coast, including the Great Barrier Reef. Other feeding areas include Torres Strait and the archipelagos of the Northern Territory and Western Australia, possibly as far south as Shark Bay or beyond. Hawksbill turtles also feed at Christmas Island and the Cocos (Keeling) Islands. (DoEE 2017g). It is not expected in the operational area although it may occur further inshore.

The **Flatback turtle** (*Natator depressus*) is found only in tropical waters in Australia and is therefore only likely to occur in the northernmost reaches of the Environmental Monitoring ZPI. On the eastern coast of Australia, nesting occurs in eastern Queensland between Bundaberg in the south and northwards to Torres Strait. The main nesting sites occur in the southern Great Barrier Reef at Peak, Wild Duck and Curtis Island (Limpus 1971; Limpus *et al*. 1981, 1983b). Minor nesting occurs at Mon Repos and the Mackay Region. Scattered periodic nesting occurs on mainland and inshore islands between Townsville and Torres Strait. Unlike other sea turtle species, Flatback turtles lack an oceanic phase and remain in the surface waters of the continental shelf. Once the pelagic stage of its life is completed, the Flatback turtle moves to sub-tidal soft bottomed habitats inshore, feeding on benthic organisms. Little is known about their foraging habits and habitat. They make long oceanic migrations which are generally restricted to the continental shelf (DoEE, 2018j).

Table 3-5 EPBC Act listed reptiles potentially occurring in the operational area and Operational ZPI

Common Name	Scientific Name	Status	Likelihood of Occurrence		
			Environmental Monitoring ZPI	Operational ZPI	Operational Area
Green turtle	*Chelonia mydas*	V, MM, L	FKO	KO	LO
Hawksbill turtle	*Eretmochelys imbricata*	V, MM, L	FKO	KO	-
Leatherback turtle	*Dermochelys coriacea*	E, MM, L	FKO	KO	LO
Loggerhead turtle	*Caretta caretta*	E, MM, L	KO	LO	LO
Flatback turtle	*Natator depressus*	V, MM, L	KO	LO	-

Status Key:
E–Endangered (threatened)

Likelihood of Occurrence Key:
LO–Species or species habitat likely to occur within area

L–Listed marine species
MM–Migratory marine species

V–Vulnerable (threatened)

KO– Species or species habitat known to occur within area
FKO-Foraging, feeding or related behaviour known to occur within area

3.4.3 Seabirds and Shorebirds

Birds listed under the EPBC Act that may occur in the Blackback P&A operational area, Operational ZPI and Environmental Monitoring ZPI are given in Table 3-6. Many are protected by international agreements (Bonn Convention, JAMBA, CAMBA and ROKAMBA) and periodically pass through the Operational ZPI or Environmental Monitoring ZPI on their way to or from the Bass Strait islands and mainlands of Victoria, NSW and Tasmania.

Table 3-6 EPBC Act listed birds potentially occurring in the operational area, Operational ZPI and Environmental Monitoring ZPI

Common Name	Scientific Name	Status	Likelihood of Occurrence		
			Environmental Monitoring ZPI	Operational ZPI	Operational Area
Antipodean albatross	*Diomedea antipodensis*	V, MM, L	FLO	FLO	LO
Asian dowitcher	*Limnodromus semipalmatus*	MW,L	RKO	-	-
Australasian bittern	*Botaurus poiciloptilus*	E	KO	-	-
Australasian gannet	*Morus serrator*	L	BKO	-	-
Australian fairy tern	*Sternula nereis nereis*	V, L	BKO	FLO	FLO
Australian painted snipe	*Rostratula australis*	E, L	LO	-	-
Bar-tailed godwit	*Limosa lapponica baurei*	V, MW, L	KO	-	-
Black-browed albatross	*Thalassarche melanophris*	V, MM, L	FLO	FLO	MO
Black faced cormorant	*Phalacrocorax fuscescens*	L	BKO	-	-
Black-faced monarch	*Monarcha melanopsis*	L	KO	-	-
Black-tailed godwit	*Limosa limosa*	MW,L`	RKO	-	-
Black winged stilt	*Himantopus caudacutus*	L	RKO	-	-
Blue petrel	*Halobaena caerulea*	V, L	MO	MO	MO
Broad-billed sandpiper	*Limicola falcinellus*	MW, L	RKO	-	-
Buller's albatross	*Thalassarche bulleri*	V, MM, L	FLO	FLO	MO
Campbell albatross	*Thalassarche impavida*	V, MM, L	FLO	FLO	LO
Caspian tern	*Sterna caspia*	MM, L	BKO	-	-
Cattle egret	*Ardea ibis*	L	MO	-	-
Chatham albatross	*Thalassarche eremita*	E, MM, L	FLO	FLO	LO
Common diving petrel	*Pelecanoides urinatrix*	L	BKO	-	-
Common noddy	*Anous stolidus*	MM, L	MO	-	-
Common sandpiper	*Actitis hypoleucos*	MW, L	KO	MO	MO
Crested tern	*Sterna bergii*	MW, L	BKO	-	-
Curlew sandpiper	*Calidris ferruginea*	CE, MW, L	KO	MO	MO
Eastern bristlebird	*Dasyornis brachypterus*	E	KO	-	-
Double banded plover	*Charadrius bicintus*	MW, L	RKO	-	-
Eastern curlew	*Numenius madagascariensis*	CE, MW, L	KO	MO	MO

Fairy prion	*Pachyptila turtur subantarctica*	V, L	KO	MO	MO
Flesh-footed shearwater	*Puffinus carneipes*	MM, L	FLO	FLO	LO
Fork-tailed swift	*Apus pacificus*	MM, L	LO	LO	-
Forty-spotted pardalote	*Pardalotus quadragintus*	E	KO	-	-
Gibson's albatross	*Diomedea antipodensis gibsoni*	V, L	FLO	FLO	LO
Gould's petrel	*Pterodroma leucoptera*	E	BKO	MO	MO
Great egret	*Ardea alba*	L	KO	LO	-
Great knot	*Calidris tenuirostris*	CE, MW, L	RKO	-	-
Great skua	*Catharacta skua*	L	MO	MO	MO
Greater frigatebird	*Fregata minor*	MM, L	MO	-	-
Greater sand plover	*Charadrius leschenauitii*	V, MM, L	RKO	-	-
Greenshank	*Tringa nebularia*	MW, L	KO	-	-
Grey plover	*Pluvialis squatarola*	MW, L	RKO	-	-
Grey-headed albatross	*Thalassarche chrysostoma*	E, MM, L	MO	MO	MO
Grey-tailed tattler	*Tringa brevipes*	MW, L	RKO	-	-
Hooded plover	*Thinornis rubricollis*	L	KO	-	-
Hooded plover (eastern)	*Thinornis rubricollis*	V, L	KO	-	-
Kelp gull	*Larus dominicanus*	L	BKO	-	-
Kermadec petrel (western)	*Pterodroma neglecta neglecta*	V	FMO	-	-
Latham's snipe	*Gallinago hardwickii*	MW, L	RKO	-	-
Lesser sand plover	*Charadrius mongolus*	E, MM, L	RKO	-	-
Little curlew	*Numenius minutus*	MW, L	RKO	-	-
Little penguin	*Eudyptula minor*	L	BKO	-	-
Little tern	*Sterna albifrons*	MM, L	BKO	-	-
Marsh sandpiper	*Tringa stagnatilis*	MW, L	RKO	-	-
Masked owl (Tasmanian)	*Tyto novaehollandiae castanops*	V	KO	-	-
Northern Buller's albatros	*Thalassarche bulleri platei*	V	FLO	FLO	MO
Northern giant-petrel	*Macronectes halli*	V, MM, L	MO	MO	MO
Northern royal albatross	*Diomedea sanfordi*	E, MM, L	FLO	FLO	LO
Northern Siberian bar-tailed godwit	*Limosa lapponica menbieri*	CE, L	MO	-	-
Orange-bellied parrot	*Neophema chrysogaster*	CE, L	KO	-	-
Oriental cuckoo	*Cuculus saturatus*	L	KO	-	-
Osprey	*Pandion haliaetus*	MW, L	KO	MO	-
Pacific albatross	*Thalassarche* sp.nov.	V, L	FLO	FLO	MO
Pacific golden plover	*Pluvialis fulva*	MW, L	RKO	-	-
Pacific gull	*Larus pacificus*	L	BKO	-	-
Painted honeyeater	*Grantiella picta*	V	BKO	-	-

Pectoral sandpiper	*Calidris melanotos*	MW, L	KO	MO	MO
Pin tailed snipe	*Gallinago stenura*	MW, L	RKO	-	-
Rainbow bee-eater	*Merops ornatus*	L	MO	-	-
Red capped plover	*Charadrius ruficapillus*	L	RKO	-	-
Red necked stint	*Calidris ruficolis*	MW, L	RKO	-	-
Red knot	*Calidris canutus*	E, MW, L	KO	MO	MO
Regent honeyeater	*Anthocharea phrygia*	CE	KO	-	-
Ruddy turnstone	*Arenaria interpres*	MW, L	RKO	-	-
Ruff	*Philomachus pugnax*	MW, L	RKO	-	-
Rufous fantail	*Rhipidura rufifrons*	L	KO	-	-
Sanderling	*Calidris alba*	MW, L	RKO	-	-
Salvin's albatross	*Thalassarche salvini*	V, MM, L	FLO	FLO	LO
Satin flycatcher	*Myiagra cyanoleuca*	L	KO	-	-
Sharp-tailed sandpiper	*Calidris acuminata*	MW, L	RKO	MO	MO
Short tailed shearwater	*Ardenna tenuirostris*	MM, L	BKO	-	-
Soft plumaged petrel	*Pterodroma mollis*	V	MO	-	-
Sooty albatross	*Phoebetria fusca*	V, MM, L	LO	MO	MO
Sooty shearwater	*Ardenna grisea*	MM	BKO	-	-
Southern giant-petrel	*Macronectes giganteus*	E, MM, L	FLO	LO	MO
Southern royal albatross	*Diomedea epomophora*	V, MM, L	FLO	FLO	LO
Spectacled monarch	*Monarcha trivirgatus*	L	KO	-	-
Swift parrot	*Lathamus discolor*	CE, L	KO	-	-
Swinhoe's snipe	*Gallinago megala*	MW, L	RLO	-	-
Tasmanian azure kingfisher	*Ceyx azureus diemenensis*	E	LO	-	-
Tasmanian shy albatross	*Thalassarche cauta*	V, MM, L	FLO	FLO	LO
Tasmanian wedge-tailed eagle	*Aquila audax fleayi*	E	BLO	-	-
Terek sandpiper	*Xenus cinereus*	MW, L	RKO	-	-
Wandering albatross	*Diomedea exulans*	V, MM, L	FLO	FLO	LO
Wedge-tailed shearwater	*Ardenna pacifica*	MM	BKO	-	-
Whimbrel	*Numenius phaeopus*	MW, L	RKO	-	-
White bellied storm petrel	*Fregetta grallaria*	V	LO	LO	LO
White-bellied sea-eagle	*Haliaeetus leucogaster*	L	KO	-	-
White-capped albatross	*Thalassarche cauta steadi*	V, MM, L	FLO	FLO	LO
White-faced storm petrel	*Pelagodroma marina*	L	BKO	-	-
White-throated needletail	*Hirundapus caudacutus*	L	KO	-	-
Wood sandpiper	*Tringa glareola*	MW, L	RKO	-	-

Status Key:
E–Endangered (threatened)
V–Vulnerable (threatened)
CE-Critically endangered (threatened)
L–Listed marine species
MM–Migratory marine birds
MW–Migratory wetland species

Likelihood of Occurrence Key:
BLO-Breeding likely to occur within area
FLO-Feeding likely to occur within area
RLO-Roosting likely to occur within area
LO–Species or species habitat likely to occur within area
MO–Species or species habitat may occur within area
KO–Species or species habitat known to occur within area

RKO-Roosting known to occur within area
BKO-Breeding known to occur within area

The Victorian coast and neighbouring islands provide feeding and nesting habitats for many coastal and migratory bird species. Seabirds spend much of their lives at sea in search of prey only to return for a short time to breed and raise chicks. Most species tend to forage on their own, though large feeding flocks will gather at rich or passing food sources. Squid, fish and krill are common sources of food.

No islands are located within the Operational ZPI, although islands within the Environmental Monitoring ZPI are nesting sites for many seabird species, many of which migrate to these islands each year. Colonies of seabirds occur to the west of the operational area in Corner Inlet and on the islands around Wilsons Promontory, to the east at The Skerries, Tullaberga Island and Gabo Island and to the south on Curtis Island and the Hogan Island Group (Harris & Norman 1981). Species that nest and breed on these islands include the listed marine species, Little penguin (*Eudyptula minor*), Black faced cormorant (*Phalacrocorax fuscescens*), White-fronted tern (*Sterna striata*), Common diving petrel (*Pelecanoides urinatrix*) and the Fairy prion (*Pachyptila turtur*). Recent research investigating feeding movements of the Little penguin has found individuals that nest on these islands move into eastern Bass Strait (Hoskins *et al*. 2008). The breeding and/or foraging BIAs for the Little penguin, Black-faced cormorant, White fronted tern and Common diving petrel overlap the Environmental Monitoring ZPI. The BIAs for four migratory shearwater species overlap with the Operational ZPI and/or Environmental Monitoring ZPI.

Montague Island on the southern NSW coast is a breeding BIA for the Crested tern.

Eastern Bass Strait is also a foraging area for at least 16 listed species of albatross, six listed species of petrel and one species of skua. Most also forage in eastern Bass Strait within the Operational ZPI and Environmental Monitoring ZPI and are expected to occur within the operational area (Table 3-6). There are seven species of albatross and four species of petrel where the BIA for foraging overlaps the operational area, Operational ZPI or Environmental Monitoring ZPI.

The Environmental Monitoring ZPI also includes much of the east Gippsland coastline. Coastal wetlands such as Corner Inlet and Gippsland Lakes are periodically inhabited by waders (birds) due to their migratory nature. Migratory species include the Red-necked stint (*Calidris ruficollis*), Curlew sandpiper (*Calidris ferruginea*), Great knot (*Calidris tenuirostris*), Bar-tailed godwit (*Limosa lapponica*) and Eastern curlew (*Numenius madagascariensis*). Similarly, a number of oceanic seabirds, such as the Little tern (*Sterna albifrons*) and Short-tailed shearwater (*Puffinus tenuirostris*) migrate to the East Gippsland region. Over 20 million Short-tailed shearwaters nest on Bass Strait islands during summer (Pizzey 2003). Of these, only the Curlew sandpiper (*Calidris ferruginea*), and Eastern curlew (*Numenius madagascariensis*) may also occur in the operational area.

Both the Hooded plover (*Thinornis rubricollis*) and Australian fairy tern (*Sternula nereis nereis*) nest along the sandy beaches of the Gippsland coast within the Environmental Monitoring ZPI. Nests are predominantly located in the adjacent sparsely vegetated dunes above the high tide level (DoEE 2017h and 2017i) but these species are not expected within the Blackback P&A operational area.

Little penguins (*Eudyptula minor*) breed in colonies along the southern coast of Australia. They seek prey in shallow short dives, frequently between the 10 to 30 m range and very occasionally extending to 60 m. Its diet varies in different locations but consists mainly of small school fish, some squid or krill (shrimp-like crustaceans). Little penguin colonies can be found at Gabo Island, Tullaberga Island, The Skerries, Rabbit Island, Monkey Point (Wilsons Promontory), Seal Island, Notch Island, Rag Island, Hogan Island Group (Tas.), Curtis Island (Tas) (DoEE 2017m) but are not expected within the Operational ZPI or the operational area.

It is common to see some migratory birds rest on offshore facilities in the Gippsland Basin before continuing on their migratory flight, however, the presence of the offshore facilities does not appear to significantly disrupt or divert their migratory route or disorient the birds.

3.4.4 Marine mammals

3.4.4.1 Pinnipeds

Seals listed under the EPBC Act that may occur in the operational area, Operational ZPI and Environmental Monitoring ZPI are given in Table 3-7 Dugongs are not expected to occur within the Environmental Monitoring ZPI. The two species of seal, the Australian fur seal (*Arctocephalus pusillus*)

and the New Zealand fur seal (*Arctocephalus forsteri*), do not carry a threatened status under Commonwealth legislation (DoEE 2017j) or Victorian State legislation. Note that the results of the EPBC Protected Matters Search Tool state "seals … have only been mapped for breeding sites near the Australian continent". Seals are frequently seen throughout Esso's oil and gas operational areas and are usually found resting on the offshore facility structures and swimming in the vicinity.

The 2010 estimate of pup numbers (Kirkwood *et al* 2010) placed the total number of Australian fur seal pups at 26,000, which increased since 2002. There are 10 established breeding colonies of the Australian fur seal, which are restricted to islands in the Bass Strait; six occurring off the coast of Victoria and four off the coast of Tasmania (Kirkwood *et al*. 2010; Pemberton & Kirkwood 1994; Warneke 1995). Australian fur seals breed during the summer months, with pups born from late October to late December. Breeding is known to occur within the Environmental Monitoring ZPI.

The closest colonies of the Australian fur seal in the Environmental Monitoring ZPI are located at Gabo Island, Kanowna Island (off Wilson's Promontory) and The Skerries, which is home to a major Australian fur seal breeding colony with an estimated population of 11,500, representing approximately 12% of the national population. Between feeding trips seals return to land to rest, for example at the resting site at Cape Conran.

In addition to the colonies, Australian fur seals have over 50 'haul out' or resting sites around south eastern Australia. Pups are not typically born at 'haul out' sites.

Table 3-7 EPBC Act listed seals potentially occurring in the operational area and ZPI

Common Name	Scientific Name	Status	Likelihood of Occurrence		
			Environmental Monitoring ZPI	Operational ZPI	Operational Area
Australian fur seal	*Arctocephalus pusillus*	L	BKO	LO	-
New Zealand fur seal	*Arctocephalus forsteri*	L	MO	MO	-

Status Key:
L–Listed marine species

Likelihood of Occurrence Key:
LO- Species or species habitat likely to occur within area
MO–Species or species habitat may occur within area
BKO-Breeding known to occur within area

Satellite tracking of seals from both Kanowna Island and The Skerries, and reports from offshore facilities within the Gippsland Basin Exclusion Zone near the shore show that Australian fur seals commonly occur in the vicinity of these facilities (Arnould & Kirkwood 2008) and commonly rest on these structures.

The New Zealand fur seal also breeds along the south-eastern coast of Australia, ashore (generally on remote islands), and feeds at sea, mostly on cephalopods and fish. Despite breeding in south-eastern waters, the largest populations are found outside Bass Strait on Macquarie Island.

3.4.4.2 Cetaceans

Cetaceans listed under the EPBC Act that may occur in the Blackback P&A operational area, Operational ZPI and Environmental Monitoring ZPI are given in Table 3-8. Under the EPBC Act all cetaceans (whales, dolphins and porpoises) are protected in Australian waters. The Australian Whale Sanctuary includes all Commonwealth waters from the 3 NM State waters limit out to the boundary of the Exclusive Economic Zone (i.e. out to 200 NM and further in some places) and within the Sanctuary it is an offence to kill, injure or interfere with a cetacean. All states and territories also protect whales and dolphins within their waters (DoEE 2017l). The following cetaceans are listed as threatened:

- Blue whale (Balaenoptera musculus)
- Fin Whale (Balaenoptera physalus)
- Humpback whale (Megaptera novaeangliae)
- Sei Whale (Balaenoptera borealis)
- Southern right whale (Eubalaena australis)

Table 3-8 EPBC Act listed cetaceans potentially occurring in the operational area and ZPI

Common Name	Scientific Name	Status	Likelihood of Occurrence		
			Environmental Monitoring ZPI	Operational ZPI	Operational Area
Dolphins					
Bottlenose dolphin	*Tursiops truncatus s. str.*	L	MO	MO	MO
Common dolphin	*Delphinus delphis*	L	MO	MO	MO
Dusky dolphin	*Lagenorhynchus obscurus*	MM, L	LO	LO	LO
Indian ocean/spotted bottlenose dolphin	*Tursiops aduncus*	L	LO	LO	-
Risso's dolphin, Grampus	*Grampus griseus*	L	MO	MO	MO
Southern right whale dolphin	*Lissodelphis peronei*	L	MO	MO	MO
Whales					
Andrew's beaked whale	*Mesoplodon bowdoini*	L	MO	MO	MO
Antarctic minke whale	*Balaenoptera bonaerensis*	MM, L	LO	LO	-
Arnoux's beaked whale	*Berardius arnuxii*	L	MO	MO	-
Blainsville's beaked whale	*Mesoplodon densirostris*	L	MO	MO	MO
Blue whale	*Balaenoptera musculus*	E, MM, L	LO	LO	LO
Bryde's whale	*Balaenoptera edeni*	MM, L	LO	MO	MO
Cuvier's beaked whale	*Ziphius cavirostris*	L	MO	MO	MO
Dwarf sperm whale	*Kogia simus*	L	MO	MO	MO
False killer whale	*Pseudorca crassidens*	L	LO	LO	LO
Fin Whale	*Balaenoptera physalus*	V, MM, L	FLO	FLO	FLO
Gingko beaked whale	*Mesoplodon ginkgodens*	L	MO	MO	-
Gray's beaked whale	*Mesoplodon grayi*	L	MO	MO	-
Hector's beaked whale	*Mesoplodon hectori*	L	MO	MO	MO
Humpback whale	*Megaptera novaeangliae*	V, MM, L	FKO	FKO	KO
Killer whale, Orca	*Orcinus orca*	MM, L	LO	LO	LO
Long-finned pilot whale	*Globicephala melas*	L	MO	MO	MO
Minke whale	*Balaenoptera acutorostrata*	L	MO	MO	MO
Pygmy right whale	*Caperea marginata*	MM, L	FLO	FLO	FLO
Pygmy sperm whale	*Kogia breviceps*	L	MO	MO	MO
Sei Whale	*Balaenoptera borealisc*	V, MM, L	FLO	FLO	FLO
Short-finned pilot whale	*Globicephala macrorhynchus*	L	MO	MO	MO
Southern bottlenose whale	*Hyperoodon planifrons*	L	MO	-	-
Southern right whale	*Eubalaena australis*	E, MM, L	KO	KO	MO
Sperm whale	*Physeter macrocephalus*	MM, L	MO	MO	MO

Common Name	Scientific Name	Status	Likelihood of Occurrence		
			Environmental Monitoring ZPI	Operational ZPI	Operational Area
Strap-toothed beaked whale	*Mesoplodon layardii*	L	MO	MO	MO
Tasman beaked whale	*Tasmacetus shepherdi*	L	MO	MO	-
True's beaked whale	*Mesoplodon mirus*	L	MO	MO	MO

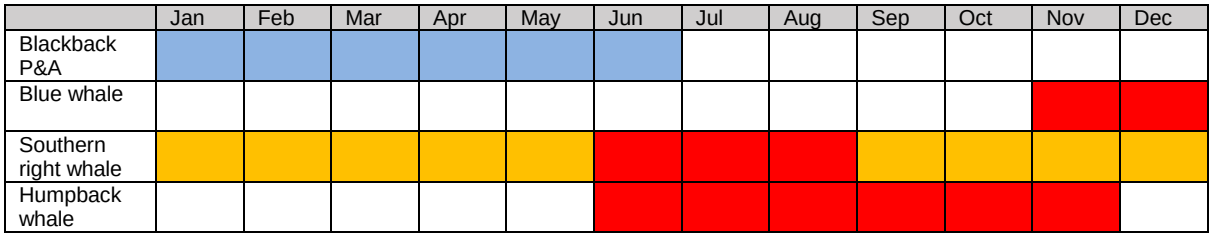
Status Key:
C–Listed cetacean species
V–Vulnerable (threatened)
E–Endangered (threatened)
L–Listed marine species
MM–Migratory marine species
MT–Migratory terrestrial species

Likelihood of Occurrence Key:
FLO–Foraging likely to occur within area
FKO-Foraging known to occur within area
LO–Species or species habitat likely to occur within area
MO–Species or species habitat may occur within area
KO–Species or species habitat known to occur within area

Humpback whales migrate annually along the eastern coast of Australia heading north to tropical calving grounds from June to August, and south to Southern Ocean feeding areas from September to November. While the main migration route of this species is along the east coast of Australia along the continental shelf to the east of Bass Strait, some animals migrate through Bass Strait and into the Blackback P&A operational area. Humpback whales do not feed, breed or rest in Bass Strait and the Victorian coastal waters are not a key location for this whale species (Bannister *et al.* 1996). Humpback whales (*Megaptera novaeangliae*) are regularly spotted from Esso's operational areas within the Gippsland Basin Exclusion Zone.

Southern right whales (*Eubalaena australis*) travel along the southern coast of Australia in winter and spring (Kemper *et al.* 1997). They migrate annually along the eastern coastline from high latitude feeding grounds to lower latitudes for calving between mid-May and September (DoEE 2017k). Winter, in particular, is the peak for Southern right whale abundance, especially along the southern coast of Australia (Kemper *et al.* 1997). At this time, calving adult females are spotted frequently nearshore in shallow, northeast trending bays over sandy bottoms (Bannister *et al*. 1996). Although sighted along the Gippsland coast during migration, the known Southern right whale calving and nursery zone is located in the nearshore waters of western Victoria around Warrnambool, a considerable distance from the operational area and outside of the Environmental Monitoring ZPI. The Operational ZPI and Environmental Monitoring ZPI overlap with the Southern right whale migration BIA.

Table 3-9 Whale migration timing in Bass Strait



Blue whales (*Balaenoptera musculus*). There are two subspecies of Blue whale that occur within Australian waters and Blue whale sightings in Australia are widespread. Blue whales have extensive migration patterns that are not known to follow any particular coastlines or oceanographic features (Bannister et al. 1996). However, they are most likely to be present in southeastern Australian seas from November through to December as a result of migration to warmer waters.

Blue whales are observed more frequently in western Victoria and southeastern South Australia, where they occur along the continental shelf break (Gill 2002; Gill & Morrice 2003) than in eastern Bass Strait. While eastern Bass Strait is not known as a feeding or aggregation area for this mammal species and sightings in the Gippsland Basin are reasonably rare (Bannister et al., 1996), feeding areas do occur at upwelling locations where nutrient enriched water and krill occur. Australia has two recognised seasonal feeding aggregations of Blue whales. One occurs adjacent to the Bonney Upwelling system off South Australia and Victoria, and the other off Exmouth, WA. Outside of these recognised feeding areas possible foraging areas for the Pygmy blue whale (*Balaenoptera musculus brevicauda*) include Bass

Strait (DoEE 2015b). Pygmy blue whales are typically foraging in this area between January and April, while the abundance of whales in the area varies within and between seasons (DoEE 2015b). The operational area, Operational ZPI and Environmental Monitoring ZPI overlap the foraging BIA for the Pygmy blue whale.

Sei whales (*Balaenoptera borealis*) have been infrequently recorded in Australian waters; however occasional sightings have been recorded within the Great Australian Bight (DoEE 2018d). Sei Whales typically feed between the Antarctic and Subtropical convergences (DoEE 2018d). However, Sei Whales have also been observed feeding on the continental shelf in the Bonney Upwelling region during November and May, suggesting the area may be used for opportunistic feeding (DoEE 2018d).

Fin whales (*Balaenoptera physalus*) The distribution of Fin whales in Australian waters is uncertain, but they have been recorded in Commonwealth waters off most States (DEE, 2017t). Fin whales frequently lunge or skim feed, at or near the surface (DEE, 2017t). Fin whales have been observed in waters off the Bonney Upwelling during November and May, suggesting the region may be used for opportunistic feeding (DEE 2018e).

The **Bottlenose dolphin** (*Tursiops truncatus*) and the **Common dolphin** (*Delphinus delphis*) are commonly sighted in near-shore Victorian waters and may be in the operational area; however they do not carry a threatened status under Commonwealth legislation (DoEE 2017j). These species feed on fish and cephalopods.

Dusky dolphins (*Lagenorhyynchus obscurus*) are listed as a migratory marine species likely to be present in the vicinity of the Blackback P&A operational area; however they do not carry a threatened status under Commonwealth legislation (DoEE 2017j). Although Dusky dolphins have been sighted off Tasmania, there is no known calving locality for this species in Australian waters (Gill *et al.* 2000).

The Environmental Monitoring ZPI impinges on the southernmost extent of the BIA for breeding for the **Indo-pacific/spotted bottlenose dolphin.**

Whales are known, and observed, to play and display normal breaching, blowing, lobtailing and diving behaviour around the operational area and vessels, including with calves, before moving on again. Although whales are known to migrate through the region during spring and autumn/early winter, the Blackback P&A operational area is not a recognised feeding, breeding or resting area for cetaceans.

3.4.5 Listed threatened species recovery plans

The requirements of the species recovery plans and conservation advices (Table 3-10) have been considered to identify any requirements that may be applicable to the risk assessments (Chapter 5). Recovery plans are enacted under the EPBC Act and remain in force until the species is removed from the threatened list. Conservation advice provides guidance on immediate recovery and threat abatement activities that can be undertaken to facilitate the conservation of a listed species or ecological community.

Table 3-10 outlines the recovery plans and conservation advices relevant to those species identified as potentially occurring within or utilising habitat in the operational area, Operational ZPI and Environmental Monitoring ZPI by the EPBC Protected Matters search and summarises the key threats to those species, as described in relevant recovery plans and conservation advices.

Table 3-10 Conservation advice for EPBC listed species considered during environmental risk assessment

Species / Sensitivity	Status	Likelihood of Occurrence			Recovery Plan / Conservation Advice (Date Issued)	Presence of BIA	Key Threats Identified in the Recovery Plan / Conservation Advice	Relevant Conservation Actions	Relevant Section of EP
		Environmental Monitoring ZPI	Operational ZPI	Operational Area					
Marine mammals									
Sei whale	V, MM	FLO	FLO	FLO	Approved Conservation Advice for *Balaenoptera borealis* (sei whale) (TSSC 2015a)		Noise interference, vessel disturbance	• Evaluate risk of sound impacts to cetaceans and, if required, ensure appropriate mitigation measures are implemented • Evaluate risk of vessel strikes and, if required, ensure appropriate mitigation measures are implemented • Ensure all vessel strike incidents are reported in the National Vessel Strike Database	6.13 and 6.22
Blue whale	E, MM	LO	LO	LO	Conservation Management Plan for the Blue Whale - A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999 (DoEE 2015b)	Distribution / Foraging (Pygmy blue whale) – overlaps Operational Area	Noise interference, vessel disturbance	• Evaluate risk of sound impacts to cetaceans and, if required, ensure appropriate mitigation measures are implemented • Evaluate risk of vessel strikes and, if required, ensure appropriate mitigation measures are implemented • Ensure all vessel strike incidents are reported in the National Vessel Strike Database	6.13 and 6.22
Fin whale	V, MM	FLO	FLO	FLO	Approved Conservation Advice for *Balaenoptera physalus* (fin whale) (TSSC 2015c)		Noise interference, vessel disturbance	• Once the biologically important areas for fin whales are defined (both spatial and temporal aspects) an assessment of anthropogenic noise impact should be conducted for this species • Develop a national vessel strike strategy that investigates the risk of vessel strikes on fin whales and also identifies potential mitigation measures • Evaluate risk of sound impacts to cetaceans and, if required, ensure appropriate mitigation measures are implemented • Evaluate risk of vessel strikes and, if required, ensure appropriate mitigation measures are implemented • Ensure all vessel strike incidents are reported in the National Vessel Strike Database	6.13 and 6.22
Southern right whale	E, MM	KO	KO	MO	Conservation Management Plan for the Southern Right Whale. A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999 (DSEWPAC 2012)	Migration – overlaps Operational and Environmental Monitoring ZPIs	Noise interference, vessel disturbance	• Evaluate risk of sound impacts to cetaceans and, if required, ensure appropriate mitigation measures are implemented • Evaluate risk of vessel strikes and, if required, ensure appropriate mitigation measures are implemented • Ensure all vessel strike incidents are reported in the National Vessel Strike Database	6.13 and 6.22

Species / Sensitivity	Status	Likelihood of Occurrence			Recovery Plan / Conservation Advice (Date Issued)	Presence of BIA	Key Threats Identified in the Recovery Plan / Conservation Advice	Relevant Conservation Actions	Relevant Section of EP
		Environmental Monitoring ZPI	Operational ZPI	Operational Area					
Humpback whale	V, MM	FKO	FKO	KO	Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale) (TSSC 2015e)		Noise interference, vessel disturbance	• Site-specific modelling should be conducted to investigate acoustic impacts (including cumulative impacts) on humpback whale calving, resting, feeding areas or migratory pathways (for example from pile driving or explosives) • Ensure the risk of vessel strike on humpback whales is considered when assessing actions that increase vessel traffic in areas where humpack whales occur and, if required appropriate mitigation measures are implemented to reduce the risk of vessel strike • Evaluate risk of sound impacts to cetaceans and, if required, ensure appropriate mitigation measures are implemented • Ensure all vessel strike incidents are reported in the National Vessel Strike Database	n/a – noise modelling would not reduce potential impact of noise to cetaceans given the low levels expected (6.13 and 6.22)
Marine reptiles									
Loggerhead turtle Green turtle Hawksbill turtle Flatback turtle	E, MM V, MM V, MM V, MM	KO FKO FKO KO	LO KO KO LO	LO LO - -	Recovery plan for marine turtles in Australia (DoEE 2017)		Vessel disturbance, oil pollution	• Vessel interactions identified as a threat. No explicit relevant management actions relating to vessels prescribed in the plan • Ensure that spill risk response programs and strategies include management of turtles and turtle habitats	6.13 and 6.28 / 6.32 / 8
Leatherback turtle,	E, MM	FKO	KO	LO	Recovery plan for marine turtles in Australia (DoEE 2017) Commonwealth Conservation Advice on *Dermochelys coriacea* (TSSC 2008)		Vessel disturbance	• No explicit relevant management actions. Vessel interactions identified as a threat	6.13
Fish, sharks and rays									
Australian grayling	V	LO	MO	-	National Recovery Plan for the Australian Grayling *Prototroctes maraena* (DSE, 2008)		Vegetation clearing, impoundment or diversion of water, installation of structures acting as barriers to migration	• No relevant management actions	n/a
Black rockcod	V	MO	MO	-	Approved Conservation Advice for *Epinephelus daemelii* (black cod) (DoE, 2012a)		Incidental by-catch and illegal fishing	• No relevant management actions	n/a

Species / Sensitivity	Status	Likelihood of Occurrence			Recovery Plan / Conservation Advice (Date Issued)	Presence of BIA	Key Threats Identified in the Recovery Plan / Conservation Advice	Relevant Conservation Actions	Relevant Section of EP
		Environmental Monitoring ZPI	Operational ZPI	Operational Area					
Red handfish	CE	MO	-	-	Approved Conservation Advice for *Thymichthys politus* (red handfish) (DoE, 2012b)		Habitat degradation resulting from introduced species, pollution and siltation, increasing water temperatures.	• No explicit relevant management actions. General pollution (affecting inshore reefs) identified as a threat.	6.28 / 6.32
Grey nurse shark (east coast population)	CE	LO	LO	-	Recovery Plan for the Grey Nurse Shark (Carcharias taurus) (DoEE 2014)	• Migration – overlaps Environmental Monitoring ZPI	Habitat modification and pollution	• No explicit relevant management actions	n/a
Great white shark	V, MM	BKO	BKO	KO	Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPAC 2013)	• Distribution • Foraging / Breeding – overlap Operational and Environmental Monitoring ZPIs	None	• No explicit relevant management actions	n/a
Whale shark	V, MM	MO	MO	-	Approved Conservation Advice for *Rhincodon typus* (whale shark) (TSSC 2015g)		Vessel disturbance, habitat degradation / modification	• Assess impacts to whale sharks from offshore installations and associated environmental changes (chronic noise, light spill, water temperature changes, altered nutrient levels) and the mitigation measures required • Evaluate risk of vessel interactions and ensure appropriate mitigation measures are implemented if required (collision avoidance systems) • Minimise offshore development and transit of large vessels near habitats which correlate with whale shark aggregations and migration routes	n/a – no installation
Seabirds									
Antipodean albatross, Gibson's albatross, Southern Royal albatross, Wandering albatross, Northern royal albatross, Sooty,	V, MM V V V, MM E, MM V, MM	FLO FLO FLO FLO FLO LO	FLO FLO FLO FLO FLO MO	LO LO LO LO LO MO	National recovery plan for threatened albatrosses and giant petrels 2011-2016 (DSEWPAC 2011b)	White capped albatross / Northern giant petrel / Southern giant petrel – Foraging BIA overlaps Environmental Monitoring ZPI Indian yellow nosed albatross / Campbell albatross / Black browed albatross and Shy albatross – Foraging BIA	Vessel disturbance, oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32

Species / Sensitivity	Status	Likelihood of Occurrence			Recovery Plan / Conservation Advice (Date Issued)	Presence of BIA	Key Threats Identified in the Recovery Plan / Conservation Advice	Relevant Conservation Actions	Relevant Section of EP
		Environmental Monitoring ZPI	Operational ZPI	Operational Area					
albatross, Buller's albatross, Shy albatross, White-capped albatross, Grey-headed albatross, Chatham albatross, Campbell albatross, Black-browed albatross, Salvin's albatross, Northern giant petrel, Southern giant petrel	V, MM V, MM V, MM E, MM E, MM V, MM V, MM V, MM V, MM E, MM	FLO FLO FLO MO FLO FLO FLO FLO MO FLO	FLO FLO FLO MO FLO FLO FLO FLO MO LO	FLO LO LO MO LO LO MO LO MO MO		overlaps Operational Area Bullers albatross – Foraging BIA overlaps Operational Area Antipodean albatross – Foraging BIA overlaps Operational Area			
Australasian bittern	E	KO	-	-	Approved Conservation Advice for *Botaurus poiciloptilus* (Australasian Bittern) (DSEWPAC 2011a)		Habitat modification and pollution	• Manage any changes to hydrology that may result in changes to sedimentation or pollution.	6.28 / 6.32
Australian fairy tern	V	BKO	FLO	FLO	Commonwealth Conservation Advice on *Sternula nereis nereis* (Fairy Tern) (TSSC 2011)		Habitat degradation / modification - oil pollution	• Ensure appropriate oil-spill contingency plans exist to manage subspecies' breeding sites which are vulnerable to oil spills	6.28 / 6.32 / 8
Australian painted snipe	E	LO	-	-	There is no adopted or made Recovery Plan for this species.		Habitat degradation / modification - oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32
Bar-tailed godwit,	V, MW	KO	-	-	Approved Conservation Advice for *Limosa lapponica baueri* (Bar-tailed godwit (western Alaskan)) (TSSC 2016b)		Habitat degradation - oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32
Blue petrel	V	MO	MO	MO	Conservation Advice *Halobaena caerulea* (Blue petrel (TSSC 2015b)		None	• No explicit relevant management actions	n/a
Curlew sandpiper	CE, MW	KO	MO	MO	Approved Conservation Advice for *Calidris*		Habitat degradation - oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32

Species / Sensitivity	Status	Likelihood of Occurrence			Recovery Plan / Conservation Advice (Date Issued)	Presence of BIA	Key Threats Identified in the Recovery Plan / Conservation Advice	Relevant Conservation Actions	Relevant Section of EP
		Environmental Monitoring ZPI	Operational ZPI	Operational Area					
					ferruginea (Curlew Sandpiper) (TSSC 2015d)				
Eastern bristlebird	E	KO	-	-	National Recovery Plan for Eastern Bristlebird *Dasyornis brachypterus*. (OEH 2012).		Habitat degradation / modification - oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32
Eastern curlew	CE, MW	KO	MO	MO	Approved Conservation Advice for *Numenius madagascariensis* (Eastern Curlew) (TSSC 2015f)		Habitat degradation / modification - oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32
Fairy prion (southern)	V	KO	MO	MO	Conservation Advice *Pachyptila turtur subantarctica* fairy prion (southern) (TSSC 2015b)		None	• No explicit relevant management actions	n/a
Forty spotted pardalote	E	KO	-	-	Fauna Recovery Plan: Forty-Spotted Pardalote 2006-2010 (DPIWE, 2006)		Loss or decline in area of habitat – clearing/deforestation	• No relevant managerment actions	n/a
Gould's petrel	E	BKO	MO	MO	Gould's Petrel (*Pterodroma leucoptera leucoptera*) Recovery Plan (DoECC (NSW) 2006)		Oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32
Great knot	CE, MW	RKO	-	-	Conservation Advice for *Calidris tenuirostriss* (Great Knot) (TSSC 2016c)		Habitat degradation – water quality deterioration, environmental pollution	• No explicit relevant management actions.	n/a
Greater sand plover	V, MM	RKO	-	-	Conservation Advice *Charadrius leschenaultii* Greater sand plover (DoE, 2016a)		Habitat loss and degradation – water quality deteriation, pollution/contamination, human disturbance	• No explicit relevant management actions	n/a
Hooded plover (eastern)	V	KO	-	-	Recovery Plan not required. significant research and management actions are being undertaken at national, state and local levels		Oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32
Kermadec petrel (western)	V	FMO	-	-	Norfolk Island Region Threatened Species Recovery Plan (DEWHA, 2010a)		Disturbance, degradation and loss of breeding habitat (on Norfolk Island)	• No relevant management actions	n/a
Lesser sand plover	E, MM	RKO	-	-	Conservation Advice *Charadrius mongolus* Lesser sand plover (DoE, 2016b)		Habitat loss and degradation – water quality deteriation, pollution/contamination, human disturbance	• No explicit relevant management actions	n/a
Masked owl (Tasmanian)	V	KO	-	-	Approved Conservation Advice for *Tyto*		Habitat clearing and fragmentation	• No relevant management actions	n/a

Species / Sensitivity	Status	Likelihood of Occurrence			Recovery Plan / Conservation Advice (Date Issued)	Presence of BIA	Key Threats Identified in the Recovery Plan / Conservation Advice	Relevant Conservation Actions	Relevant Section of EP
		Environmental Monitoring ZPI	Operational ZPI	Operational Area					
					novaehollandiae castanops (Tasmanian Masked Owl) (DEWHA, 2010b)				
Northern Siberian bar-tailed godwit	CE	MO	-	-	Approved Conservation Advice for *Limosa lapponica menzbieri* (Bar-tailed godwit (northern Siberian)) (TSSC 2016)		Habitat degradation - oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32
Orange-bellied parrot	CE	KO	-	-	National recovery plan for the Orange-bellied Parrot (Neophema chrysogaster) (DELWP, 2016)		Oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32
Painted honeyeater	V	BKO	-	-	Conservation Advice *Grantiella picta* painted honeyeater (DoE, 2015b)		Habitat loss	• No relevant management actions	n/a
Red knot	E, MW	KO	MO	MO	Approved Conservation Advice for *Calidris canutus* (Red knot) (TSSC 2016a)		Habitat degradation - oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32
Red knot, Great knot, Bar-tailed godwit, Greater sand plover					Wildlife conservation plan for migratory shorebirds (DoEE, 2015d)		Habitat degradation / modification - oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32
Regent honeyeater	CE	KO	-	-	National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia*) (DoEE, 2016)		Habitat loss / degradation	• No explicit relevant management actions.	n/a
Soft plumaged petrel	V	MO	-	-	Conservation Advice *Pterodroma Mollis* soft-plumaged petrel (DoE, 2015a).		Introduced predators	• No relevant management actions	n/a
Swift parrot	CE	KO	-	-	National Recovery Plan for the Swift Parrot *Lathamus discolor*. (Saunders and Tzaros 2011).		Oil pollution	• No explicit relevant management actions. Oil pollution is recognised as a threat	6.28 / 6.32
Tasmanian azure kingfisher	E	LO	-	-	Approved Conservation Advice for *Ceyx azureus diemenensis* (Tasmanian Azure Kingfisher) (DEWHA, 2010c)		Habitat clearing, illegal fishing, human interfence.	• No relevant management actions	n/a

Species / Sensitivity	Status	Likelihood of Occurrence			Recovery Plan / Conservation Advice (Date Issued)	Presence of BIA	Key Threats Identified in the Recovery Plan / Conservation Advice	Relevant Conservation Actions	Relevant Section of EP
		Environmental Monitoring ZPI	Operational ZPI	Operational Area					
Tasmanian wedge-tailed eagle	E	BLO	-	-	Threatened Tasmanian Eagles recovery plan: 2006-2010 (DPIWE 2006)		Oiling, pollution	• No explicit relevant management actions. Oiling identified as a cause of unnatural mortality	6.28 / 6.32
White-bellied storm-petrel (Tasman Sea)	V	LO	LO	LO	Lord Howe Island Biodiversity Management Plan (DoECC (NSW) 2007)		Habitat degradation / modification	• • No explicit relevant management actions. Degradation / modificiation to threatened habitat recognised as a threat	6.28 / 6.32

3.4.6 Shoreline and intertidal marine habitat

No shoreline contact, above the ANZECC reference level threshold for entrained oil, is expected based on oil spill modelling. The Environmental Monitoring ZPI, which is based on the ANZECC reference level entrained oil threshold, however includes much of the coastline of Gippsland and extends along the coastline of southern NSW, therefore, for completeness, further details on the shoreline have been included below.

The coastline, from Wilson's Promontory in the west to Cape Howe in the east, including the offshore islands at the extremities of the region, consists mainly of steep rocky cliffs, sandy beaches and rocky outcrops. The shoreline is generally one of high sea activity due to prevailing weather patterns.

The shoreline of the inland waters adjacent to the Environmental Monitoring ZPI which includes Corner Inlet, the Gippsland Lakes and Mallacoota Inlet consist of sandy beach, salt marsh, mangrove or mudflats (Boon *et al*. 2011). These shores are generally protected from all but the worst weather conditions and therefore have very low sea activity.

3.4.6.1 Intertidal Rocky Shores

Sheltered rocky shores are characterized by a rocky substrate that can vary widely in permeability. Sheltered clay scarps are characterized by a steep, usually vertical scarp in hard-packed and stiff clay. Vegetation usually occurs landward of the scarp (NOAA 2010d). Most animals on the intertidal rocky shores are herbivorous molluscs, grazing algae off rock surfaces. Filter feeding organisms abound, including tube building worms, sea squirts (cunjevoi), mussels and barnacles.

Intertidal rocky shores occur at Bastion Point, Quarry Beach, Shipwreck Creek, Seal Cove, Little Rame Head, Sandpatch Point, Petrel Point, Thurra River, Clinton Rocks, Cloke Rock, Tamboon Inlet and Shelley Beach.

3.4.6.2 Intertidal, Emergent, Sub Tidal Aquatic Vegetation (Seagrass and Kelp)

Seagrasses are highly productive habitats that occur on intertidal flats and in shallow coastal waters worldwide from arctic to tropical climates. Water temperature, light penetration, sediment type, salinity, and wave or current energy control seagrass distribution. Seagrasses provide breeding and nursery grounds for fish and wildlife. Seagrasses are used by fish and shellfish as nursery areas.

Kelps are very large brown algae that grow on hard sub tidal substrates in cold temperate regions. Kelps have a holdfast that attaches to the substrate, a stem-like or trunk-like stipe, and large, flattened, leaf-like blades called fronds. Because kelps require constant water motion to provide nutrients, they are located in relatively high-energy settings. Kelp forests support a diverse animal community of fish, invertebrates, and marine mammals as well as important algal communities (NOAA 2010d).

The Giant Kelp Marine Forests of South East Australia ecological community, consisting mostly of giant kelp (*Macrocystis pyrifera*) plants, are listed as endangered under the EPBC Act and may occur within the Environmental Monitoring ZPI. The Giant Kelp Marine Forests are found predominately in temperate south eastern waters. The largest extent of the ecological community is found in Tasmanian coastal water, but some patches may also be found in Victoria.

Intertidal, emergent and sub tidal aquatic vegetation occurs at Mallacoota and Mallacoota Inlet, Tamboon Inlet, Cann River Estuary (continuously open), Sydenham Inlet, Snowy River Estuary, Yeerung River Estuary (intermittently open), Lake Tyers estuary (intermittently open), Inside Lakes Entrance - Gippsland Lakes Ramsar Site and Corner Inlet Ramsar Site.

3.4.6.3 Sheltered Intertidal Flats and Bare Sediment

Sheltered intertidal flats are composed primarily of mud with minor amounts of sand and shell. They are usually present in calm-water habitats, sheltered from major wave activity, and frequently backed by marshes. The sediments are very soft and cannot support even light foot traffic in many areas. There can be large concentrations of bivalves, worms, and other invertebrates in the sediments. They are heavily used by birds for feeding (NOAA 2010d).

Sheltered intertidal flats occur at Nooramunga and Corner Inlet Marine and Coastal Parks. Bare sediment occurs at Mallacoota Inlet, Wingan Inlet, Sydenham Inlet - Bemm River and Mud Lake.

3.4.6.4 Marshes

Salt marshes can be found behind Mallacoota Entrance to Lake Barracouta, Wingan Inlet, inside Cann River Estuary, Tamboon Inlet, Sydenham Inlet (Bemm River Estuary and Mud Lake), Dock Inlet, inside Snowy River Estuary, Lake Tyers Estuary, and inside Lakes Entrance - Gippsland Lakes Ramsar Site.

Intertidal wetlands contain emergent, herbaceous vegetation, including both tidal and muted tidal marshes. Depending on location and inter-annual variations in rainfall and runoff, associated vegetation may include species tolerant or adapted to salt, brackish, or even tidal freshwater conditions. The marsh width may vary from a narrow fringe to extensive areas. Sediments are composed of organic muds except where sand is abundant on the margins of exposed areas. Exposed areas are located along bays with wide fetches and along heavily trafficked waterways. Sheltered areas are not exposed to significant wave or boat wake activity. Abundant resident flora and fauna with numerous species and high use by birds, fish, and shellfish (NOAA, 2010d).

3.4.6.5 Mangroves

Along the Gippsland coast, mangroves can be found in Corner Inlet and Nooramunga Marine and Coastal Park and more recently have also been found in Cunningham Arm at Lakes Entrance.

The roots and trunks are intertidal, with only the lowest leaves inundated by high tide. The width of the forest can range from one tree, to many kilometres. The substrate can be sand, mud, leaf litter, or peat, often as a veneer over bedrock. They are highly productive, serve as nursery habitat, and support a great diversity and abundance of animal and plant species (NOAA, 2010d).

3.4.6.6 Sandy Beaches and Dunes

Sandy beaches and dunes form a distinctive group of marine habitats with their own biological communities. These beaches are flat to moderately sloping and relatively hard-packed. They can be important areas for nesting by birds. This environment occurs along the coastline of Victoria and NSW.

The Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community is listed as critically endangered under the EPBC Act and occurs along the Gippsland coastline (DoEE, 2017t). The ecological community provides habitat for over 70 threatened plants and animals and provides a buffer to coastal erosion and wind damage (DoEE, 2017t). The ecological community occurs close to the coast from northern Queensland to eastern Victoria and on offshore islands. It occurs on a range of landforms including dunes and flats, headlands and sea-cliffs.

3.4.6.7 Cliffs/Exposed Rocky Headlands

The intertidal zone is steep (>30° slope) and narrow with very little width.

Sediment accumulations are uncommon because waves remove debris that has slumped from the eroding cliffs. There is strong vertical zonation of intertidal biological communities. Species density and diversity vary greatly, but barnacles, snails, mussels, polychaetes, and macroalgae can be abundant (NOAA, 2010).

This environment occurs behind Betka Beach and Secret Beach through to Little Rame Head, Sandpatch Point, Wingan Point, The Skerries, Rame Head, Petrel Point, Point Hicks, Clinton Rocks, Tamboon Inlet, Pearl Point, Cape Conran (Needle Rocks, Irvine Rocks, Quincy Rocks Salmon Rocks), and at Ricardo Point.

3.4.7 Subtidal marine habitats

The subtidal marine habitats that occur within the operating area, Operational ZPI and Environmental Monitoring ZPI include:

- Water Column (Open Water)
- Soft sediment
- Subtidal reef
- Submarine canyons.

3.4.7.1 Water Column

The water column is occupied by planktonic (drifting) and pelagic (actively swimming) species.

Plankton species, including both phytoplankton and zooplankton, are a key component in oceanic food chains. Phytoplankton are photosynthetic organisms that spend either part or all of their lifecycle drifting with the ocean currents. Phytoplankton biomass ranges from about 0.1 to 1.6 mg/L across Bass Strait from shallow to deeper waters and about 0.5 mg/L at the operational area (Gibbs *et al*. 1991). Phytoplankton biomass rapidly drops off with water depth, to about 0.1 μg/L below 100m, due to diminishing light penetration.

Zooplankton is comprised of small protozoa, crustaceans (such as krill) and the eggs and larvae from larger animals. Zooplankton biomass is higher in shallow waters of Bass Strait (16.1 mg/m^3 dry weight off Mallacoota and 15.5 mg/m^3 off Seaspray), dropping to between 1.2 – -2.1 mg/m^3 further offshore (integrated over the top 50 m of the water column) (Gibbs *et al.* 1991). As with phytoplankton, zooplankton biomass appears to be higher in the shallow waters of the shelf. Copepods were the dominant species present (Watson & Chaloupka 1982).

Significant pelagic species such as marine mammals, marine reptiles and fish are considered in Section 3.6.4, Section 3.6.2 and Section 3.6.1 respectively.

3.4.7.2 Soft Sediment

Soft sediment habitat is the dominant habitat within the operational area and Operational ZPI. The benthic fauna present on the soft sediment can be broadly divided into two groupings:

- The epibenthos which includes sessile species such as sponges and bryozoans, hydroids, ascidians, poriferans and mobile fauna including hermit crabs, sea stars and octopus
- The infauna which includes a diverse range of species such as amphipods, shrimps, bivalves, tubeworms, small crustaceans, nematodes, nemerteans, seapens, polychaetes and molluscs (Parry *et al*. 1990).

The subtidal sand community along Ninety Mile Beach has been found to be the most species-rich of its type in the world. A survey of a section of Ninety Mile Beach found approximately 800 marine invertebrate species per 10 m^2, compared to 300 to 400 per 10 m^2 in comparable habitats (Coleman *et al*. 1997). This high species richness was a major factor in the creation of a Marine National Park on the Ninety Mile Beach (ParksVic 2017c). The subtidal sand invertebrate fauna are dominated by small animals, mostly crustaceans, molluscs, echinoderms and polychaetes (Plummer *et al*. 2003, Bax and Williams 2001).

Parry *et al*. (1990) found high diversity and patchiness of benthos sampled off Lakes Entrance, where a total of 353 species of infauna was recorded. Crustaceans (53%), polychaetes (32%) and molluscs (9%) dominated sample results. A significant site for the listed opistobranch mollusc (seaslug) *Platydoris galbana* is located off Delray Beach, 2 km south-west of Golden Beach on the shoreline (O'Hara & Barmby, 2000). An ROV seabed survey was conducted following drilling at the Snapper operational area in 2009 (Coffey 2010) and a seabed monitoring program conducted near West Tuna in 1999 (URS 2000) confirmed that polychaetes and crustaceans were the most abundant infaunal taxa present in the seabed sediments.

The introduced New Zealand screw shell (*Maoricolpus roseus*) is present in eastern Bass Strait and is known to form extensive and dense beds on the sandy seafloor spreading to the 80 metres (m) isobath off eastern Victoria and NSW (Patil *et al*. 2004).

3.4.7.3 Subtidal Reefs

This habitat occurs either as extensions of intertidal rocky shores or as isolated offshore reefs.

Subtidal rocky reefs are scattered throughout Environmental Monitoring ZPI waters from the low-water mark to a depth of 100 m. The rocky reefs of southern Australia support a highly endemic marine flora and fauna. Over 1,400 species of algae have been recorded from southern Australia, with 70% endemic to the area (ParksVic 2017m). The shallow reefs (0 to 20 m) are dominated by kelps or other brown seaweeds. Bubble kelp (*Phyllospora* sp.) and leather kelp (*Ecklonia* sp.) combine to cover many of the exposed reefs. *Sargassum* spp. and *Cystophora* spp. are dominant in more sheltered areas.

This habitat consists of sub tidal substrates composed of rock, boulders, or cobbles, though there can be patches of sand veneer covering a hard bottom. There may be rich, diverse communities of attached and associated algae and animals; often there is little open space. Some of these habitats form a relief (reef or bank) several metres high that attracts a diversity of fish (NOAA 2010d).

Subtidal rocky reefs located along the Gippsland shore include; Bastion Point, Quarry Beach, Little Rame Head, Long Reef, Wingan Point, The Skerries, Rame Head, Petrel Point, Thurra River, Point Hicks Marine National Park, Pearl Point, Yeerung River Estuary (Intermittently open), Cape Conran (East Cape, Cowrie Bay, Flat Rocks), Beware Reef, Point Ricardo and Ricardo Beach.

Isolated offshore reefs are also likely to be present within the operational area and Operational ZPI.

3.4.7.4 Submarine canyons

Submarine canyons are abundant features along continental and oceanic island margins that connect continental shelves to deep ocean basins. Because of the physical complexity of canyon habitats, predictions concerning the effects of canyons on diversity are not straightforward since a variety environmental and physical characteristics interact in canyon habitats. The most important driver affecting biodiversity and biomass/abundance patterns in canyons is organic matter input and is mostly related to coastal detrital inputs or pelagic productivity regimes (de Leo *et al*. 2010).

While some studies have reported levels of megafaunal biodiversity in canyons rivalling seamounts (Schlacher *et al*. 2007), in other cases high disturbance rates (Rowe *et al*., 1982) and absence of stable habitat heterogeneity lead to faunal impoverishment compared to adjacent slope environments (Vetter *et al*. 2010).

Bass Canyon System

The Bass Canyon is an 80 km long, narrow (10 km wide) and linear, southeast trending flat bottomed canyon located at 3,000–4,000 m depth in the Gippsland Basin. Entering the head of the Bass Canyon at 3,000 m depth are five shelf-breaching tributary canyons and three slope-confined tributary canyons (Mitchell *et al*., 2007). The Bass Strait canyons are characterised by dense shelf water cascades (Godfrey *et al*. 1980).

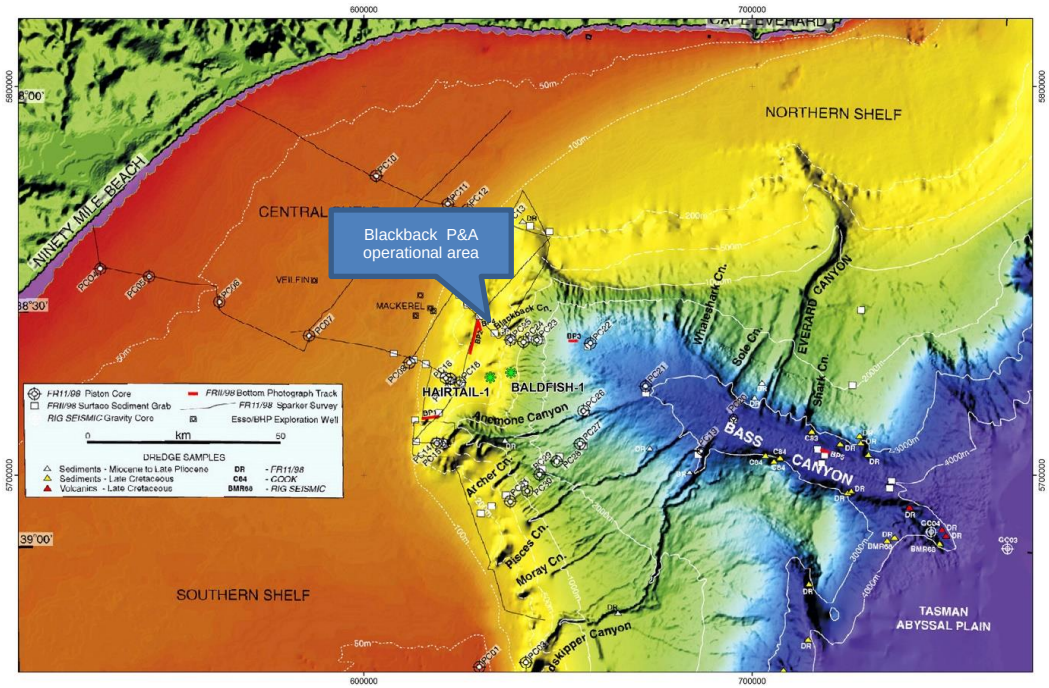


Figure 3-6 **Blackback P&A operational area relative to bathymetry of the Gippsland Basin and Bass Canyon (after Mitchell *et al*., 2007)**

The Blackback P&A operational area lies near Blackback Canyon (Henry *et al*, 2000), to the north of the Anemone Canyon, one of the five major tributary canyons. The Bass Canyon is typified by U-shaped tributary canyons and canyon heads, followed by scoured canyon walls further down the slope.

Backscatter studies typify the slopes as mudflows with down-slope sediment transport flow patterns, funnelling down the Bass Canyon. At the lower slopes (>1,750m depth) there is a marked change, from mud to a sandy composition. The Blackback P&A operational area (Facies: MS) is described as muddy, fine-grained calcarenite (packstone and wackestone), consisting of 55-80% calcium carbonate,

composed of medium-coarse sand sized bioclasts (i.e. derived from shell fragments or similar organic remains containing mollusc, forams, bryozoan), with a fine quartz sand, pelloids & organic-rich calcareous mud matrix.

Deposition in the Blackback P&A operational area may be attributed to the mixing of shelf and pelagic particles during remobilisation in downslope low-energy sediment gravity flows, similar to sediment facies described by Passlow (1997) from the adjacent Otway, and are interpreted as mud-lubricated, sandy debris flow deposits.

Because of the lack of hard substrate and relative sediment mobility, canyon fauna the area is expected to generally impoverished, in analogy with similar observations for canyons with high rates of flow and sediment accumulation (see above).

3.5 Commercial Fishing

Commercial fishing in south-eastern Australia includes inshore coastal waters, mainly state administered fisheries, and areas along the continental slope, mainly Commonwealth fisheries. The majority of the commercial fishing (volume basis) occurs in Commonwealth waters along the continental shelf and the upper continental slope (see Figure 3-7).

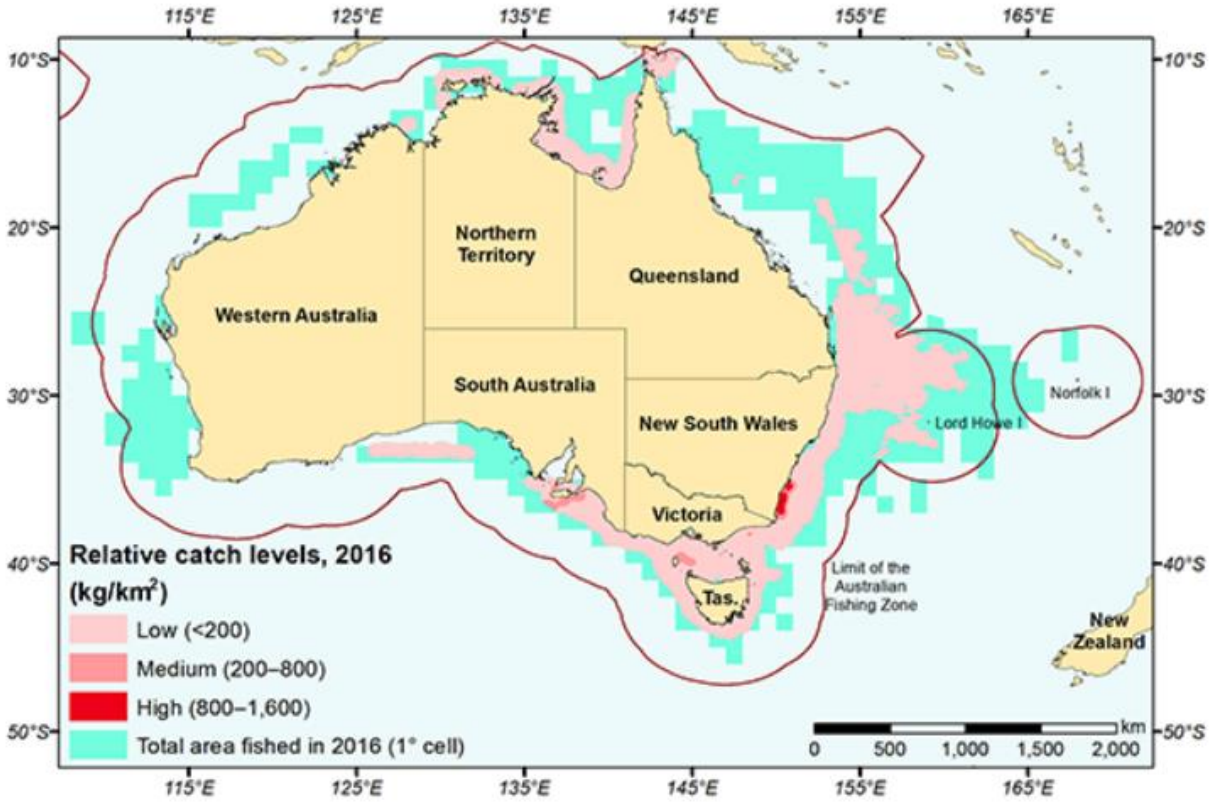


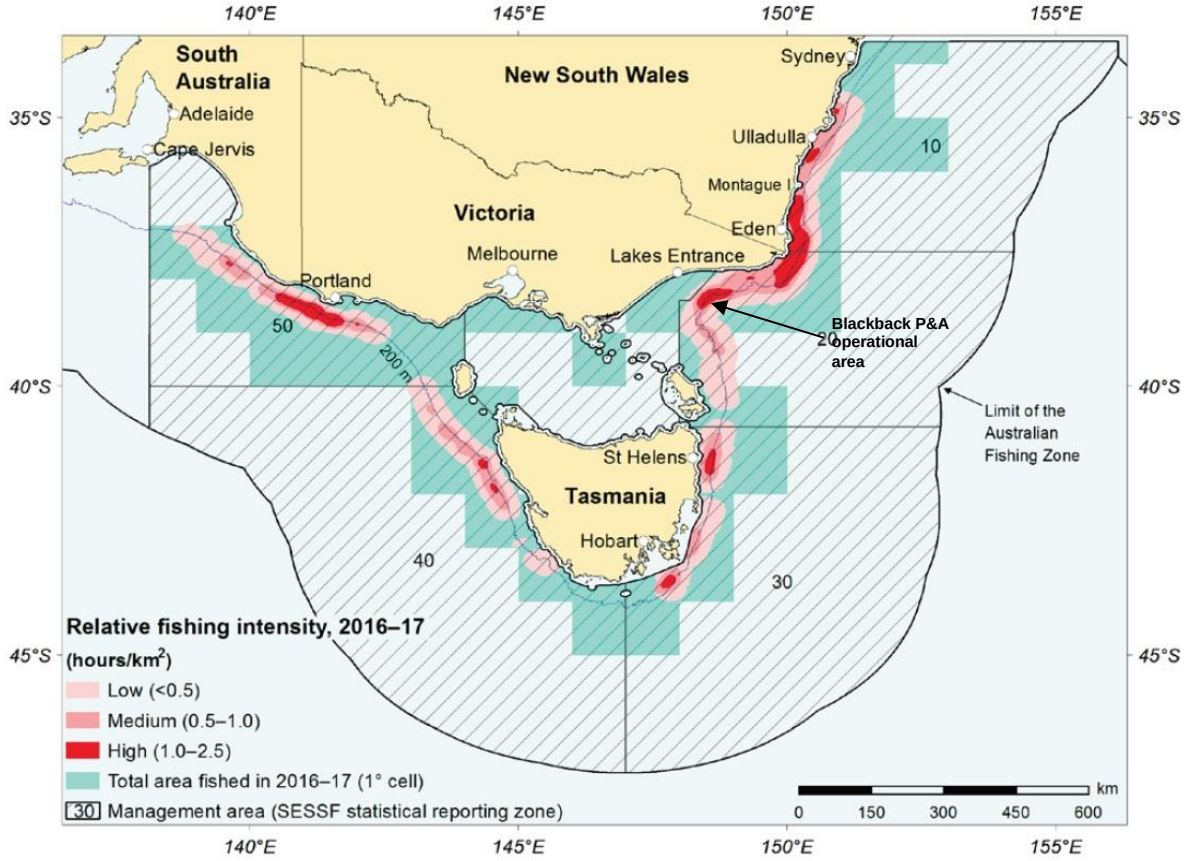
Figure 3-7 Relative catch levels of Commonwealth-managed fisheries, 2016 (ABARES 2017)

The main commercial Commonwealth fisheries within the Operational ZPI are the Southern and Eastern Scalefish and Shark Fishery (SESSF) which includes ((AFMA, 2014a, 2016, ABARES, 2016a, 2017) :

- Commonwealth Trawl Sector (CTS); and
- Gillnet, Hook and Trap Sectors (GHTS)

Of these, Danish seiners and otter-board trawlers of the Commonwealth Trawl Sector are most likely to be encountered either in the operational area or within the Operational ZPI. Fishing intensity for the Commonwealth Trawl Sector is shown in Figure 3-8.

Other Commonwealth fisheries potentially operational within the Operational ZPI include the Small Pelagic Fishery, Southern Jig Squid Fishery, Eastern Skipjack Tuna Fishery and the Eastern Tuna and Billfish Fishery.



Note: Fishing vessels are prohibited from entering the 500 m PSZ.

Figure 3-8 Relative fishing intensity in the Commonwealth Trawl Sector, 2016–17 fishing season (ABARES 2017)

3.5.1 Fishing activity around Gippsland Basin

A review of fishing activity for 2010-16 within a one degree grid square (3,600 NM^2, or about 12,360 km^2), based on data provided by AFMA (2017d), confirms that of the three main fisheries in this area, Danish seine fishing made up the largest component (around 53%), followed by otter board trawling (43%) and gillnet fishing (4%).

Danish seine fisheries between 2010 and 2016 (average of 754 tonne per annum) largely yielded Flathead (89%), while gillnet fisheries (average of 55 tonne/annum) mainly yielded Gummy shark (72%) and other shark species (25%).

Otter trawling within the Commonwealth Trawl Sector between 2010 and 16 (average of 609 tonne/annum), yielded a range of fish species, dominated by Flathead (33%), Pink ling (12%), Blue grenadier (9%) and Silver warehou (7%). An average of 0.9 tonne/annum of Orange roughy was landed in this area between 2010 and 2016, decreasing from 1.4 tonne in 2010 to 0.4 tonne in 2016.

In 2010, hook fishing made up around 5% of total catch in this area (85 tonne), landing mainly Pink ling (63%), followed by Reef ocean perch, and Ribaldo (9% each), Blue eyed trevally and Gummy shark (6% each) and Hapuku (3%). Less than 5 boats were hook-fishing in this area between 2011 and 2016, so that no detailed data were released.

Scallop fisheries within this area yielded around 34 tonne in 2012, with no data available for other years due to low fishing intensity (less than 5 boats). Although the Small Pelagic Fishery, Eastern Skipjack

Fishery, as well as Southern Bluefin, Eastern Tuna and Billfish Fishery are operational in this area, none of these took place between 2010 and 2016.

Southern Squid Jig fisheries yielded about 79 tonne in 2012, with no fishing activity in 2010, 2011, 2014 and 2015, and less than 5 squid boats operating in this area in 2016.

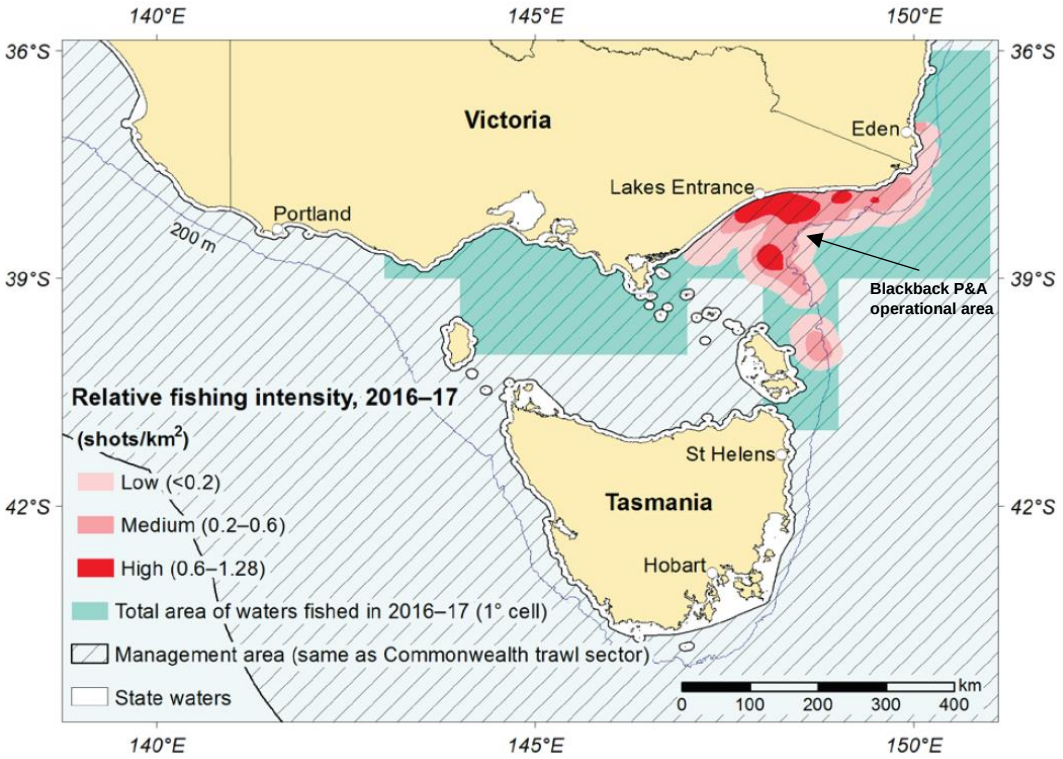


Figure 3-9 Relative fishing intensity by Danish-seine operations, 2016–17 (ABARES 2017)

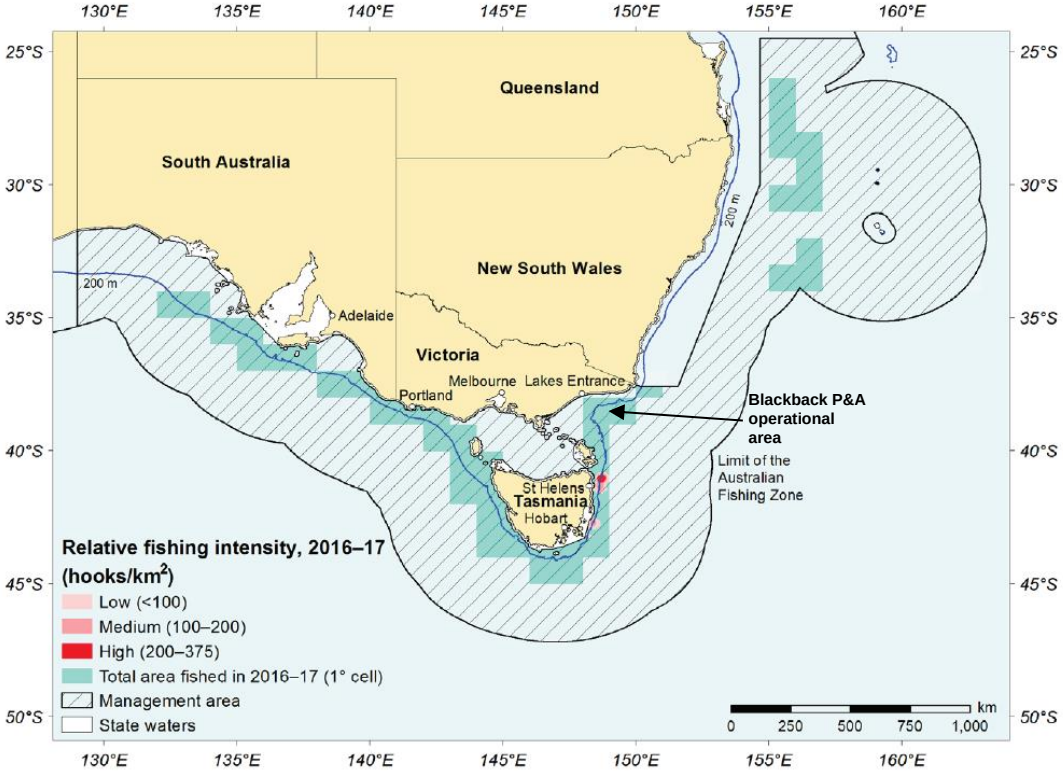


Figure 3-10 Relative fishing intensity in the Scalefish Hook Sector (SHS), 2016–17 (ABARES 2017)

3.5.1.1 Southern and Eastern Scalefish and Shark Fishery (SESSF)

The SESSF incorporates the Commonwealth Trawl Sector (formerly the Southeast Trawl Sector), the Great Australian Bight Trawl Sector (GABTS), East Coast Deepwater Trawl Sector (ECDTS) and Gillnet, Hook and Trap Sector (GHTS; formerly the Southern Shark and Southeast Non-trawl Sectors) under a common set of management objectives (Figure 3-9). The SESSF extends from waters off southern Queensland, south around Tasmania and then west to Cape Leeuwin in Western Australia.

Sharks are fished using predominantly demersal gillnets (Walker *et. al.* 2001), with a small percentage caught by demersal longlines. The deepwater demersal sharks occur between 50 and 1,800m depth offshore and live up to 50 years, maturing between 25 and 30 years (ABARES, 2016c).

The trawl and scalefish-hook sectors of the fishery include over 100 species that are captured, but 16 species provide the bulk of trawl landings and are subject to quota management. Fishing is year round, varying according to availability, market price and progress with quotas (Figure 3-10).

The trawl sector includes otter trawl and Danish seine methods. Otter trawlers use larger boats, generally greater than 20 m long, while Danish seiners use smaller boats and operate in nearshore shelf areas often in more restricted areas unavailable to otter trawlers (Larcombe & Begg 2008). Board boats can stay out at sea for 5 -7 days, whilst Danish seiners usually fish for a maximum of three days. The range of Danish seiners, which target predominantly flathead, is limited to a 100 km radius from Lakes Entrance (Figure 3-10).

Otter board trawlers, operating out of Lakes Entrance, concentrate their fishing operations in deeper waters and consequently catch more morwong, ling, blue grenadier and other deep sea species. The net is towed by two wire ropes and fixed, between these ropes and the net, are paravanes (commonly known as boards or doors). Unlike the Danish seine net which closes and stops fishing after about two minutes of towing, the board trawl net remains open and may be towed for any length of time, although it is rare for tows to exceed four hours (Leftrade 2013). Distribution of the fishing effort shows a predominance of effort concentrated along the 100-250 m contour (Figure 3-11; ABARES 2017).

The SESSF includes several stocks that are classified as overfished. These overfished stocks are blue warehou (*Seriolella brama*), eastern gemfish (*Rexea solandri*), gulper sharks (*Centrophorus harrissoni*, *C. moluccensis*, *C. zeehaani*), school shark (*Galeorhinus galeus*), redfish (*Centroberyx affinis*) and orange roughy (*Hoplostethus atlanticus*) in two zones (southern and western) (ABARES, 2017).

3.5.1.2 Small Pelagic Fishery

The Small Pelagic Fishery (SPF) targets Australian sardines (*Sardinops sagax*), jack mackerel (*Trachurus declivis*), blue mackerel (*Scomber australasicus*) and redbait (*Emmelichthys nitidus*). The fishery extends from the Queensland/New South Wales border, typically outside 3 NM, to southern Western Australia (Figure 3-11). The fishery includes purse-seine and midwater trawl fishing vessels.

The key target species for the purse-seine vessels are Australian sardine (*Sardinops sagax*), blue mackerel (*Scomber australasicus*) and jack mackerel (*Trachurus declivis*). The key target species for the midwater trawl fishery are blue mackerel, jack mackerel and redbait (*Emmelichthys nitidus*) (ABARES 2017).

Small pelagic fish are generally caught during targeted fishing for a single species. They are also caught in small quantities in other Commonwealth- and state-managed fisheries, including the Southern and Eastern Scalefish and Shark Fishery, the Eastern Tuna and Billfish Fishery, the Western Tuna and Billfish Fishery, and the New South Wales Ocean Hauling Fishery. There is no active SPF fisheries near the Blackback P&A operational area.

Jack mackerel are found in continental shelf waters between 27 to 460 m, although generally in waters less than 300m deep. They live for 16 years, maturing at 3 to 4 years. Spawning occurs between December and March (ABARES, 2018).

Blue mackerel are found in continental shelf waters between 87 to 265 m. They live for about 7 years, maturing at 2 years. Spawning occurs between September and May (ABARES, 2018).

Redbait are found in continental shelf waters between 86 to 500 m. They live for about 21 years, maturing at 2 to 4 years. Spawning occurs between September and November (ABARES 2018).

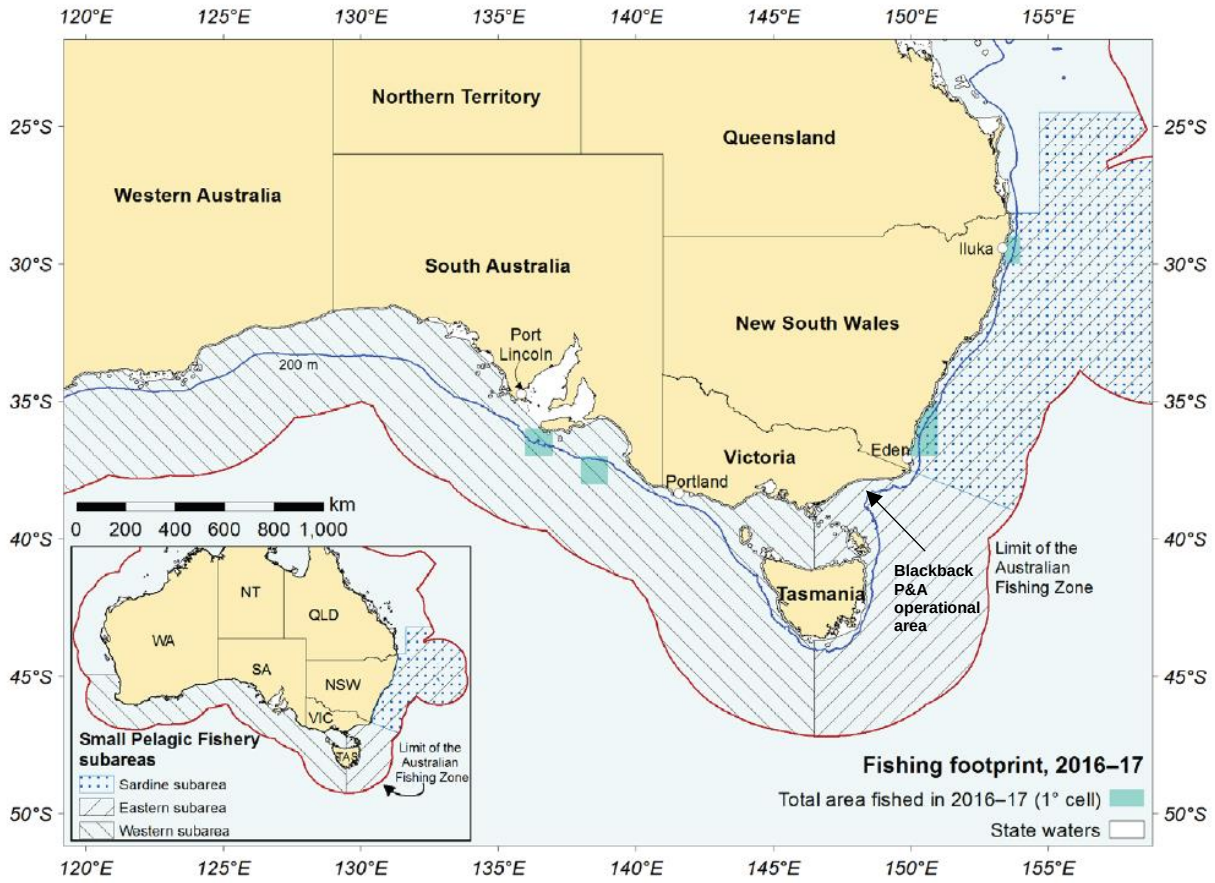


Figure 3-11 Area fished in the Small Pelagic Fishery, 2016–17 (ABARES 2017)

3.5.1.3 Scallop Fisheries (BSCZSF, Victorian and Tasmanian)

The Bass Strait scallop fisheries are predominantly single-species fisheries targeting aggregations ('beds') of the commercial scallop (*Pecten fumatus*) using scallop dredges, which are towed along the bottom of the sea in much the same way as trawl equipment (ABARES 2016b). The management of scallops in Bass Strait is divided into three zones, of which the Commonwealth manages the Central Zone (the Bass Strait Central Zone Scallop Fishery; BSCZSF). The remaining zones, which extend up to 20 nautical miles off the coasts of Victoria (Victorian Scallop Fishery) and Tasmania (Tasmanian Scallop Fishery), are managed by those states respectively (AFMA, 2017c).

The areas open to fishing vary from year to year depending on the location of commercially viable scallop beds. In 2015 fishing was concentrated on beds east of King Island (well outside the operational area) (ABARES 2016b). The season typically extends from May to December but the fishery is not opened unless the abundance of scallops in specific locations meets regulatory criteria.

The commercial scallop usually matures at about 12 to 18 months of age. Once maturity has been reached (fecundity increases with age), spawning occurs from winter to spring (June to November) although there are periods when spawning may be at a peak. The timing of these peaks may vary according to location and also according to environmental conditions, but appears to be in spring in Victoria (Sause *et al*. 1987). There is also some very limited evidence for a smaller, autumn peak in spawning for scallop populations in Bass Strait (Coleman 1988).

Scallop populations throughout the world fluctuate quite dramatically in response to variable environmental conditions. Relatively high populations occur in some years. These can be followed by relative scarcity, but populations can quickly rebound to large numbers provided enough adults remain for successful breeding and recruitment (VFA 2017b). Scallops are seldom found in commercial quantities in depths greater than 60-70 m.

3.5.1.4 Abalone Fisheries

The blacklip abalone (*Haliotis rubra*) forms the basis of the abalone fisheries in NSW, Victoria and Tasmania, however greenlip abalone (*Haliotis laevegata*) are also targeted. Blacklip abalone are commonly found, mainly on rocky substrates, from 0 m to 40 m depth range and are widely distributed along the southern half of Australia as far as Rottnest Island in the West to Coffs Harbour in the East, but are not present in the vicinity of the Blackback P&A operational area.

Abalone are sourced from the wild and from coastal farms. There are about 40 reefs from Iron Prince to Marlo Reef in Victoria. In NSW, most commercial abalone fishing takes place on the south coast, primarily from Jervis Bay to the Victorian border (DPI 2014). The Tasmanian abalone fishery is the largest wild abalone fishery in the world and the fishery area surrounds the entire island extending northwards into Bass Strait to include Bass Strait islands such as the Furneaux Group.

Victoria's abalone farms are situated primarily in Port Phillip Bay and southwest Victoria, however farms are also located off Tullaberga Island and Gabo Island.

Abalone are hand harvested by divers, who typically operate from small, trailable or tender vessels using low-pressure surface–air supply equipment (hookah). Abalone are removed from the reef using a tool known as an abalone iron. Fishing is open all year round (VFA 2017b).

Abalone grow to at least 21 cm in length and growth rates vary with location and time of year. Abalone mature at 6 to 10 years of age in Tasmania and spawning occurs from October through to March.

3.5.1.5 Rock Lobster Fisheries

The Victorian and Tasmanian Rock Lobster Fisheries are based primarily on one species, the southern rock lobster (*Jasus edwardsii*). Rock lobster is Victoria's second most profitable fishery after abalone. Eastern rock lobster (*Jasus verreauxi*) is the main species harvested by the NSW Lobster Fishery, but occasionally southern rock lobster, and tropical rock lobster are also caught.

Rock lobster fishing grounds exist around Ulladulla and Bateman's Bay, the southern tip of Wilsons Promontory and around Bass Strait islands, such as the Hogan Group, Curtis Group, Kent Group islands and Flinders Island. Most fishing occurs between mid-November and March, outside the June to mid-November spawning season. Fishers use baited rock lobster pots which are lowered to the bottom in rocky areas. The lobsters crawl down the funnel in the top of the pots and are unable to escape.

Holders of Rock lobster access licences are also eligible for permits for the Victorian Giant Crab fishery which extends from Apollo Bay to the boundary of NSW and Victoria, however only a few have been issued. Giant crabs can only be taken by hand or with recreational hoop nets (VFA 2017b).

3.5.1.6 Victorian Wrasse Fishery

The commercial fishery extends along the entire length of the Victorian coastline and out to 20 nautical miles offshore, except for marine reserves. Bluethroat wrasse (*Notolabrus tetricus*) and Purple wrasse (also called Saddled wrasse; *N. fucicola*), comprise approximately 90 per cent of the commercial Victorian wrasse harvest. Small catches of Rosy wrasse (*Pseudolabrus psittaculus*), Senator wrasse (*Pictilabrus laticlavius*) and Southern Maori wrasse (*Ophthalmolepis lineolatus*) are also caught.

Most wrasse is harvested by hook and line although commercial rock lobster fishers who also hold a commercial wrasse licence can keep those fish that they catch in their rock lobster pots (VFA 2017b)

3.5.1.7 Victorian Commercial Bay and Inlet Fisheries

The commercial bay and inlet fisheries of Victoria are a collection of complex multi-species, multi-gear fisheries which operate in environments that are ecologically distinct to those existing in waters of both their catchment tributaries and the nearby ocean. Although between 60 to 80 fish species have been recorded from commercial bay and inlet catches, only about a dozen or so key species, including King George whiting, black bream, snapper, flathead, mullet, garfish, flounder, anchovies and pilchards, are usually targeted by commercial fishers.

Commercial fishing for fin fish occurs in Port Phillip Bay, Corner Inlet/Nooramunga and the Gippsland Lakes. All other Victorian bays, inlets and estuaries are closed to commercial fishing (other than for eels and bait). The main bay and inlet commercial fishing methods are seine nets and gillnets.

3.5.1.8 Victorian Sea urchin Fishery

The sea urchin fishery comprises four individual management zones. The central and eastern zones intersect the Environmental Monitoring ZPI. The central zone covers Victorian waters from Hopkins River to Lakes Entrance. The eastern zone extends from Lakes Entrance to the NSW border. The target species are the White sea urchin (*Heliocidaris erythrogramma*) and the Black, long-spined sea urchin (*Centrostephanus rodgersii*).

The sea urchin is usually collected by hand by divers. Currently, sea urchin will only be harvested in eastern Victoria, primarily out of Mallacoota, and in Port Phillip Bay (VFA 2017b).

3.5.1.9 Tasmanian Shellfish Fishery

The commercial shellfish fishery includes clams (*Veneruptis largillierti*) for which there are three licences restricted to Georges Bay, native oyster (*Ostrea angasi*) for which there are two licences restricted to Georges Bay and cockles (*Katelysia scalarina*) for which there are four licences restricted to Ansons Bay and wild Pacific oyster (*Crassostrea gigas*) (DPIPWE 2017b).

Temperate climate bivalves generally have two spawning periods within a year following spring and autumnal peaks in phytoplankton production.

3.5.1.10 NSW Ocean Trawl Fishery

There are two sectors to the NSW Ocean Trawl Fishery: The prawn trawl sector (within 1.5 nm of the coastline) and the fish trawl sector (west of the 90 m depth contour). Both sectors use the otter trawl net. The major species taken in this fishery include school whiting (comprising of stout whiting and red spot whiting), eastern king, school and royal red prawns, tiger flathead, silver trevally, various species of sharks and rays, squid, octopus and bugs (DPI 2014).

3.5.1.11 NSW Ocean Trap and Line Fishery

The Ocean Trap and Line fishery is a multi-method, multi species fishery targeting demersal and pelagic fish along the entire NSW coast, in continental shelf and slope waters. The fishery uses a variety of methods, most commonly involving traps or lines with hooks. Snapper, yellowtail kingfish, leatherjackets, bonito and silver trevally form the bulk of the commercial catch. Other key species include rubberlip (grey) morwong, blue-eye trevalla, sharks, bar cod and yellowfin bream (DPI 2014).

3.5.1.12 NSW Estuary General Fishery

The Estuary General Fishery is a diverse, multi-species, multi-method fishery that operates in many of the State's estuarine systems. The fishery includes all forms of commercial estuarine fishing (other than estuary prawn trawling) in addition to the gathering of pipis and beachworms from ocean beaches. The most frequently used fishing methods are mesh and haul netting. Other methods used include trapping, hand-lining and hand-gathering. Sea mullet, luderick, yellowfin bream, school prawn, blue swimmer crab, dusky flathead, sand whiting, pipi, mud crab and silver biddy make up over 80% of the catch (DPI 2014).

3.5.1.13 NSW Ocean Hauling Fishery

The Ocean Hauling Fishery targets approximately 20 finfish species using commercial hauling and purse seine nets from sea beaches and in ocean waters within 3 NM of the NSW coast. The catch is mainly made up of pilchards, sea mullet, Australian salmon, blue mackerel, yellowtail scad and yellowfin bream (DPI 2014).

3.5.1.14 NSW Oyster Aquaculture

The Sydney rock oyster (*Saccostrea glomerata*) is the main species grown in NSW. Commercial production in the State occurs in 41 estuaries between Eden in the south to the Tweed River in the north. Wallis Lake and the Hawkesbury River are the main producing areas.

The Sydney rock oyster industry in NSW is largely dependent on natural spatfall. The first spawning of a Sydney rock oyster is usually as a male and subsequent spawnings as a female. During spawning, adult females disperse up to 20 million eggs and males hundreds of millions of sperms into the water when the tide and current are optimal for the widest distribution. Fertilisation takes place in the water column and development continues for up to 3 to 4 weeks as the larval stages of the oyster grow, with the 'spat' ultimately being caught on 'sticks'. Oysters are knocked off these sticks at 0.5 to 3 years of

age for growing intertidally on trays until maturity in 3 to 4 years. Alternative growing systems such as baskets and tumblers are also being used, and some oysters are grown subtidally on rafts or on floating culture.

3.6 Recreational Fishing, Boating and Tourism

The Gippsland region is estimated to attract more than 7 million visitors annually. These visitors are estimated to spend an estimated $1 billion in the region per annum, with flow-on expenditure estimated at over $699 million per annum. There are more than 1,000 specialised tourism businesses in Gippsland and more than 12,000 people estimated to be employed as a direct result of tourism in Gippsland (Ainsaar *et al*. 2007).

Tourism and recreational activities offered by the coastal areas of central and eastern Gippsland include (Tourism Victoria, 2013):

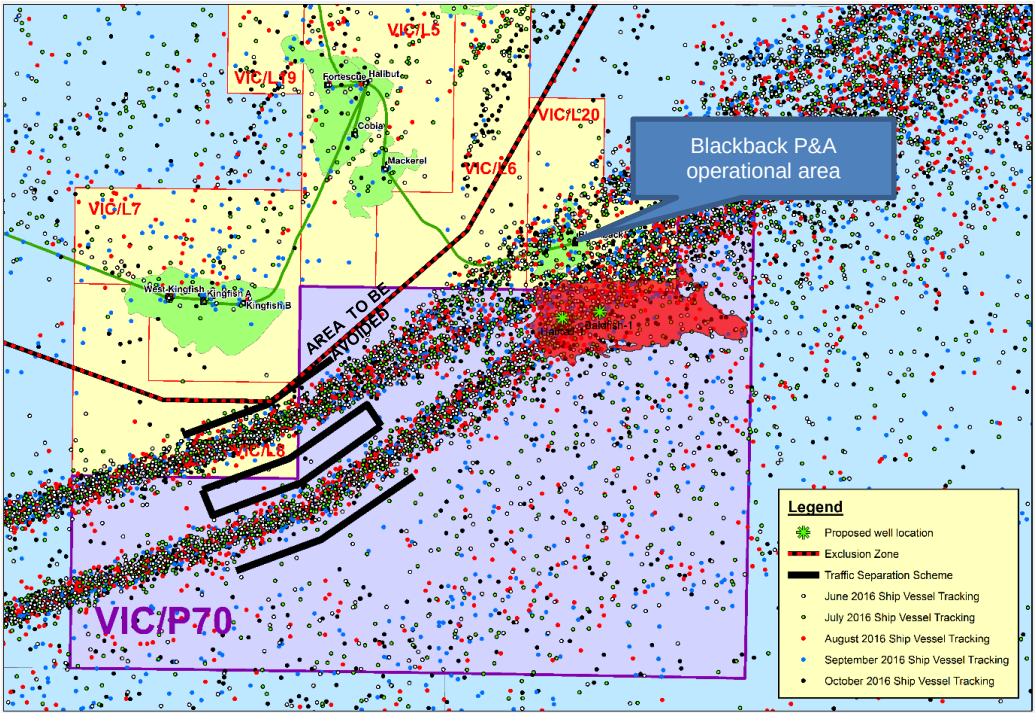
- Recreational fishing amongst the Nooramunga islands, on the Gippsland Lakes, along Ninety Mile Beach, at Cape Conran Coastal Park and Croajingolong National Park and off the coast of Mallacoota, comprising both boat based fishing and beach based surf fishing. Boat based fishing includes charter operations and private craft launched from boat ramps in the region. Boatyards and slipways are located at Bullock Island (Lakes Entrance), Port Welshpool and Mallacoota.
- Swimming and surfing along the Gippsland coast. Surf Life Saving Clubs are located at Lakes Entrance, Seaspray and Woodside Beach on the Ninety Mile Beach and at Mallacoota. Popular locations with experienced surfers include along the coast of Wilson's Promontory National Park, Red Bluff at Lake Tyers Beach, Salmon Rocks at West Cape Beach in the Cape Conran Coastal Park and Bastion Point Beach in Mallacoota.
- Scuba diving and snorkelling in Gippsland's Marine and Coastal Parks, in particular Cape Conran Coastal Park around West Cape Beach and Salmon Rocks.
- Walking and hiking in Gippsland's National and Coastal Parks.

3.7 Commercial Shipping

Bass Strait is one of Australia's busiest shipping areas, with more than 3,000 vessels passing through Bass Strait each year. Bass Strait is a transit route for shipping traffic connecting the eastern and western ports of Australia (NOO 2002). A shipping exclusion area (Area to Be Avoided; Refer chart AUS357) surrounds much of the Gippsland Basin operational area (see Figure 3-12) but does not include VIC/L20.

While the Blackback P&A operational area lies approximately 13 NM to the north east of the IMO Traffic Separation Scheme (TSS) boundary, it is in the middle of the north-east traffic lane of the TSS (Figure 3-12). This area has some of the heaviest commercial shipping traffic in Australia.

Each dot on the plot in Figure 3-12 represents a vessel's position, as broadcast by AIS (Automatic Identification System; AMSA 2017a) at 1 hour intervals. Analysis (AMSA, 2017b) reveals that some 80% of the vessels are cargo vessels, 12% are tankers and 2% are passenger ships. The rest are a combination of fishing vessels, pleasure craft, tugs etc. On average, every day, one large vessel will transit the TSS every 2 hours in the vicinity of the Blackback P&A operational area.



Based on AMSA (2017) AIS observations. Each dot represents a vessel location at a 1 hour interval

Figure 3-12 Shipping activity through Traffic Separation Scheme (TSS) and Blackback P&A operational area between June-October 2016

3.8 Oil and Gas Industry

The Gippsland Basin has been producing hydrocarbons since 1969 (a total of 4 billion barrels of liquids and 7 tcf of gas to date). Although a mature basin by comparison with other Australian basins, by world standards it is relatively unexplored. The Gippsland Basin includes offshore production facilities (operational platforms, monotowers and subsea completions), a pipeline network of over 600 km; and various fields under exploration or development. Other titleholders of production licences in the Gippland Basin are given in Table 3-11.

Table 3-11 Production licences, Exploration Permits and Retention Leases within Gippsland Basin

Title	Title Holder/s	Field
Production Licenses, Gippsland Basin		
VIC/L1	EARPL, BHPB	Barracouta/Tarwhine/ Whiptail
VIC/L10	EARPL, BHPB	Snapper
VIC/L11	EARPL, BHPB	Flounder
VIC/L13-14	EARPL, BHPB	Bream
VIC/L15	EARPL, BHPB	Dolphin
VIC/L16	EARPL, BHPB	Torsk
VIC/L17	EARPL, BHPB	Perch
VIC/L18	EARPL, BHPB	Seahorse
VIC/L19	EARPL, BHPB	West Fortescue
VIC/L2	EARPL, BHPB	Barracouta/Whiting/Wirrah
VIC/L20	EARPL, BHPB	Blackback
VIC/L21	Cooper Energy	Patricia Baleen
VIC/L25	EARPL, BHPB, MEPAU	Kipper
VIC/L29	SGH Energy	Longtom
VIC/L3	EARPL, BHPB	Marlin/Turrum/North Turrum

VIC/L32	Cooper Energy	Sole
VIC/L4	EARPL, BHPB	Marlin/Turrum/Tuna/Baldfish/Flounder
VIC/L5	EARPL, BHPB	Halibut/Fortescue/Cobia/ Mackerel
VIC/L6	EARPL, BHPB	Mackerel/Flounder
VIC/L7-8	EARPL, BHPB	Kingfish
VIC/L9	EARPL, BHPB	Tuna
VIC/L31	Carnarvon Hibiscus	West Seahorse (see VIC/P57)
Exploration Permits, Gippsland Basin		
VIC/P47	Emperor Energy / Shelf Energy	Judith/Moby
VIC/P57	Carnarvon Hibiscus	West Seahorse/Sea Lion (See VIC/L31)
VIC/P68	Bass Oil	Leatherjacket
VIC/P70	Esso Deepwater	Dory/Baldfish
VIC/P71	Llanberis Energy	-
VIC/P72	Cooper Energy	-
Retention Leases, Gippsland Basin		
VIC/RL1	EARPL, BHP (Pending Renewal)	Golden Beach
VIC/RL13 **VIC/RL14** **VIC/RL15**	Cooper Energy	Basker, Manta, Gummy Field
VIC/RL4	EARPL, BHP (Pending Renewal)	Remora

From NOPTA 2018. Prefix: VIC/L: Production License; VIC/P: Exploration Permit; VIC/RL: Retention Lease

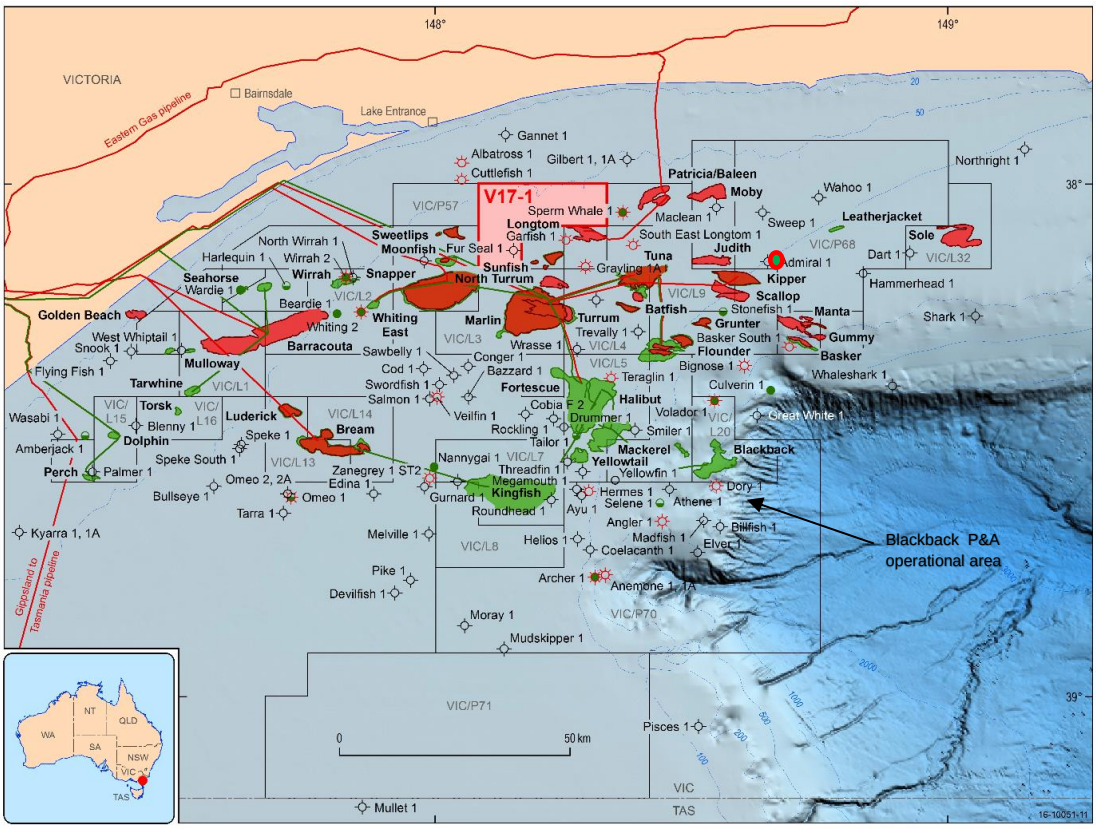


Figure 3-13 **Offshore operations in Gippsland Basin** ***Gippsland Basin release area map 2017. http://www.petroleum-acreage.gov.au/***

3.9 Cultural Heritage

There are no World Heritage properties or National Heritage places in the Operational ZPI or Environmental Monitoring ZPI. The Lord Howe Island Group, which is inscribed on both the World Heritage List and National Heritage List, is located approximately 1,500 km from the operational area and well outside the Environmental Monitoring ZPI.

The Gabo Island lighthouse, which is located on Gabo Island within the Environmental Monitoring ZPI, is a Commonwealth heritage place. The Commonwealth Heritage List is a list of natural, Indigenous and historic heritage places owned or controlled by the Australian Government. These include places connected to defence, communications, customs and other government activities that also reflect Australia's development as a nation. Built in 1863, the curved profile of this elegant red granite lighthouse makes it an outstanding example of stonemasonry. It was built from stone hewn from this isolated site. Its design was replicated at all subsequent lighthouses in Victoria (Heritage Council Victoria, 1999). A number of other lighthouses which are included on the Commonwealth Heritage List are also located within the Environmental Monitoring ZPI, these include Montague Island, Eddystone Point, Goose Island and Swan Island (Lighthouses of Australia, 2018)

3.9.1 European and/or indigenous sites of significance

The Gunai-Kurnai people hold native title over much of Gippsland. The native title determination area (Tribunal file no. VCD2010/001) covers approximately 45,000 hectares and extends from west Gippsland near Warragul, east to the Snowy River, and north to the Great Dividing Range, (Figure 3-14). It also includes offshore sea territory between Lakes Entrance and Marlo, outside the Operational ZPI but within the Environmental Monitoring ZPI. The area includes 10 parks and reserves that are jointly managed by the Victorian government and the Gunai-Kurnai people (NNTT, 2010).

Non-exclusive native title rights and interests that exist over land and water in the determination area include:

- Rights of access.
- Rights to use and enjoy the land.
- Rights to take resources from the land for non-commercial purposes.
- Rights to protect and maintain sites of importance within the determination area.
- Rights to engage in certain activities on the land (including camping, cultural activities, rituals, ceremonies, meetings, gatherings, and teaching about the sites of significance within the determination area).

These rights do not confer exclusive rights of possession, use and enjoyment of the land or waters. Native title does not exist in minerals, petroleum or groundwater.

Aboriginal occupancy by the Gunai-Kurnai people pre-dates the time at which the sea reached its present level by many thousands of years; thus, many early hunting grounds are now under the sea. In the past, coastal wetlands were highly productive areas for hunter-gatherer people, having a variety of habitats and species, so the majority of archaeological sites in Victoria are found within 1 km of the coast (LCC 1993). Along the Gippsland coast, stone artefacts that have been found were mostly made from silcrete and quartz from the hinterland. Middens on offshore islands indicate that in the past, Aboriginal people from the area now known as Wilsons Promontory were likely to have visited (Jones & Allen 1979).

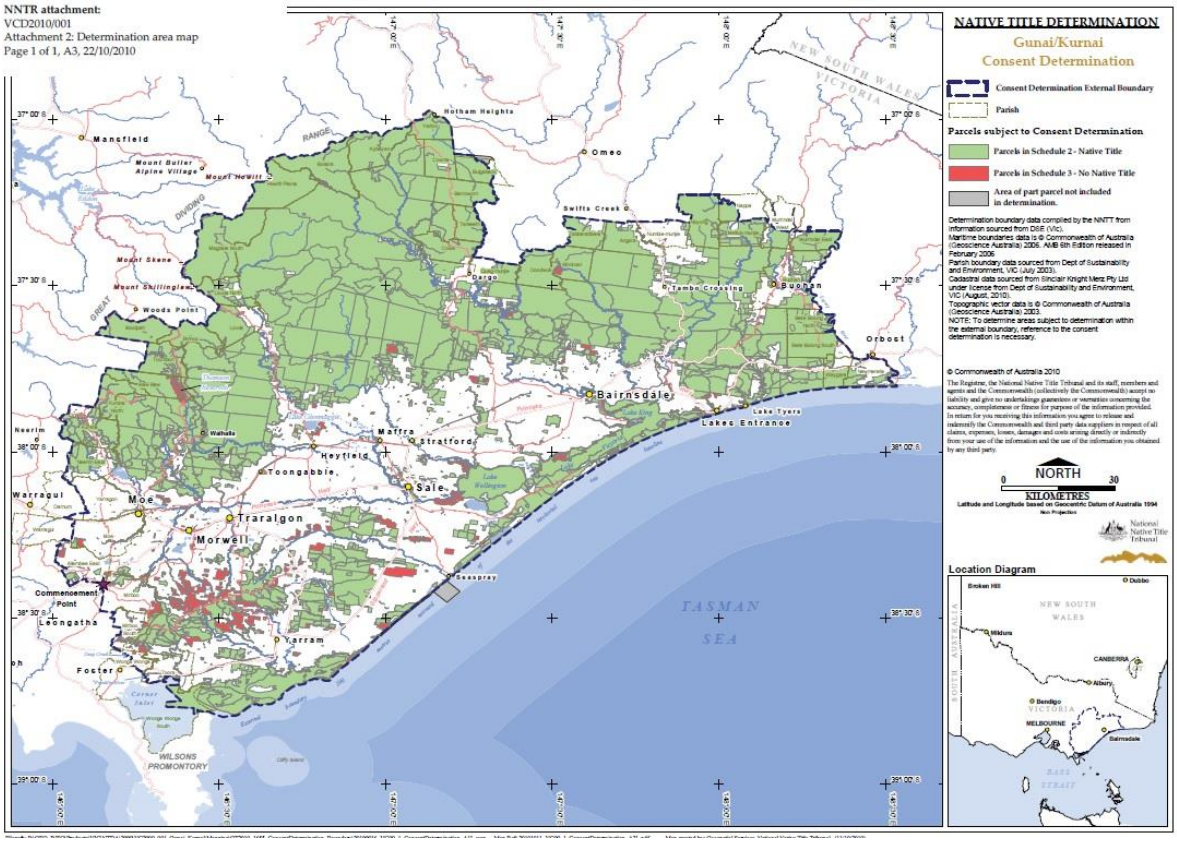
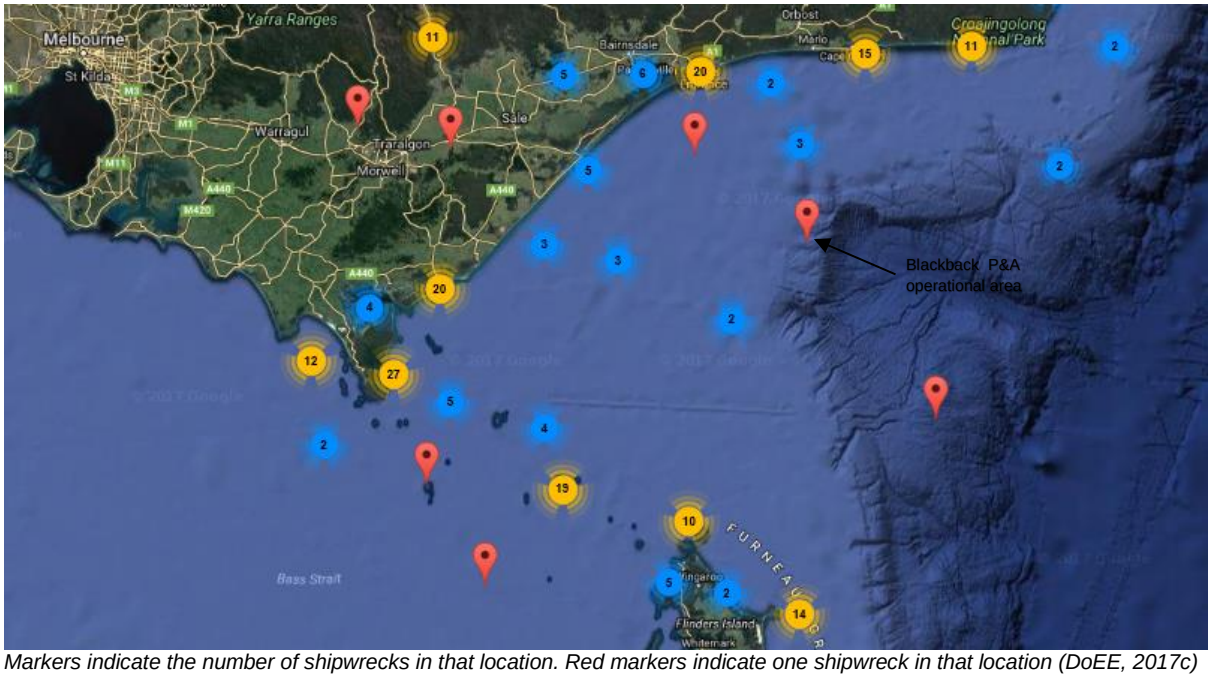


Figure 3-14 Gunai-Kurnai Native Title Determination Area (VCD2010/01)

3.9.2 Shipwrecks

A search of the National Shipwrecks Database identified 255 wrecks between Latitude 37° 00' to 40° 00', and Longitude 146° 00' to 150° 00', with none in the Blackback P&A operational area (Figure 3-15). One wreck, AHO 6528 (wrecked in 1940; Latitude 38° 33', Longitude 148° 30'), lies approximately 5 km to the west of the Blackback wells. No further details are available on this wreck (DoEE 2017c).



Markers indicate the number of shipwrecks in that location. Red markers indicate one shipwreck in that location (DoEE, 2017c)

Figure 3-15 Shipwreck sites around the Gippsland Basin

4 Environmental Impact and Risk Assessment Methodology

The approach and methodology used within this Environment Plan is consistent with AS/NZS ISO 31000 Risk management – Principles and Guidelines and AS/NZS ISO14001 Environmental Management Systems – Requirements with Guidance for Use.

4.1 Risk Assessment Methodology

Environmental impacts and risks for planned activities that have the potential to impact the environment and for unplanned spill scenarios were evaluated first by determining the consequence severity, and estimating the probability or likelihood that the consequences could occur.

- Consequence severity: There are four consequence categories (I through IV, with I being the highest consequence level). The consequence categories consider environmental effects (in terms of duration, size/scale, and intensity) and sensitivity (in terms of irreplaceability, vulnerability and influence).
- Probability: There are five probability categories (A through E, with A being the most likely level). The probability categories consider the probability for each failure, event or condition necessary to produce the consequences, given the implementation of controls that prevent and mitigate the risk.

The combination of consequence severity and probability of occurrence determines the position on the ExxonMobil Risk Matrix. The ExxonMobil Risk Matrix is divided into four categories, with Category 1 being the highest risk category and Category 4, the lowest. A risk could have a low consequence severity and high probability of occurrence, and result in the same risk ranking as a risk with a high consequence severity and low probability of occurrence.

4.2 Demonstration of ALARP

As described above the Risk Matrix is divided into four risk categories. The significance of each Risk Category is as follows:

Category 1: A higher risk where specific controls should be established in the short term and should, when possible, be reduced to a Category 2 risk or below. Continued operation requires annual review and approval by the Production Manager or equivalent.

Category 2: A medium risk that should be reduced unless it is not "reasonably practicable" to do so.

Category 3: A medium risk that should be reduced if "lower cost" options exist to do so.

Category 4: A lower risk that is expected to be effectively managed in base OIMS practices and therefore typically requires "No Further Action." Risk mitigation measures that are in place to manage the risk to Category 4 should be continued.

RA 22 (Interference with commercial shipping) and RA 30 (Loss of well control/well blowout) were categorised as Category 3 risks. All other environmental hazards and impacts were assessed to be Category 4 risks.

Determining whether risks have been reduced to ALARP requires an understanding of the nature and cause of the risk to be avoided and the sacrifice (in terms of impact on personal safety and/or the environment, time, effort and cost) involved in avoiding that risk. Where the nature of a risk is well-understood, in the context of the receiving environment, and the activity is a well-established practice, the application of control measures specific to systems and specified in international standards or design codes may be sufficient and obvious to demonstrate that the risk is ALARP. For complex situations it may be difficult to reach a decision on the basis of ‘good practice’ or standards alone. Therefore for each risk, a discussion on ALARP demonstration has been provided which considers elimination of the activity, availability of practical alternatives where they exist, and the decision to rule out adoption of additional control measures (where they exist) because they involve grossly disproportionate sacrifices to the resultant reduction in risk.

In alignment with NOPSEMA’s ALARP Guidance Note (N-04300-GN0166, Rev 6, June 2015), Esso has adapted the approach developed by Oil and Gas UK (OGUK, 2014) for use in an environmental

context to determine the assessment technique required to demonstrate that potential impacts and risks are ALARP (Figure 4-1).

Specifically, the framework considers impact severity and several guiding factors:

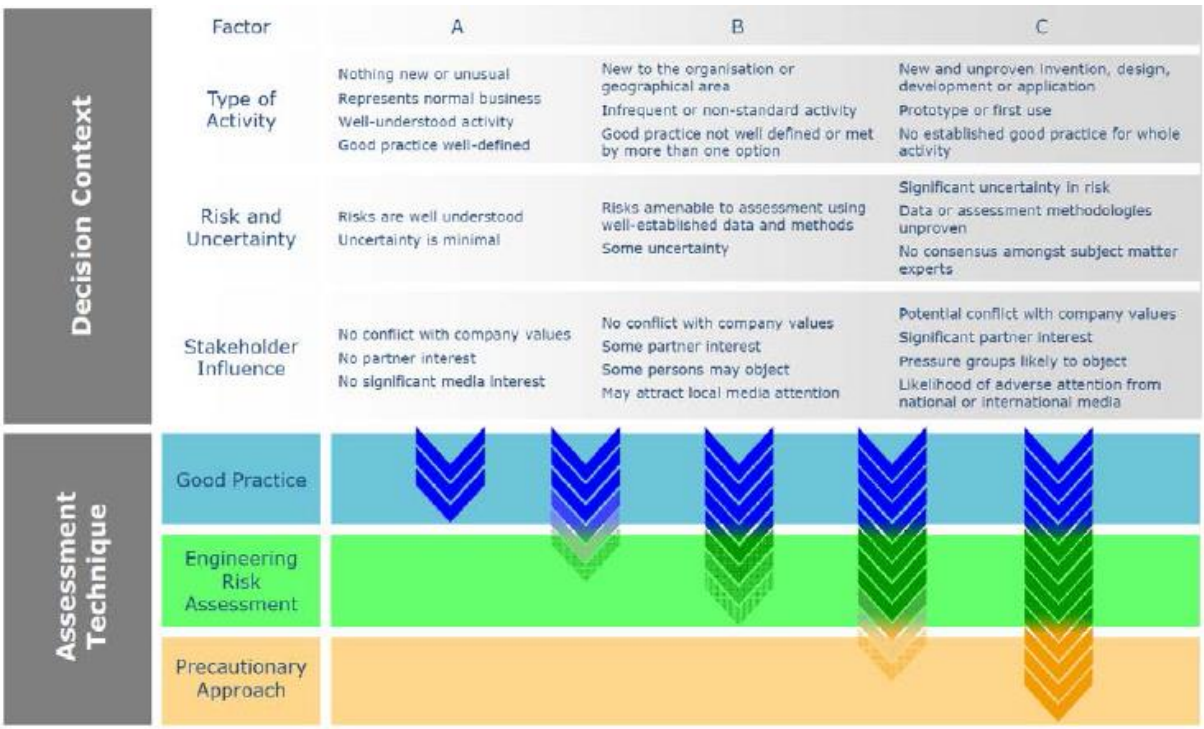
- activity type
- risk and uncertainty
- stakeholder influence.

Type A decision:
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.

Type B decision:
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.

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.

These decision types (Figure 4-1) were applied in determining the level of assessment required to demonstrate that environmental impacts and risks are ALARP (Chapter 6).



Source: NOPSEMA Decision-making – Criterion 10A(c) Acceptable level. N-04750-GL1637, Rev 0, Nov 2016

Figure 4-1 ALARP Decision Support Framework

The assessment techniques include:

- good practice
- engineering risk assessment

- precautionary approach.

4.2.1 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 EP, sources of good practice include:

- requirements from Australian legislation and regulations
- relevant Australian policies
- relevant Australian Government guidance
- relevant industry standards
- 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.

4.2.2 Engineering Risk Assessment

All potential impacts and risks that require further assessment are subject to an 'Engineering Risk Assessment'. In accordance with OGUK (2014), a comparative assessment of risks, costs, and environmental benefit was applied, based on a cost–benefit analysis between the environmental benefit and the cost of implementing the identified measure.

4.2.3 Precautionary Approach

Where the assessment, considering all available engineering and scientific evidence, is insufficient, inconclusive, or uncertain, then a precautionary approach to hazard management is applied (OGUK 2014).

Under the precautionary principle, environmental considerations take precedence over economic considerations, and a control measure that may reduce environmental impact is more likely to be implemented. This approach could have significant economic consequences to an organisation.

4.3 Demonstration of Acceptable Level

The environmental impact and risk is considered to be reduced to acceptable levels if:

- The level of residual environmental risk was assessed as being as low as reasonably practicable (ALARP); and
- The level of residual environmental risk associated with the activity was either Category 2, 3 or 4; and
- The activity is commonplace in current offshore practice (i.e., benchmarked), and is compliant with current industry/ExxonMobil Australia policy and standards, and Australian legislation; and
- Valid claims or objections to the risk from relevant persons or stakeholders, if any, are considered.

These factors are used to demonstrate acceptability in Chapter 5.

5 Environmental Risk and Impact Evaluation

The risk assessment process undertaken as part of the preparation of this environment plan assessed the environmental impacts and risks associated with the Blackback P&A scope.

Thirty impacts and risks have been identified and assessed. Of these risks, 11 (RA 1 to RA 11) were identified and assessed as support activities, 13 (RA 12 to RA 24) were identified and assessed as P&A related activities within the operational area, with a further 8 risks (RA 25 to RA 32) identified and assessed as resulting from unplanned events.

Table 5-1 Summary of Impacts and Risks associated with Blackback P&A Campaign

RA	Environmental Impact or Risk	Likelihood	Consequence	Risk Ranking
Routine Offshore Activities				
1	MODU/Vessel Sewage discharge	D	IV	4
2	MODU/Vessel Seawater intakes	D	IV	4
3	Disposal of food wastes from MODU/vessels	D	IV	4
4	Accidental release of general, solid or hazardous waste	D	IV	4
5	MODU/vessel deck drainage	D	IV	4
6	MODU/Vessel oily water (bilge) discharge	D	IV	4
7	MODU/Vessel Ballast water discharge	D	IV	4
8	MODU/Vessel Biosecurity & Hull Biofouling	D	IV	4
9	Vessel and helicopter movements - Interaction with fauna	D	IV	4
10	Emissions to Air from MODU/Vessels	B	IV	4
11	Cooling water and brine Discharges	D	IV	4
Operational Area Presence and Abandonment Operations				
12	Hydraulic fluid discharge during ROV operations	D	IV	4
13	Hydraulic Fluid Discharge from BOP Operations	D	IV	4
14	Planned Dscharge – Brine/packer fluid discharges	D	IV	4
15	Planned Discharge – Discharge of interface fluid containing NADF	D	IV	4
16	Planned Discharge – Wellhead removal discharges	D	IV	4
17	Planned Discharge - Cement discharges	C	IV	4
18	Planned Discharge – Flowline contents	D	IV	4
19	Physical presence - Noise and light	C	IV	4
20	Physical presence – Infrastructure integrity	E	IV	4
21	Physical presence - Interference with Commercial Fishing	C	IV	4
22	Physical presence - Interference with Commercial Shipping	C	III	3
23	Physical presence – Seabed Disturbance	D	III	4
24	Physical presence - NORM	D	IV	4
Unplanned Events				
25	Accidental Release – Dropped Objects	D	IV	4
26	Accidental Release - Loss of containment from vessel collision	D	III	4
27	Accidental Release - Spills during Bulk transfer via bunkering hose	D	IV	4
28	Accidental Release - Foam Deluge System	D	IV	4
29	Accidental Release – Spills: Chemical & oils storage and handling	D	III	4
30	Accidental Release - Loss of well integrity	E	I	3
31	Accidental Release - Mooring failure/Emergency Disconnect	E	IV	4
32	Impacts resulting from Spill Response Strategies	E	IV	4

5.1 MODU/Vessel Sewage discharge (RA 1)

5.1.1 Hazard

Disposal of sewage overboard may temporarily increase nutrients and pathogens in the water column over a localised area, potentially impacting aquatic organisms and stimulating population numbers of some plankton organisms. Black and grey water volume is estimated at around 190 L per person per day, consisting of 30 L sewage, and the remainder consisting of kitchen waste, bathing and laundry waste (Shen & Xing, 2017). MODUs typically generate around 5-15 m^3 of waste water (consisting of sewage and grey water) per day depending on the number of persons on board (EMSA 2016).

5.1.2 Impact Assessment

A discharge of sewage and greywater has the potential to result in impacts to marine fauna from nutrient enrichment and increased scavenging behaviour.

The discharge of sewage and grey water from a moving vessel is broadly acceptable due to the high level of dilution achieved on release to the receiving waters. Several studies have quantified the high levels of dilution which are in the order of approx. 200,000 – 640,000 for effluents discharged behind large ships (USEPA 2002; Loehr *et al*. 2006). The discharge and subsequent level of dilution was shown to be adequate for mitigating localised toxicity impacts to marine biota from any changes in water quality.

This mixing zone boundary has been studied in the industry. Monitoring of sewage discharges has demonstrated that a 10 m^3 sewage discharge over 24hrs from a stationary source in shallow water, reduced to approximately 1% of its original concentration within 50 m of the discharge location. In addition to this, monitoring at distances 50, 100 and 200 m downstream of the platform and at five different water depths confirmed that discharges were rapidly diluted or nutrients rapidly metabolised and no elevations in water quality monitoring parameters (e.g. total nitrogen, total phosphorous and selected metals) were recorded above background levels at any station (NERA 2017b).

The ecological receptors with the potential to be exposed to changes in surface water quality are transient marine fauna, including whales, sharks, fish and marine reptiles. Specifically, the operational area lies within a foraging BIA for the Pygmy Blue Whale.

McIntyre and Johnson (1975) indicate that the influence of nutrients in open marine areas is much less significant than that experienced in enclosed areas and suggest that zooplankton composition and distribution are not affected in these areas. Black *et al.* (1994) state that BOD of treated effluent is not expected to lead to oxygen depletion in the receiving waters.

Sewage discharges promote scavenging behaviour by marine fauna or seabirds, resulting in localised increases, in turn promoting predatory behaviour. This may impact on plankton, marine mammals, fish and seabirds near the point of discharge (the operational area lies within a foraging BIA for the Pygmy Blue Whale). The rapid consumption of this food waste by scavenging fauna, and physical and microbial breakdown, ensures that the impacts of food waste discharges are insignificant and temporary, and receptors that may potentially be in the water column are not impacted.

The release of grey-water, sewage and their associated cleaning agents into the marine environment will increase nutrient availability and biological oxygen demand and potentially impact on the water quality around the discharge point. However, there have been no recent observations of phytoplankton blooms in the Gippsland Basin as a result of sewage discharge from platforms. No significant impacts are expected from the release of grey-water, sewage and their associated cleaning agents given the small quantities involved, the localised area of impact, rapid mixing in the high energy environment and high biodegradability/low persistence of the wastes.

As impacts on plankton are highly localised and temporary, impacts to the Pygmy Blue Whale (or other fauna) food source and any predator-prey dynamics is negligible. Several species of seabirds are known to have a large foraging range, and consequently may be exposed to these discharges. However, as impacts from sewage discharge on water quality is highly localised, any potential change to scavenging behaviours from seabirds is expected to be incidental.

Consequently, the potential impacts and risks from the planned discharge of sewage and greywater have been evaluated as Category 4 (low), given this type of event is very unlikely to result in localised short-term impacts to a species of conservation value (seabirds; Pygmy blue Whale) through impacting their foraging habitat.

5.1.3 Controls

The disposal of sewage and grey-water from MODU and vessels (AHT, Standby) is required to be in accordance with Marine Order 96 (Marine pollution prevention – sewage) 2018 (which gives effect to MARPOL Annex IV – Regulations for the Prevention of Pollution by Sewage from Ships),

Discharge of sewage which is comminuted and disinfected sewage using a certified MARPOL compliant system is permitted at a distance of no less than 3 NM from nearest land. Sewage not comminuted or disinfected may be discharged as long as no less than 12 NM from nearest land.

All project vessels are fitted with a MARPOL compliant sewage treatment system. Compliance of support vessel will be verified as part of premobilisation audits. The MODU is also fitted with a MARPOL compliant sewage treatment system (Omnipure 12MX) which treats black and grey water and is suitable for a POB of 150. Sewage is disposed of onshore if the vessel cannot meet the regulatory requirements for sewage discharge. Therefore the likelihood of impacts to marine organisms within the abandonment area are considered to be low. Sewage discharges are within parameters as defined within the draft Reference Case for sewerage discharges (NERA 2017b).

In summary:

- Maintained and operational MARPOL compliant sewage treatment facility.
- Discharge of comminuted and disinfected sewage using a certified MARPOL-compliant sewage treatment plant at a distance of no less than 3NM from nearest land. Discharge of untreated sewage at a distance of no less than 12 NM from nearest land.
- A Planned Maintenance System (PMS) is in place to ensure that the MARPOL-compliant sewage system continue to operate at the required standard.

5.1.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.1.5 Demonstration of ALARP

Having a maintained and operational MARPOL compliant sewage treatment plant, confirmed by the pre-mobilisation inspection of the MODU, is considered sufficient to reduce the impacts and risks associated with this hazard to ALARP. As the nature of this risk is well understood, the activity is a well-established practice and the control measures are well established, the residual risk resulting from this activity is considered to be low (Category 4). The requirements under MARPOL for the sewage treatment plant to be operational and maintained, combined with inspection to confirm the MARPOL requirements are being complied with, are appropriate for managing the day to day risk of this activity.

The potential impact associated with this aspect is limited to a localised short-term impact, which is not considered as having the potential to affect biological diversity and ecological integrity. The activity is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required. No stakeholder concerns have been raised to date regarding treated sewage discharges.

The alternatives, such as onboard holding tanks and onshore disposal, are not considered practicable due to cost considerations (i.e., the costs of implementing these measures are grossly disproportionate to the reduction in risk) and the environmental impacts (emissions, additional fuel use) associated with alternatives (onshore disposal; evaporation units). On this basis Esso considers the risk to be ALARP.

5.1.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. This is a type A ALARP decision. As all relevant standards (Esso, Australian Standards, MARPOL and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable.

5.2 MODU/Vessel Seawater intakes (RA 2)

5.2.1 Hazard

Marine fauna may be trapped or entrained in seawater intakes. This may result in morbidity or mortality.

5.2.2 Impact Assessment

Open ocean intakes are equipped with coarse bar screens, which have openings between the bars of 20 mm to 150 mm followed by smaller-size screens with openings of 1 mm to 10 mm, which preclude the majority of the adult and juvenile marine organisms (fish, crabs, etc.) from entering the plants. Most marine organisms are removed by screening and downstream filtration before this seawater enters the plant.

OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel design meets industry best practise via the pre-mobilisation inspection of the MODU and support vessels and contributes to controls regarding to seawater intake design and maintenance.

5.2.3 Controls

- All seawater intakes on MODU and support vessels are designed so that the risk of entrapment of marine fauna is minimised.
- A Planned Maintenance System is in place to ensure that grating on the seawater intakes are maintained and in good working order.

5.2.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.2.5 Demonstration of ALARP

Ensuring that the grating on the seawater intakes is in place and maintained is considered a sufficient control measure to reduce the impacts and risks associated with this hazard to ALARP.

Use of fine screens would further reduce the risk of entrapment, especially for smaller organisms. However, this would result in rapid fouling and blockages of the seawater intakes, requiring in-water intervention and /or regular disassembly to rectify. The expense, operational losses and the additional safety considerations are not considered justifiable against the benefits. This is a Type A ALARP decision, as this approach is best industry practise, the risks are well understood, and the potential impacts are low.

The potential impact is localised and short-term, and is not considered as having the potential to affect biological diversity and ecological integrity or result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required. There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.2.6 Demonstration of Acceptability

For this hazard the residual risk was assessed as a Category 4 low risk. As all relevant standards (Esso, Australian Standards, MARPOL and Industry best practice) have been met, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3.

5.3 Disposal of food wastes from MODU/vessels (RA 3)

5.3.1 Hazard

Disposal of food scraps/putrescible wastes overboard may temporarily increase nutrients in the water column over a localised area, potentially impacting aquatic organisms and stimulating population numbers of some plankton organisms, fish and seals. Ingestion by marine fauna may result in morbidity or mortality.

5.3.2 Impact Assessment

The food scraps from the vessels are required to be treated in accordance with Marine Order 95 (Marine pollution prevention – garbage) 2018 (which gives effect to MARPOL Annex V – Regulations for the Prevention of Pollution by Garbage from Ships).

Food scraps are biodegradable and macerated scraps (to <25 mm diameter) will be rapidly dispersed and assimilated in the high energy marine environment. Discharge of putrescible waste which is not comminuted to 25 mm or less is permitted at greater than 12 NM from the nearest land while en-route. Discharge of un-macerated waste is prohibited within the 500m PSZ surrounding offshore platforms. Waste which is not able to be discharged in accordance with these requirements will be temporarily stored onboard for onshore disposal.Therefore the likelihood of impacts to marine organisms within the abandonment area is considered to be low (see Section 5.1.2).

There have been no recent observations of phytoplankton blooms as a result of food scraps discharge from vessels in the Gippsland Basin. No significant impacts are expected from food waste given the small quantities involved, the localised area of impact, the rapid mixing in the high energy environment and the high biodegradability/low persistence of the wastes. Disposal of food wastes within parameters, as defined MARPOL Annex V will be verified as part of audits and inspections (see Section 7.5.4 for an overview).

Esso's OIMS Framework establishes expectations for addressing risks inherent in the business and ensuring hazards are safely controlled. OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) contributes to the control of this risk through the pre-mobilisation inspection of the MODU and support vessels.

5.3.3 Controls

- Food waste macerated to ≤25 mm (using an onboard macerator) before discharge.
- Macerated putrescible waste only discharged overboard when the vessel is greater than 3 NM from the coastline and while proceeding en-route. Un-macerated putrescible waste only discharged overboard when the vessel is more than 12 NM from the coastline and while proceeding en-route. Unmacerated waste not discharged within 500m of offshore platforms.
- A Planned Maintenance System is in place to ensure that the food/putrescible waste macerators continue to operate at the required standard.
- Environmental induction on garbage management requirements.

5.3.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.3.5 Demonstration of ALARP

Having a maintained and operational MARPOL compliant macerator, confirmed by the pre-mobilisation inspection, is considered a sufficient control measure to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4-2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4). The requirements under MARPOL, as confirmed by inspection, are appropriate for managing the day to day risk of this activity.

Other controls and alternatives were considered, in accordance with Section 4-2 (Demonstration of ALARP), including the disposal of food scraps onshore. This would require storage in dedicated holding tanks for which there is limited space on a MODU/vessel, additional lifting operations and transport to an onshore port. Although food scraps are stored temporarily for onshore disposal during equipment malfunction and maintenance, this is not considered to be practicable on a permanent basis. In addition to safety and hygiene considerations, additional vessel trips to shore increases the consumption of diesel and hence atmospheric emissions. The time and cost involved in implementing these measures is grossly disproportionate to the reduction in risk.

The potential impact is localised and short-term, which is not considered as having the potential to affect biological diversity and ecological integrity, and is not considered as having the potential to result in

serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required. No stakeholder concerns have been raised to date regarding treated sewage discharges. There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.3.6 Demonstration of Acceptability

For this hazard the residual risk was assessed as a Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4-3 (Demonstration of Acceptability).

5.4 Accidental release of general, solid or hazardous waste (RA 4)

5.4.1 Hazard

The handling and storage of materials and waste on board MODUs and vessels has the potential for accidental over-boarding of hazardous/non-hazardous materials and waste.

The types of waste generated by the MODU and support vessels include general and hazardous wastes (solid and liquid). When generated, waste materials are segregated according to the type, contained in appropriately labelled containers or covered skips and placed in a waste store pending transport for onshore disposal, or recycling where possible. The types of waste that will be disposed of to shore, but have the potential to be accidentally dropped or disposed overboard due to overfull bins or crane operator error are summarised in Table 5-2.

Table 5-2 General and Hazardous waste generated during P&A campaign

Non-hazardous materials	Hazardous materials
• Paper and cardboard • Wooden pallets • Scrap steel, metal, aluminium, cans • Glass • Plastics.	• Hydrocarbon-contaminated materials (e.g., oily rags, pipe dope, oil filters) • Batteries, empty paint cans, aerosol cans, fluorescent tubes, printer cartridges • Contaminated personal protective equipment (PPE) • Acids and solvents (laboratory wastes) • Laboratory wastes • Waste chemicals • Empty drums containing oil or chemical residues.

5.4.2 Impact Assessment

Inappropriate disposal of general refuse, solid and hazardous waste into the marine environment could cause visual pollution, temporary change in the water quality and death or injury of marine fauna (through ingestion, entanglement, suffocation).

5.4.2.1 Hazardous Materials and Waste

The Hazardous Waste (Regulation of Exports and Imports) Act 1989, which covers hazardous waste only, defines hazardous waste as:

- Waste prescribed by the regulations, where the waste has any of the characteristics mentioned in Annex III to the Basel Convention. These characteristics include Explosive, Flammable Liquids/Solids, Poisonous, Toxic, Ecotoxic and Infectious Substances.
- Wastes that belong to any category contained in Annex I to the Basel Convention, unless they do not possess any of the hazardous characteristics contained in Annex III. Wastes in Annex I include: clinical wastes; waste oils/water; hydrocarbons/water mixtures; emulsions; wastes from the production, formulation and use of resins, latex, plasticizers, glues/adhesives; wastes resulting from surface treatment of metals and plastics; residues arising from industrial waste disposal operations; and wastes which contain certain compounds such as: copper, zinc, cadmium, mercury, lead and asbestos.
- Household waste; or

- Residues arising from the incineration of household waste.

Hazardous materials and wastes released to the sea causes pollution and contamination, with either direct or indirect effects on marine organisms. Impacts from an accidental release would be limited to the immediate area surrounding the release, prior to the dilution of the chemical with the surrounding seawater. In an open ocean environment such as the operational area, it is expected that any release – unless substantial - would be rapidly diluted and dispersed.

Solid hazardous materials, such as paint cans containing paint residue, batteries and so forth, would settle on the seabed if dropped overboard (see Section 5.24: Dropped Objects). Over time, this may result in the leaching of hazardous materials to the seabed, which is likely to result in a small area of substrate becoming toxic and unsuitable for colonisation by benthic fauna. Given the size of materials release it is expected that only very localised impacts to benthic habitats within the operational area would be affected and unlikely to contribute to a significant loss of benthic habitat or species diversity.

All hazardous waste will be disposed of at appropriately licensed facilities, by licenced contractors, therefore impacts such as illegal dumping or disposal to an unauthorised onshore landfill that is not properly lined are unlikely to result from the project.

5.4.2.2 Non-hazardous Materials and Waste

Discharged overboard, non-hazardous wastes can cause smothering of benthic habitats as well as injury or death to marine fauna or seabirds through ingestion or entanglement (e.g., plastics caught around the necks of seals or ingested by seabirds and fish).

C&R Consulting (2009) reported that at least 77 species of marine wildlife found in Australian waters have been impacted by entanglement in, or ingestion of, plastic debris during the last three and a half decades (1974-2008). The affected species include six species of marine turtles, 12 species of cetaceans, at least 34 species of seabirds, dugongs, six species of pinnipeds, at least 10 species of sharks and rays, and at least eight other species groups.

Most records of impacts of plastic debris on wildlife relate to entanglement, rather than ingestion. However, the rate of ingestion of plastic debris by marine wildlife is difficult to assess as not all dead animals are necropsied or ingested plastic debris may not be recorded where it is not considered as the primary cause of death.

The patterns of reports of entanglement in and ingestion of plastic debris by wildlife in Australian waters are likely to be influenced by factors such as the size and distribution of populations, foraging areas, migration patterns, diets, proximity of species to urban centres, changes in fisheries equipment and practices, weather patterns, and ocean currents, as well as the frequency of monitoring and/or observation of wildlife.

Species dominating existing entanglement and ingestion records are turtles and humpback whales. Australian pelicans and a number of cormorant species are also frequently reported. If dropped objects such as bins are not retrievable by ROV, these items may permanently alter very small areas of seabed, resulting in the loss of benthic habitat. However, as with most subsea infrastructure, the items themselves are likely to become colonised by benthic fauna over time (e.g., sponges) and become a focal area for sea life, so the net environmental impact is likely to be neutral. This would affect extremely localised areas of seabed and would be unlikely to contribute to the loss of benthic habitat or species diversity.

Seals have been observed offshore with injuries from entanglement with plastic that have occurred either onshore or en-route to offshore facilities within Gippsland basin. There are no recent records of incidents associated with the disposal of floating waste to the marine environment from offshore facilities within Gippsland basin that has caused either visual pollution or death or injury to marine fauna.

Given the restricted exposures and limited quantity of marine pollution expected from this program, it is expected that any impacts from marine pollution may have an impact resulting from a localised short-term impact to species/habitats of recognised conservation value but not affecting local ecosystem functioning.

Vessels are required to be compliant with MARPOL Annex V, while MODU waste management procedures are in compliance with MARPOL Annex V (Regulations for the Prevention of Pollution by Garbage from Ships). This is enforced through AMSA Marine Order Part 95 (Marine pollution prevention — garbage) and Marine Order Part 94, (Packaged harmful substance). MARPOL Annex V

requires that a garbage / waste management plan and garbage record book is in place and implemented.

Victorian legislative instruments for waste management include the Environment Protection Act 1970 (Vic) and the State Environment Protection Policy (Waters of Victoria) – Clause 47 (Ports, marinas and vessels).

Vessel waste management procedures require housekeeping provisions be made for the safe handling and storage of materials such as dirty rags, trash, waste oil, and chemicals. Flammable liquids and chemicals spilled on vessel should be immediately cleaned up. Particular care should be taken to provide proper storage for paint and chemicals.

The potential impact is localised and short-term, and is not considered as having the potential to affect biological diversity and ecological integrity, or to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required. No stakeholder concerns have been raised to date regarding waste management on the MODU/support vessels. There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.4.3 Controls

- Vessel waste management procedures will be in compliance with Marine Order 95 (Marine pollution prevention – garbage) 2018 (which gives effect to MARPOL Annex V (Prevention of Pollution by Garbage from Ships)) Requirements.
- Garbage Management Plan in place and implemented.
- Garbage Record Book maintained in accordance with Marine Order 95.
- Inductions for all vessel crew provide an opportunity to make personnel aware of the requirements of the Garbage Management Plan and housekeeping provisions during the activity
- Also see Section 5.24: Dropped Objects.

5.4.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.4.5 Demonstration of ALARP

The controls listed above are considered sufficient to reduce the impacts and risks associated with waste management to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, well-established practices are in place and the residual risk resulting from this activity is considered to be low (Category 4). The waste management plan, in compliance with the requirements under MARPOL, is appropriate for managing the day to day risk of this activity.

The potential impact of incorrect waste management is localised and short-term, and is not considered as having the potential to affect biological diversity and ecological integrity, or to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required. No stakeholder concerns have been raised to date regarding waste management on the MODU/vessels. There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.4.6 Demonstration of Acceptability

For this hazard the residual risk was assessed as a Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.5 MODU/Vessel deck drainage (RA 5)

5.5.1 Hazard

Discharge of deck drain water from vessels and MODU, contaminated with hydrocarbons and / or other chemicals (e.g., detergents) may cause a temporary change in the water quality and acute or chronic impacts to marine organisms.

Periodic deck wash-down is necessary to prevent the build-up of dirt and grime which causes decks to become slippery and unsafe. During these wash-down events it is possible that minor diluted quantities of oil and grease, mud and chemicals may be discharged.

Spills within designated deck containment areas where chemicals, oils and wastes are stored are either pumped out to the waste oil settling tank or mopped up utilising spill clean-up materials.

5.5.2 Impact Assessment

A discharge of contaminated deck drain water has the potential to result in chronic effects to plankton through potential toxicity in the water column.

Decks or deck drains which only contain rainwater are directed overboard and all overboard drains are fitted with scupper plugs to be closed in the event of a spill on the deck. MODU drainage meets industry best practise (Section 2.5.6: Drain, Effluent and Waste Systems) while vessel drainage is required to meet MARPOL requirements (Annex 1: Regulations for the Prevention of Pollution by Oil). Low concentrations of contaminants are likely to be present in the overboard discharges and any localised change in water quality will rapidly disperse in the high energy marine environment; therefore the impact on marine organisms is assessed to be low.

As outlined in Section 2.5.6, deck drainage onboard the MODU is separated in open and closed drain systems:

- **Uncontaminated** open drain system: non-hazardous water from the decks (e.g. stormwater) passes through a scupper system directly to the sea by way of piping chutes or dumps.
- **Contaminated** open drain system: Drainage from separate higher risk collection areas is led directly to the skimmer tank and automatic oily water separator (OWS). The OWS processes the fluid, passing the clean phase with less than 15 ppm oil directly to the sea and any oil is forced to the dirty oil tank for eventual disposal to shore facilities (as per bilge water). Any discharge detected with higher than 15 ppm oil is redirected back to the skimmer tank. Equipment with the potential to leak hazardous materials have coamings fitted to contain any potentially polluting fluids and these are either drained to drain tanks or emptied manually into storage containers for disposal.
- **Bilge water system** (Section 5.6): The drainage from engine room and auxiliary machine pit bilges is collected in the dirty oil tank for eventual onshore transfer for disposal. Spent grease and lubricants for other equipment is collected in storage drums and stored in a designated hazardous storage area away from potential sources of heat or flames. All fuel and bulk lubricant disposal is fully documented using an oil record book.

Discharge of deck drainage is permissible under MARPOL Annex I (Regulations for the Prevention of Pollution by Oil), provided it meets MARPOL requirements.

The drain, effluent and waste systems onboard the MODU are designed to comply with the requirements of:

- ABS Rules for Building and Classing Mobile Offshore Drilling Units 2001; and applicable updates and corrigenda's, effective at 10 March 2006, Part 4, Chapter 2, Section 4, Fuel oil and other piping systems
- IMO Code for the Construction and Equipment of Mobile Offshore Drilling Units, 1989, Chapter 9 Fire Safety
- IMO International Convention for Prevention of Pollution from Ships, 1973, 1978 Protocol (MARPOL)

- IMO Resolution MEPC.107(49) 2003, Revised Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilges of Ships.

OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures MODU/vessel meet MARPOL requirements through the premobilisation inspection and provides assurance that these controls exist.

Given the low concentration of hydrocarbon being discharged, the infrequent nature of this discharge, the rapid dispersion in the high energy marine environment, the dilution effect once discharged and the low number of sensitive receptors known to occur in the operational area, the discharge is anticipated to have little or no impact on the receiving environment.

There is potential for short-term impacts to species that rely on plankton as a food source. Any impact to prey species would be temporary as the duration of exposure would be limited, and fish larvae and other plankton are expected to rapidly recover as they are known to have high levels of natural mortality and a rapid replacement rate (UNEP 1985).

Consequently, the potential impacts and risks from discharge from deck drains are considered to be localised and short-term, and have been rated as a Level IV consequence, with the probability of this discharge having significant impacts to be very unlikely (D), resulting in a Category 4 risk.

5.5.3 Controls

- MODU vessel and deck drainage procedures meet MARPOL Annex I (Regulations for the Prevention of Pollution by Oil) requirements.
- Drainage from separate higher risk collection areas is led directly to the skimmer tank and automatic oily water separator (OWS), for discharge through bilge water system (Section 5.6).
- Selection of lox toxicity chemicals, in accordance with Esso chemical selection procedure.
- A Planned Maintenance System (PMS) is in place to ensure that the OWS and ODME (appropriate to the vessel size) are routinely calibrated and maintained.

5.5.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.5.5 Demonstration of ALARP

Having a maintained and operational drainage system, compliant with MARPOL, is considered sufficient to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4). The requirements under MARPOL are appropriate for managing the day to day risk of this activity. This is a Type A ALARP Decision. Since uncontaminated open drain discharges do not affect biological diversity and ecological integrity, and the risk is low, no further evaluation against the principles of ESD is required.

Other controls and alternatives that have been considered, in accordance with Section 4.2 (Demonstration of ALARP), include the treatment and/or collection of all stormwater discharges. This would require storage in dedicated holding tanks for which there is limited space either on or below deck, as well as increased capacity of OWS systems. This is not considered to be practicable due to the time and costs of implementing these measures being grossly disproportionate to the reduction in risk, and safety considerations involved.

The installation of an electric marine water evaporator to evaporate away the water portion of deck drainage water is not considered practicable due to cost considerations and the environmental impacts associated with emissions from the generator. Such a generator would also necessitate additional fuel storage (most likely to be diesel), which increases diesel spill related risks.

There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.5.6 Demonstration of Acceptability

For this hazard the residual risk was assessed as a Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.6 MODU/Vessel oily water (bilge) discharge (RA 6)

5.6.1 Hazard

Discharge of machinery space drainage (bilge) contaminated with hydrocarbons and/or other chemicals (e.g., detergents) may cause a temporary change in the water quality.

The MODU is fitted with MARPOL-compliant oily water separators (OWS), with effluent monitored through an inline Oil Detection Monitoring System (ODME), and with out-of-spec waste water (>15 ppm Oil-in-Water, OIW) returned to slops tanks.

5.6.2 Impact Assessment

A discharge of contaminated bilge water has the potential to result in chronic effects to plankton through potential toxicity in the water column.

Marine equipment and machinery spaces on the MODU/vessels are fully contained and have dedicated drains leading to the oily water separator system, which is required to comply with MARPOL and is tested and certified to verify compliance. Oily residues/concentrate generated in this process are containerised in transit tanks and returned to shore for disposal at licenced waste disposal facilities. Each shipment of wastes to shore is accompanied by a manifest and recorded in the shipboard oil record book.

Discharge of treated effluent from vessel bilges is permissible under Marine Order 91 (Marine pollution prevention – oils) 2018 (which gives effect to MARPOL Annex I (Regulations for the Prevention of Pollution by Oil)), provided it meets MARPOL requirements for vessels over 400 MT (MARPOL compliant OWS, OIW <15 ppm, ODMS), and vessels contracted to undertake activities for Esso are equipped with an oil-water separator capable of achieving effluent standards specified by the Marine Environment Protection Committee of the IMO.

The drain, effluent and waste systems onboard the MODU are designed to comply with the requirements of:

- ABS Rules for Building and Classing Mobile Offshore Drilling Units 2001; and applicable updates and corrigenda's, effective at 10 March 2006, Part 4, Chapter 2, Section 4, Fuel oil and other piping systems
- IMO Code for the Construction and Equipment of Mobile Offshore Drilling Units, 1989, Chapter 9 Fire Safety
- IMO International Convention for Prevention of Pollution from Ships, 1973, 1978 Protocol (MARPOL)
- IMO Resolution MEPC.107(49) 2003, Revised Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilges of Ships.

OSPAR (2014) indicates that the predicted no effect concentration (PNEC) for marine organisms exposed to dispersed oil is 70.5 ppb. It should be noted that this PNEC is based upon no observed effect concentrations (NOEC) after exposure to certain concentrations for an extended period that was greater than 7 days (OSPAR 2014).

USEPA (2002) modelled the plume off liquid discharges, in addition to tracking the plume of liquid. The effluent was marked with a fluorescent dye for tracing dilution rates in the plume. Predicted initial dilution rate was 40,000:1, whereas measured values varied between 200,000:1 and 640,000:1.

Given the low concentration of hydrocarbon being discharged, the infrequent nature of this discharge, the rapid dispersion in the high energy marine environment, the dilution effect once discharged and the

low number of sensitive receptors known to occur in the operational area, the discharge is anticipated to have little or no impact on the receiving environment.

There is potential for short-term impacts to species that rely on plankton as a food source. Any impact to prey species would be temporary as the duration of exposure would be limited, and fish larvae and other plankton are expected to rapidly recover as they are known to have high levels of natural mortality and a rapid replacement rate (UNEP 1985).

Consequently, the potential impacts and risks from planned discharge of treated bilge are considered to be localised and short-term, and have been rated as a Level IV consequence, with the probability of this discharge having significant impacts being very unlikely (D), resulting in a Category 4 risk.

5.6.3 Controls

- Maintained and operational oily water separator and oil in water analyser compliant with MARPOL Annex I: Regulations for the Prevention of Pollution by Oil
- MODU procedures for oily water discharges including OWS operation and reliability, and onshore disposal of residual oil.

5.6.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.6.5 Demonstration of ALARP

Having a maintained and operational oily water separator and oil in water analyser compliant with MARPOL is considered sufficient control measure to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4). The requirements under MARPOL are appropriate for managing the day to day risk of this bilge water discharge. This is a Context A ALARP Decision. Since bilge water discharges do not affect biological diversity and ecological integrity, and risk is low, no further evaluation against the principles of ESD is required.

Other controls and alternatives that have been considered, in accordance with Section 4.2 (Demonstration of ALARP), including the disposal of oily water onshore. This would require storage in dedicated holding tanks for which there is limited space either on or below deck, additional lifting operations and/or transport to an onshore port for transfer by road tanker to a licensed waste treatment plant. This is not considered to be practicable due to the time and costs of implementing these measures being grossly disproportionate to the reduction in risk, and safety considerations involved.

The installation of an electric marine water evaporator to evaporate away the water portion of oily bilge water is not considered practicable due to cost considerations and the environmental impacts associated with emissions from the generator. Such a generator would also necessitate additional fuel storage (most likely to be diesel), which increases diesel spill related risks.

There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.6.6 Demonstration of Acceptability

For this hazard the residual risk was assessed as a Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.7 MODU/Vessel ballast water discharge (RA 7)

5.7.1 Hazard

Marine vessels can carry ballast seawater containing marine species that, when discharged, has the potential to translocate the marine species into areas where they could displace native species, or interfere with ecosystem processes in other ways.

Note that biofouling risk has been addressed separately, under RA 8 (Section 5.8).

5.7.2 Impact Assessment

Planned discharge of ballast water has the potential to introduce a marine pest. The Australian Government biosecurity department indicates that ballast water is responsible for 20-30% of all marine pest incursions into Australian waters (DAWR, 2015a). The Department of Agriculture & Water Resources (DAWR) (formerly AQIS) declares that all saltwater from ports or coastal waters outside Australia's territorial seas presents a high risk of introducing foreign marine pests into Australia (AQIS 2011).

The DAWR has introduced mandatory ballast water regulations, where ballast water must be exchanged outside Australia's territorial sea. The Territorial Sea is a belt of water not exceeding 12 NM in width, measured from the territorial sea baseline. Australia's sovereignty extends to the territorial sea, its seabed and subsoil, and to the air space above it. This sovereignty is exercised in accordance with international law as reflected in the Convention. The major limitation on Australia's exercise of sovereignty in the territorial sea is the right of innocent passage for foreign ships. The territorial sea around certain islands in the Torres Strait is 3 NM.

This measure greatly reduces the risk of Invasive Marine Pests (IMPs) from international shipping, so that the risk of IMP introduction into territorial waters from international shipping should be negligible to low. Risk from ballast water exchange by domestic ships within the territorial sea (e.g. at any Australian port) depends on where the ballast water was last acquired.

The Marine Pests Interactive Map (DAFF 2017) indicates that ports such as Portland, Geelong, Melbourne and Eden are known to harbour the following species:

- Northern pacific sea star – See Section 5.8.2.
- European shore crab – See Section 5.8.2.
- New Zealand screw shell – See Section 5.8.2
- European fan worms (Sabella spallanzannii and Euchone sp.) – attaches to hard surfaces, artificial structures and soft sediments, preferring sheltered waters up to 30 m deep. It reached Port Phillip Bay in the mid-1980s and is a nuisance fouler (ParksVic 2017).
- Japanese kelp (Undaria pinnatifida) – occupies cold temperate oceanic waters up to 20 m deep, growing on rock, reef, stones and artificial structures. It rapidly forms dense forests and overgrows native species. It first established in Port Phillip Bay in the 1980s (ParksVic 2017).
- Asian date mussel (Musculista senhousia) – prefers soft sediments in waters up to 20 m deep, forming mats and altering food availability for marine fauna.
- European shell clam (Varicorbula gibba) – burrows into soft-bottomed habitats in waters up to 150 m deep in temperate waters, forming mats and altering food availability for marine fauna.

These species have the potential to be picked up in the ballast water and transferred to other areas. Two of these species (Pacific oyster and European green crab) are also known to occur in the Gippsland Lakes (Hirst & Bott 2016).

The known and potential impacts of IMP introduction include:

- Reduction in native marine species diversity and abundance;
- Displacement of native marine species;
- Socio-economic impacts on commercial fisheries; and

- Changes to conservation values of protected areas.

No ballast water discharge or exchange is expected to occur within the Australian territorial sea boundary. Open-ocean ballast water discharge or exchange is considered the best compromise between efficacy, environmental safety and economic practicality to manage the potential risk if IMPs (DOF 2009). The two key assumptions underpinning this are:

- Changes in biological condition (including salinity) of source and recipient waters (i.e. coastal or estuarine IMPs) are presumed unlikely to survive in ocean waters, and vice versa.
- The transport of viable released non-indigenous organisms from open-ocean to coastal and estuarine waters, by ocean currents, is considered extremely unlikely.

Research indicates that biofouling has been responsible for more foreign marine introductions than ballast water (DAWR 2015b). Section 5.8 (Vessel Biosecurity & Hull Biofouling) provides an overview of recent biosecurity incidents in Victorian waters, largely relating to hull biofouling.

The potential risks from ballast water discharge are considered to be low, considering that support vessels and MODU are operating well outside the Australian Territorial Sea, are required to meet Australian Ballast Water Management Requirements (DAWR 2017). The MODU and support vessels have been continuously operating in Australian waters, thereby further reducing this risk. Consequently, this risk has been rated as a Level IV consequence, with the probability of ballast water impacts to be very unlikely (D), resulting in a Category 4 risk.

5.7.3 Controls

- All project vessels have fulfilled the requirements of the Australian Ballast Water Management Requirements (DAWR 2017) if they have mobilised from outside of Australian territorial waters.
- Under the Biosecurity Act 2015 Section 193, pre-arrival information must be reported through the Maritime Arrivals Reporting System (MARS) no later than 12 hours before arriving in Australian waters.
- Vessel adherence to the Australian Ballast Water Management Requirements (DAWR 2017)
- Ballast Water Management Plan and Certificate in accordance with the IMO Ballast Water Management Convention (IMO, 2004)
- Vessels only discharge low-risk domestic ballast water into Victorian state waters (on entry to a Victorian port and throughout the survey) in accordance with:
    - The Victorian Environment Protection (Ships Ballast Water) Regulations 2017 (EPA 2017a).
    - EPA Protocol for Environmental Management (PEM): Domestic Ballast Water Management in Victorian Waters (Publication 949.7, EPA 2017b).
    - DAWR Ballast water risk assessment undertaken (Australian Ballast Water Management Information Tool[2]) and submitted by the Vessel Master prior to entering Victorian state waters (https://management.marinepests.gov.au/bw/).
- Non-compliant discharges of domestic ballast water are reported to the EPA Victoria immediately.
- Suspected or known introductions of IMS will be reported to the DELWP immediately.

5.7.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

[2] Developed by the Australian Ballast Water Unit (ABWU), custodian of the of Australian Ballast Water Management Infoirmation System (ABWMIS)

5.7.5 Demonstration of ALARP

Compliance with Australian Ballast Water Management Requirements (DAWR 2017) is considered a sufficient control measure to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4). This is a Context A ALARP Decision.

The project aims to use vessels / MODUs that are currently operating in Commonwealth Waters to reduce the potential for introducing IMS. However, use of international vessels (e.g. during well intervention / source control; Section 6.5) cannot be fully eliminated. Limiting vessel / MODU selection to use of those currently operating in Commonwealth Waters could potentially pose a significant risk in terms of time and duration for sourcing a vessel, as well as the ability of those chosen to perform the required tasks. This potential cost is grossly disproportionate to the minor environmental gain (of reducing the potential likelihood of IMS introduction) achieved, and is not reasonably practicable.

There is potential for a localised, but irreversible, impact to benthic communities. However, Blackback P&A operations are in deep water (~400 m), and a long distance from the shore (90 km), so that the potential for irreversible impacts is very unlikely to affect biological diversity and ecological integrity.

Further considerations against the remaining Principles of ESD include that there is little uncertainty associated with this aspect as the activities are well known, the cause pathways are well known, and activities are well regulated and managed. It is not considered that there is significant scientific uncertainty associated with this aspect. Therefore, the precautionary principle has not been applied.

Other controls and alternatives were considered, in accordance with Section 4.2 (Demonstration of ALARP), including the use of ballast free vessels; however ballast free vessels are not commercially available or viable. No stakeholder concerns have been raised for this risk. On this basis Esso considers the risk to be ALARP.

5.7.6 Demonstration of Acceptability

For this hazard the residual risk was assessed as a Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.8 MODU/Vessel Biosecurity & Hull Biofouling (RA 8)

5.8.1 Hazard

Biological fouling on MODU/vessel hulls has the potential to translocate marine species into areas where they could displace native species or interfere with ecosystem processes in other ways.

5.8.2 Impact Assessment

In the South-east Marine Region, 115 marine pest species have been introduced and an additional 84 have been identified as possible introductions, or ‘cryptogenic’ species (NOO 2002). Several introduced species have become pests, either by displacing native species, dominating habitats, or causing algal blooms.

Marine pests known to occur in South Gippsland, according to ParksVic (2017o) and VEAC (2014) include:

- **Pacific oyster** (*Crassostrea gigas*) – small number of this oyster species are reported to occur in Western Port Bay and at Tidal River in the Wilsons Promontory National Park (DELWP, 2015).
- **Northern pacific seastar** (*Asterias amurensis*) – prefer soft sediment habitat, but also use artificial structures and rocky reefs, living in water depths usually less than 25 m (but up to 200 m water depths). It is thought to have been introduced in 1995 through ballast water from Japan.
- **New Zealand screw shell** (*Maoricolpus roseus*) – lies on or partially buried in sand, mud or gravel in waters up to 130 m deep. It can densely blanket the sea floor with live and dead shells and compete with native scallops and other shellfish for food. This species is present in eastern

Bass Strait, forming extensive and dense beds on sandy seabeds (Patil *et al*., 2004). It is known to occur in the Point Hicks Marine National Park.

- **European shore crab** (*Carcinus maenas*) – prefers intertidal areas, bays, estuaries, mudflats and subtidal seagrass beds, but occurs in waters up to 60 m deep. It is presumed to occur on the intertidal reefs of all the marine national parks in Gippsland, except the Ninety Mile Beach MNP (which has no intertidal reef).

Successful Invasive Marine Species (IMS) invasion requires the following three steps:

1. Colonisation and establishment of the marine pest on a vector (e.g., vessel hull) in a donor region (e.g., home port).
2. Survival of the settled marine species on the vector during the voyage from the donor to the recipient region (e.g., project area).
3. Colonisation (e.g., dislodgement or reproduction) of the marine species in the recipient region, followed by successful establishment of a viable new local population.

If colonisation occurs, the IMS is likely to have little or no natural competition or predation in its new location, thus potentially outcompeting native species for food or space, preying on native species or changing the nature of the environment. Research indicates that biofouling has been responsible for more foreign marine introductions than ballast water (DAWR 2015b).

Marine pest species can also deplete fishing grounds and aquaculture stock, with between 10% and 40% of Australia's fishing industry being potentially vulnerable to marine pest incursion (AMSA n.d.). For example, the introduction of the Northern Pacific seastar (*Asterias amurensis*) in Victorian and Tasmanian waters was linked to a decline in scallop fisheries.

In summary the known and potential impacts of IMS introduction include:

- Reduction in native marine species diversity and abundance;
- Displacement of native marine species;
- Socio-economic impacts on commercial fisheries; and
- Changes to conservation values of protected areas.

To minimise the risk of IMS all project vessels must undertake an IMS risk assessment, in accordance with the Esso Invasive Marine Species - Risk Assessment Procedure (IMS-RAP). IMS-RAP is based on the "Vessel Check Risk Assessment Tool", developed by WA Department of Fisheries (DOF 2015) and incorporates requirements of National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (AQIS 2009 and evaluates the following parameters:

- Duration of stay in overseas or interstate coastal waters
- Transport method (dry verses wet haulage)
- Presence and age of antifouling coating (AFC)
- Evidence of recent dry dock or in-water IMS inspections and cleaning
- Presence and operation of internal seawater treatment systems if applicable

The MODU was subjected to a biofouling inspection prior to mobilisation to Australian waters (Singapore, May 2017) and has been continuously operating in Australian waters since that inspection. An IMS-RAP was undertaken for the MODU for the Esso Baldfish Drilling activities and found to be acceptable. As the MODU will be directly moving from a nearby Gippsland Basin location directly to the Blackback location to undertake the scope covered by his EP, no additional assessment has been undertaken.

Support vessel are also sourced from those already operating in Australian waters and will be assessed using IMS-RAP.

Despite these controls, there is potential for a localised, but irreversible, impact to benthic communities resulting from the use of the MODU and vessels. As Blackback P&A operations are in deep water (~400

m) and a long distance from the shore (90 km), the likelihood for irreversible impacts affecting biological diversity and ecological integrity is low. The two key assumptions underpinning this are:

- Changes in biological condition (including salinity) of source and recipient waters (i.e. coastal or estuarine IMPs) mean that IMPs are presumed unlikely to survive in ocean waters, and vice versa.
- The transport of viable released non-indigenous organisms from open-ocean to coastal and estuarine waters, by ocean currents, is considered extremely unlikely.

Additionally, the expectation is that all project vessels, except the supply vessel, will remain in deep water, outside the Australia's territorial sea (>12 NM from shore), where IMS risk is considered to be insignificant (se IMS-RAP and DOF 2015 for details).

The potential risk from hull biofouling is considered to be low. However, use of international vessels if required (e.g. during well intervention / source control; Section 6.5), and entry into Australia's territorial sea (<12 NM from shore) cannot be fully eliminated.

5.8.3 Controls

Prior to mobilisation in the field a risk assessment for all project vessels will be performed in accordance with the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (DAFF 2009) and Esso IMS-RAP.

The following control measures will be implemented to minimise the risk of introduction of IMS:

- Esso undertakes a vessel contractor pre-qualification, including IMS-RAP, to ensure vessel biofouling risk is acceptable in accordance with:
    - National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (DAFF 2009c), and
    - IMO guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (IMO 2011; RESOLUTION MEPC.207(62). Adopted on 15 July 2011).
- Vessels are managed in accordance with the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (AQIS, 2009). This means:
    - Conducting in-water inspection by divers or inspection in dry-dock if deemed necessary.
    - Biofouling risk will be assessed, with cleaning of hull and internal seawater systems undertaken if deemed necessary.
    - Anti-fouling coating status taken into account, with antifouling renewal undertaken if deemed necessary.
- Any vessel >400 gross tonnes carries a current International Anti-fouling System (IAFS) Certificate compliant with Marine Order 98 (Marine pollution – anti-fouling systems) 2013 (which gives effect to those parts of the International Convention on the Control of Harmful Anti-fouling Systems on Ships relating to controls).
- Ships of 24 m or more in length but < 400 tonnes (engaged in international voyages) will carry a Declaration on Anti-fouling Systems, compliant with Marine Order 98 (Marine pollution – anti-fouling systems) 2013.
- Suspected or known introductions of IMS will be reported to the DELWP immediately.
- In-water equipment will be cleaned prior to initial use in the operational area, in accordance with National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (AQIS 2009).
- Any international shipments destined for Blackback P&A activities are cleared through Customs prior to mobilisation of MODU or Support vessels, in accordance with the Department of Agriculture and Water Resources requirements under the Biosecurity Act 2015, Export Control

Act 1982, and Imported Food Control Act 1992 (http://www.agriculture.gov.au/import/arrival/clearance-inspection).

5.8.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.8.5 Demonstration of ALARP

The control measures summarised above are considered sufficient to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4).

There is potential for a localised, but irreversible, impact to benthic communities. However, Blackback P&A operations are in deep water (~400 m), and a long distance from the shore (90 km), so that the potential for irreversible impacts is very unlikely to affect biological diversity and ecological integrity.

Further considerations against the remaining Principles of ESD include that there is little uncertainty associated with this aspect as the activities are well known, the cause pathways are well known, and activities are well regulated and managed. It is not considered that there is significant scientific uncertainty associated with this aspect. Therefore, the precautionary principle has not been applied.

Other controls and alternatives were considered, in accordance with Section 4.2 (Demonstration of ALARP), including the use of ballast free vessels; however ballast free vessels are not commercially available or viable. Limiting vessel / MODU selection to use of those currently operating in Commonwealth Waters could potentially pose a significant risk in terms of time and duration for sourcing a vessel, as well as the ability of those chosen to perform the required tasks. This potential cost is grossly disproportionate to the environmental gain achieved by further reducing the potential likelihood of IMS introduction, and is not reasonably practicable.

No stakeholder concerns have been raised for this risk. On this basis Esso considers the risk to be ALARP.

5.8.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.9 Vessel and helicopter movements - Interaction with fauna (RA 9)

5.9.1 Hazard

The movement of vessels and helicopters within the operational area has the potential to result in collision with marine fauna.

5.9.2 Impact Assessment

Vessel collision with marine fauna can lead to injury or mortality of sensitive marine species. Several whale species are known to transit through Bass Strait on annual migration and may occur within the Blackback P&A operational area, including those listed as either threatened and/or migratory under the EPBC Act. Dolphins, seals and turtle species may also frequent the Blackback P&A operational area, although seals are not expected to frequently venture as far out as the Blackback P&A operational area. Seabirds may also be found around the MODU and support vessels, and have been reported to use these structures as a resting place, and may be attracted by fish which tend to concentrate around offshore facilities.

The Blackback P&A operational area lies in a busy shipping route. The establishment of temporary fairways around the Blackback P&A operational area (Section 5.22.2.1 and Figure 5-1) reduces the risk of fauna interactions by third party commercial vessels, but does not eliminate this risk for project vessels. As there are no recognised feeding, breeding or resting aggregation areas in the Blackback

P&A operational area, the presence of whales is expected to be transient and occasional and therefore the risk of impacts to cetaceans is considered to be low.

Cetaceans are naturally inquisitive marine mammals that are often attracted to offshore vessels and facilities. The reaction of whales to the approach of a vessel is quite variable. Some species remain motionless when in the vicinity of a vessel, while others are curious and often approach ships that have stopped or are slow moving, although they generally do not approach, and sometimes avoid, faster-moving ships (Richardson *et al*. 1995).

Collisions between larger vessels with reduced manoeuvrability and large, slow-moving cetaceans occur more frequently where high vessel traffic and cetacean habitat occurs (Dolman *et al*. 2006). Laist *et al.* (2001) identified that larger vessels with reduced manoeuvrability moving in excess of 10 knots may cause fatal or severe injuries to cetaceans, with the most severe injuries caused by vessels travelling faster than 14 knots.

Blackback support vessels typically have a high level of manoeuvrability (DP) and would not be moving at these speeds while in the Blackback P&A operational area. The MODU is stationary, except when moving between well locations, when transit speeds are low (typically less than 2 knots).

Fur seals use Esso operational facilities in the Gippsland Basin as a resting place and as a source of food, and this may result in vessel interactions near these facilities.

Peel *et al*. (2016) reviewed vessel strike data for marine species in Australian waters:

- Whales were identified as having interacted with vessels. Of these, interaction with the Humpback Whale and the Southern Right Whale was most frequent.
- Dolphins were also identified as interacting with vessels, with interaction with the Common Bottlenose Dolphin most common.
- No vessel interactions were reported for the Australian or New Zealand Fur Seal, although seal injury by boat propellers has been reported, often resulting from the seal interacting/playing with a boat. The incidence of boat strike for seals is thought to be very low.

All vessels, when in the field, adopt proximity / speed restrictions near cetaceans as provided in the EPBC Regulations Part 8: Interacting with cetaceans and whale watching (DoEE 2000). Cetaceans tend to practice avoidance around vessels with high noise signatures and therefore the likelihood of a cetacean strike is considered very unlikely. There have been no reported recent incidents of cetacean strikes across all Bass Strait operational areas.

Esso's helicopter traffic flies at slow speeds near operational areas, for safety reasons, enabling pilots to take avoidance action if seabirds are present on the helideck; however, there have been isolated recent incidents of bird strikes (individuals only) during Esso helicopter operations in Bass Strait. Impacts to seabirds are considered to be low.

The duration of fauna exposure to vessel strike is limited to the duration of Blackback P&A activities (expected to be approximately 75 days, plus 10% contingency). If a fauna strike occurred and resulted in death, it is not expected that it would have a detrimental effect on the overall population.

Consequently, the potential impacts and risks from vessel or helicopter interaction with fauna are considered to be localised and short-term, as this type of event may result in impact to individuals from a species of recognised conservation value but is not expected to affect the population or local ecosystem function. The consequence has been rated as Level IV, with the probability very unlikely (D), resulting in a Category 4 risk.

5.9.3 Controls

- Vessel masters will be briefed on caution and 'no approach zones' and interaction management actions as defined in the EPBC Regulations 2000 – Part 8 Division 8.1
- A vessel master (or delegate) will be on duty at all times
- Vessels adhere to the distances and vessel management practices of EPBC Regulations (Part 8) and Wildlife (Marine Mammals) Regulations 2009 (Part 3(9)):

- Vessels will travel at less than 5 knots within the caution zone of a cetacean and minimise noise (Caution Zone is 150m radius for dolphins, 300 m for whales and 50m for seals).
- The vessel must not drift closer than 50 m (dolphins and seals) and 100 m (whale);
- If whale comes within above limits, the vessel master must disengage gears and let the whale approach or reduce the speed of the vessel and continue on a course away from the whale;
- The vessel must not restrict the path of a marine mammal.
- The vessel must not separate any individual from a group of marine mammals or come between a mother whale and calf or a seal and pup;
- If the vessel is within the caution zone of a marine mammal the vessel must move at a constant speed that does not exceed 5 knots, avoids sudden changes in speed or direction and manoeuvres the vessel to outside the caution zone if the marine mammal shows any sign of disturbance;

Additionally, if a vessel is within the caution zone of a marine mammal, the vessel shall not approach a marine mammal from head on, from the rear or be in the path ahead of a marine mammal at an angle closer than 30° to its observed direction of travel.

- A helicopter maintains a minimum distance of 500-metre from a marine mammal in accordance EPBC Regulations (Part 8) and Wildlife (Marine Mammals) Regulations 2009 Part 3(8). Further it will not:
  - approach a marine mammal from head on;
  - fly directly over or pass the shadow of the aircraft directly over a marine mammal;
  - land on water to observe marine mammals
  - operate a helicopter in the vicinity of a marine mammal if the marine mammal shows signs of disturbance.

  Unless it is necessary for the helicopter to:
  - avoid damage or prevent further damage to person or property; allow take-off or landing
  - comply with an Act or regulations relating to the operation of a helicopter.
- Trained crew members on active duty will report observations of megafauna located within the cautionary zone (as defined in The Australian Guidelines for Whale and Dolphin Watching) to the vessel master (or their delegate), as soon as it is safe to do so.
- All personnel have completed an environmental induction covering the requirements for marine mammal/vessel interaction consistent with EPBC Regulations 2000 (Chapter 8) and Victorian Wildlife (Marine Mammals) Regulations 2009 (Part 2/Part 3) and are familiar with the requirements. This includes a requirement to notify the bridge if marine mammals are sighted in the caution zone.
- Any injury to, or mortality of, an EPBC Act Listed Threatened or Migratory Species (including those from a vessel strike) will be recorded on the National Ship Strike database within 72 hours (https://data.marinemammals.gov.au/report/shipstrike).

5.9.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.9.5 Demonstration of ALARP

Compliance with the Environment Protection and Biodiversity Conservation Regulations 2000 and Victorian Wildlife (Marine Mammals) Regulations 2009 are considered sufficient control measures to

reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4).

The risk associated with fauna strike is well managed via legislative control measures that are considered industry best practice. These are well understood and implemented by the industry. During stakeholder consultation, no objections or claims were raised regarding physical presence.

Because the potential impacts from physical presence of the MODU and support vessels is limited and as there is likely to be limited interaction with marine fauna in the defined operational area, ALARP Decision Context A should apply. No further controls or alternatives have been identified. On this basis Esso considers the risk to be ALARP.

The potential impact associated with this aspect is limited to individual fauna mortality, which is not considered as having the potential to affect biological diversity and ecological integrity. The activities are not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required.

5.9.6 Demonstration of Acceptability

For this hazard the residual risk was assessed as a Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.10 Emissions to Air from MODU/Vessels (RA 10)

5.10.1 Hazard

Supply vessel fuel combustion equipment usually burns diesel as fuel. Helicopters use aviation gas as fuel for their engines. See Section 2.3.2 for details on the MODU operations and Section 2.5 on support vessel activities.

Air emissions may originate from equipment such as generators, turbines, and pumps. CO, NO_x and SO_x as well as greenhouse gases such as CO_2 are emitted to the atmosphere from combustion of diesel fuel and venting of gas from the annulus during abandonment activities. Another source of air emissions is venting during bunkering operations.

5.10.2 Impact Assessment

CO, NO_x and SO_x as well as greenhouse gases such as CO_2 will be emitted to atmosphere during all project activities in the field. Due to the highly dispersive offshore environment, these emissions do not contribute to any local air quality issues, but there will be a small contribution of greenhouse gases to the atmosphere.

The quantities of atmospheric emissions generated by fuel consumption, and related impacts, will be similar to other vessels and helicopters operating in the South-east Marine Region for both petroleum and non-petroleum activities. Emissions from engines, generators and deck equipment may be toxic, and will result in a localised, temporary reduction in air quality. Emissions may also create odour or impact on visual amenity.

Modelling was undertaken for nitrogen dioxide (NO_2) emissions from MODU power generation for an offshore project (BP 2013), to quantify the area of which air quality reduction may occur. NO_2 was the focus of the modelling as it is considered the main atmospheric pollutant of concern, with larger predicted emission volumes compared to other pollutants. The modelling results indicated that, on an hourly average, there is the potential for an insignificant increase in ambient NO_2 concentrations within 10 km of the source and an increase of less than 0.1 µg/m^3 (0.00005 ppm) in ambient NO_2 concentrations more than 40 km away.

The Australian Ambient Air Quality National Environmental Protection (Air Quality) Measures (NEPM) recommends that hourly exposure to NO_2 is <0.12 ppm and annual average exposure is <0.03 ppm. BP modelling indicated that even the highest hourly averages were restricted to a distance ~5 km from the MODU (BP 2013). Since the Blackback P&A operational area is 90 km from the nearest shore, no social impacts are expected from air emissions resulting from P&A related activities.

Any exposure from Blackback P&A operations in the field are expected to be below NEPM standards. Additionally, MARPOL Annex VI (Regulations for the Prevention of Air Pollution from Ships). All vessels will comply with Marine Orders – Part 97: Marine Pollution Prevention – Air Pollution (appropriate to vessel class) for emissions from combustion of fuel including:

- Vessels will hold a valid International Air Pollution Prevention (IAPP) certificate and a current international energy efficiency (IEE) certificate.
- All vessels (as appropriate to vessel class) will have a Ship Energy Efficiency Management Plan (SEEMP) as per MARPOL Annex VI.
- Vessel engine NOx emission levels will comply with Regulation 13 of MARPOL Annex VI.
- Operation of engines, generators and deck equipment in accordance with manufacturer's instructions and ongoing maintenance to ensure efficient operation.

OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures MODU/vessel contractors have certified fuel-combustion equipment and operate in accordance with a current Air Pollution Prevention Certificate through the premobilisation inspection and operational inspections (Section 7.5) which provides assurance that these controls exist.

Potential receptors above the sea surface within 5 km of the activity that may be exposed to reduced air quality include seabirds and marine megafauna that surface for air (e.g. cetaceans and marine turtles). The operational area is within known foraging BIAs for the Pygmy Blue Whale, and some seabird species. Emissions will be small in quantity and will dissipate quickly into the surrounding atmosphere, therefore any reduction in air quality will be localised and impacts would be limited.

The contribution of greenhouse gases from fuel combustion equipment on vessels is insignificant on a global scale. Therefore no further evaluation of this aspect has been undertaken. Consequently, the potential impacts and risks from air emissions are considered to be localised, as this type of event may result in a localised short-term impact to species of recognised conservation value but is not expected to affect the population or local ecosystem function, and have been rated as a Level IV consequence, with the probability of an environmental impact to be somewhat likely (B), resulting in a Category 4 risk.

5.10.3 Controls

- Low sulphur diesel fuel used as fuel source to comply with Marine Order Part 97 and Regulation 14 of MARPOL Annex VI (fuel oil with sulphur content less than 3.50% mass/mass).
- Preventive maintenance programmes in place for fuel combustion equipment and energy usage equipment to maximise efficiency.
- Certified emission standards as per Ship Energy Efficiency Management Plan: Esso undertakes a pre-mobilisation inspection with the MODU/vessel contractor(s) to review their environmental performance (via certification records) and to correct any deficiencies in their systems.
- Vessels with diesel engines>130 kW must be certified to emission standards (e.g. IAPP, EIAPP).
- Vessels >400 gross tonnes and involved in an international voyage implement their Ship Energy Efficiency Management Plan (SEEMP) as per MARPOL Annex VI.
- Vessel engine NOx emission levels will comply with Regulation 13 of MARPOL Annex VI.

5.10.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
B	IV	4

5.10.5 Demonstration of ALARP

Atmospheric emissions, from fuel combustion and venting by vessels and MODU is a common occurrence both nationally and internationally. Emissions will be low in comparison to other marine traffic, and will be reduced to below measurable levels in close proximity to the release location.

Managing the risks from atmospheric emissions is well understood with good practice controls that are understood and generally well implemented by the industry. During stakeholder consultation, no objections or claims regarding atmospheric emissions were made. Given the limited potential impact ALARP Decision Context A should apply.

Compliance with MARPOL Annex VI are considered sufficient control measures to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4).

Other controls and alternatives were considered, in accordance with Section 4.2 (Demonstration of ALARP), including alternative sources of energy, such as solar powered generators, however these would require considerable space (which is limited on deck) to meet the operational area power demands and are not considered practicable for most offshore applications due to technical feasibility. In addition, the costs of implementing these measures are grossly disproportionate to the reduction in risk.

As the Blackback P&A campaign will not include well testing, venting during abandonent activities will be reduced.

During bunkering operations, the diesel fuel displaces air in fuel tanks. This air is in equilibrium with fuel in the tanks, so that venting during bunkering will result in the release of volatile gasses to air (VOCs). There are a number of commercially available technologies for treating VOC emissions from ship loading. These include reducing volatility, vapour balancing, thermal oxidation, absorption, adsorption, membrane separation and cryogenic condensation (e.g. Rudd & Hill 2001). Many ports now have vapour recovery systems. However, this requires each vessel to install compatible equipment to enable it to transfer vapour to shore, while this option is not feasible when bunkering offshore.

Methodologies that may be applied offshore include absorption, condensation of VOC using refrigeration, hydrocarbon blanketing and vapour balancing. These systems are designed for crude offloading activities to oil tankers, where the large volumes of VOCs may justify expenditure. Cost-benefit analysis shows that the installation of VOC reduction measures cannot be justified, for the benefits that can be achieved, based on the relatively small volumes of VOCs released and low frequency of offshore bunkering operations.

No stakeholder concerns have been raised for air emissions. The potential impact associated with this aspect is considered localised and temporary, with full recovery to background levels once the activity ceases. Consequently, this aspect is not considered as having the potential to affect biological diversity and ecological integrity. Therefore, no further evaluation against the Principles of ESD is required.

There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.10.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. These emissions represent an insignificant contribution to global greenhouse gas emissions and the environmental impact is therefore considered acceptable. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.11 Cooling Water and Brine Discharges (RA 11)

5.11.1 Hazard

Concentrated brine is a waste stream created through the vessels' desalination equipment for potable water generation. Potable water is generated through reverse osmosis (RO) or distillation resulting in the discharge of seawater with a slightly elevated salinity (~10-15% higher than seawater), however this is dependent on throughput and plant efficiency. Freshwater produced is then stored in tanks on board.

Seawater is used as a heat exchange medium for cooling machinery engines on vessels. Seawater is drawn up from the ocean, where it is de-oxygenated and sterilised by electrolysis (by release of chlorine from the salt solution) and then circulated as coolant for various equipment through the heat exchangers

(in the process transferring heat from the machinery) and is then discharged to the ocean at depth (caisson on MODU) or near the surface. Upon discharge, it will be warmer than the surrounding ambient water and may contain low concentrations of residual biocide if used to control biofouling. Note that some of the Ocean Monarch MODU facilities utilise a closed cooling system, where seawater is not discharged from the MODU as part of the cooling process. Other facilities are cooled using a dual open loop water cooling system with a heat exchanger (e.g. top drive and rotary table).

5.11.2 Impact Assessment

The Ocean Monarch usually obtains its potable water by reverse osmosis (RO) desalination of sea water; however supply vessels may supply potable water, if required. Potable water is used to supply the accommodation module, hot water heaters, eye wash stations and some safety showers. Reject RO water consists of a brine which will rapidly disperse. Should the RO membranes fail, then the system will produce brine with a lower salt concentration. The known and potential environmental impact of brine discharges is a temporary and localised increase in sea surface salinity, potentially causing harm to fauna unable to tolerate higher salinity.

Brine water will sink through the water column where it will be rapidly mixed with receiving waters and dispersed by ocean currents. As such, any potential impacts are expected to be limited to the source of the discharge where concentrations are highest. This is confirmed by studies that indicate effects from increased salinity on planktonic communities in areas of high mixing and dispersion are generally limited to the point of discharge only (Azis *et al*. 2003).

The receptors with the potential to be exposed to an increase in salinity include pelagic fish species and plankton found in surface waters within the operational area. Because of the water depth (>350 m), benthic communities are not affected. Most marine species are able to tolerate short-term fluctuations in salinity in the order of 20% to 30% (Walker and McComb, 1990). However, larval stages, which are crucial transition periods for marine species, are known to be more susceptible to impacts of increased salinity (Neuparth *et al*. 2002). Pelagic species may be subjected to slightly elevated salinity levels (~10-15% higher than seawater) for a very short period which they are expected to be able to tolerate and are able to move away from the plume. As such, transient species are not expected to experience chronic or acute effects.

Cooling water discharges may locally elevate water temperatures, which has the potential to cause localised impact on the marine ecosystem. Seawater cooling flow rates can vary from 0.5 m^3/hr for smaller, diesel-powered ships to flows of greater than 40,000 m^3/hr for aircraft carriers during full-power steaming. Seawater cooling overboard discharge is primarily seawater that contains trace materials from seawater cooling system (copper, iron, aluminium, zinc, nickel, tin, titanium, arsenic, manganese, chromium, lead, and possibly oil and grease). None of the expected constituents is a bioaccumulator (UNEP 1999).

There are no prescriptive legislative controls regarding cooling water and brine discharges from vessels. ANZECC (2000) criteria for cooling water discharges mainly relate to discharge from nearshore industrial activities (power plants, cooling towers, processing industry). It recommends that temperature changes return to within natural range (20 – 80%-ile of background levels) outside the mixing zone, except for aquaculture species, where a threshold of <2.0°C change over 1 hour applies, and for recreational waters (15–35°C for prolonged exposure). Cooling water discharges in open ocean experience high mixing so that ANZECC criteria are easily met, as has been confirmed by modelling studies and verified by field observations. RPS (2017) demonstrated that cooling water discharges from the Barossa FPSO (discharge of 288,000 – 360,567 m^3/d) generally returned to background levels within 3°C of ambient temperature within <5 m from the point of discharge.

The potential for seawater cooling overboard discharge to cause thermal environmental effects was evaluated by modelling the thermal plume generated under conditions tending to produce the greatest temperature rise and then compared to state plume thermal discharge requirements (UNEP 1999). Thermal effects of seawater cooling water overboard discharge were modelled to estimate the plume size and temperature gradients in the receiving water body. The discharge was assumed to occur during winter when the ambient water temperatures are lowest. Thermal plumes from models of ships (except very large aircraft carriers) do not exceed regulatory limits.

The environmental receptors with the potential to be exposed to an increase in temperature are transient marine fauna, including whales, sharks, fish, and reptiles. Marine mammals and fish passing

through the area will be able to actively avoid entrainment in any heated plume (Langford 1990), and reptiles and sharks would be expected to behave similarly. Acclimation of test organisms at 15, 20 and 25°C allowed them to tolerate temperature increments of 8-9°C without damage (UNEP 1985).

The duration of fauna exposure to cooling water and RO water discharges is limited to the duration of Blackback P&A operations (expected to be approximately 75 days, plus 10% contingency) and localised. The potential impact associated with this aspect is considered localised and temporary, with full recovery to background levels once the activity ceases. Consequently, this aspect is not considered as having the potential to affect biological diversity and ecological integrity. Therefore, no further evaluation against the Principles of ESD is required. No stakeholder concerns have been raised for cooling water and RO discharges Risk has been rated as a Level IV consequence, with the probability of such impacts being very unlikely (D), resulting in a Category 4 risk.

5.11.3 Controls

- RO Units are operating and maintained in accordance with manufacturer specifications.
- Quality of potable water from RO unit monitored.
- Use of stored potable water as back-up.
- Engines and associated equipment that require cooling by water are operating in accordance with manufacturer specifications.

5.11.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.11.5 Demonstration of ALARP

Planned discharges of cooling water and brine by vessels and MODUs is a common occurrence both nationally and internationally. Temperature and salinity changes in the vicinity of the surface discharge will be quick to dissipate. There is potential for chemical discharges (release of chlorine from the salt solution) to result in localised impacts to surface marine fauna. As thermal and RO discharges from vessels in open ocean, and resulting dilution, are well understood not to create unacceptable impacts, it is not considered appropriate to undertake ecological monitoring of the discharge. Instead, operation in accordance with manufacturer specifications is considered adequate.

Managing the risks from planned discharges of cooling water and brine is well understood with good practice controls that are understood and generally well implemented by the industry. Other controls and alternatives were considered, in accordance with Section 4.2 (Demonstration of ALARP), such as limiting vessels and MODU to potable water from tanks, however this would result in multiple supply runs during the Blackback P&A scope and require additional storage facilities for potable water. This is not considered practicable given the negligible environmental impact of the brine discharge. In addition, the costs of implementing these measures are grossly disproportionate to the reduction in risk.

During stakeholder consultation, no objections or claims regarding planned discharges of cooling water and brine were made. Given the limited potential impact, ALARP Decision Context A should apply, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4). The potential impact associated with this aspect is considered localised and temporary, with full recovery to background levels once the activity ceases. Consequently, this aspect is not considered as having the potential to affect biological diversity and ecological integrity. Therefore, no further evaluation against the Principles of ESD is required. There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.11.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.12 Hydraulic fluid discharge during ROV operations (RA 12)

5.12.1 Hazard

Hydraulic fluid may be discharged from some ROV-operated hydraulic tools as part of normal operations (e.g. on tool changeover, estimated release of <2 L) or released on failure of hydraulic hoses or connections. These losses are normally contained onboard the MODU.

There are unplanned events where a hose may leak or a seal may fail. The ROV preventative maintenance system prevents the majority of these events and the ROV has built in safe guards (automatic shut downs) to shut systems down if there is a drop in the levels of the fluid tanks. There are no planned hydraulic releases associated with ROV operations.

The discharge of small amounts of hydraulic fluid could cause localised short term changes to water quality and acute or chronic impacts on marine organisms in the immediate vicinity.

5.12.2 Impact Assessment

The fluid used in ROV operated hydraulic tools and the ROV itself is a low toxicity fluid (Ecoterra Hydraulic Oil). Ecoterra Hydraulic Oil is a high-quality, zinc-free hydraulic oil specifically developed for use in equipment operating in environmentally sensitive areas. It is specially formulated for reduced environmental impact in case of leaks or spills. It is non-toxic to fish and aquatic species as determined by OECD Test Method 203 1-12, and is classified as inherently biodegradable by the OECD Test Method 301B. It passes the visual “no sheen” requirements of the U.S. EPA Static Sheen Test. Acute aquatic toxicity to fish, *Daphnia*, *Veriodaphnia* and algal species are above 1000 mg/L. Results from chronic toxicity tests show that the no observed effect level (NOEC) exceeds 1000 mg/L.

Less than 20 L is typically stored on the ROV unit itself, with a total of about 200 L on board the MODU or vessel winch. It is a closed-loop system, with no planned release to the environment. However, should a spill occur, then an underwater release (maximum 20L) is rapidly diluted and dispersed in the high energy environment with minimal environmental impact. Accidental releases are addressed in RA 26 (Section 5.29). Seabed interactions are covered under RA 21 (Section 6.25).

This risk has no impact on KEF. No stakeholder concerns have been raised on RA 12. No further evaluation against the principles of ESD is required.

5.12.3 Controls

- Closed loop system – no planned release to marine environment
- Storage, use and selection of chemicals meets Esso chemical selection procedure.
- Preventive maintenance of ROV equipment
- Ocean Monarch Management Procedures in accordance with "Technical Services and Maintenance Manual" (SEMS 8) and Computerised Maintenance Management System (CMMS) as per SEMS (Safety and Environmental Management System) (OM-SC-001-02).

5.12.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.12.5 Demonstration of ALARP

To demonstrate that the impacts and risk associated with this hazard have been reduced to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), other controls and alternatives were considered. The use of compressed air or inert gas for ROV movement is not considered feasible for this application and introduces other safety risks for ROV operations.

ROV Contractor maintenance procedures are considered sufficient control measures to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4).

There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.12.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.13 Hydraulic fluid discharge from BOP operations (RA 13)

5.13.1 Hazard

The BOP includes hydraulically controlled actuators and connections (Section 3.6.11). Routine/operational releases of hydraulic fluid occur when the actuator valve changes position. Hydraulic fluid may also be released as a result of the failure of subsea hydraulic connections or damage to umbilicals. Hydraulic fluid could be released due to routine subsea equipment discharges through valve operations. The discharge of hydraulic fluid can cause temporary and localised changes to water quality.

5.13.2 Impact Assessment

A release of hydraulic fluid to the marine environment could cause localised and temporary decrease in water quality and may impact on marine ecosystems, such as soft sediment, infauna communities, and sparse epibiotic communities, as well as transient marine fauna, including whales, sharks, fish, and reptiles. Hydraulic fluid from the BOP are normally discharges close to the seabed of the seabed (the BOP stack is approximately 7 m high). Given the volume and nature of the planned releases described above, exposure to receptors is expected to be temporary in nature.

The BOP hydraulic system is a separate system to the rig's ring line hydraulics. It uses a 4% Houghton STACK-MAGIC ECO-F V2 fluid, mixed with potable water for the BOP and Diverter system functions. It is OCNS rated as non-CHARMable Cat D, reserved for low toxicity chemicals (Aquatic-toxicity >100-1,000 ppm; OCNS Reg. 24101). This fluid meets Esso's chemical selection procedure, which uses the CHARM OCNS ranking in conjunction with toxicity, biodegradation and bioaccumulation data to determine potential impacts to the environment and acceptability of planned discharges. OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures MODU/vessel contractors understand Esso's expectations and reinforces the requirements for chemical selection.

The fluid is not expected to have a significant impact on the environment. The amount released during normal BOP operations will be rapidly dispersed and assimilated in the high energy marine environment resulting in only minor temporary and localised effects on water quality.

Little to no impact is expected on benthic fauna at the release location given the low toxicity, low bioaccumulation and biodegradability characteristics of the proposed chemical discharges, and the dispersion characteristics of the release. For seabed invertebrates present near the wellhead, it is possible that low-level concentrations of chemical may be present on a short term and episodic basis.

Given the low toxicity of the chemicals, the low frequency and short-term nature of the exposure, the consequence level was assessed at Level IV (Low impact), with risk of an unacceptable impact assessed to be very unlikely (D), resulting in a Level IV Consequence.

A similar risk level was determined for mobile demersal and pelagic species which may be present at the wellheads during the activity, given the localised and short-term nature of the discharge, the low toxicity and low frequency nature of the discharge and the species mobility which limits exposure.

Other seabed discharges from the BOP during abandonment activities include the potential release of small quantities of methane and other gasses, and release of metals shavings and grit during the cutting of the wellhead. The release of gas during abandonment operations is considered to have a negligible impact, and is comparable to gas releases from natural seeps. The release of metal shavings is considered to be adequately addressed under seabed disturbance (RA 21) and dropped objects (RA 22) and are not further addressed here.

This risk has no impact on KEF. No stakeholder concerns have been raised on RA13. No further evaluation against the principles of ESD is required.

5.13.3 Controls

- The hydraulic fluid used in the BOP is CHARM gold / silver or OCNS E / D rated or equivalent, in accordance with Esso chemical selection procedure (Section 7.8.1).

5.13.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.13.5 Demonstration of ALARP

Esso chemical selection procedure and Ocean Monarch operating and maintenance procedures are considered sufficient control measures to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4).

To demonstrate that the impacts and risk associated with this hazard have been reduced to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), other controls and alternatives were considered. The use of compressed air or inert gas instead of a liquid to operate the subsea equipment is not considered feasible, as this would require the installation of air/inert gas compressors and other supporting equipment on the host operational areas, for which there is already limited space. Additionally, it introduces an increased risk of the BOP not closing in an emergency. Since the BOP operates at high pressures in order to fulfil its vital role, these hydraulic operations are considered a safety critical element.

Local containment of operational releases of hydraulic fluid is not considered practical, as this would add the safety and environmental risk of the valve being prohibited from venting and therefore not closing when demanded in an emergency isolation scenario. Open loop systems are widely used in the industry, as closed systems would require return loop and supporting control systems, introducing further reliability issues.

The discharge of hydraulic fluids associated with BOP operations are well-practiced activities, both nationally and internationally. Given the small volumes of fluid released, rapid dilution, as well as the absence of sensitive features and sedentary behaviours from marine fauna, the potential impact associated with this discharge is Category 4 (low risk).

No stakeholder objections or claims were raised with regards to this activity. ALARP Decision Context A applies. There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.13.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.14 Planned Discharge – Brine/Packer fluid discharges (RA 14)

5.14.1 Hazard

Blackback P&A activities will result in planned discharge of packer fluid in the annulus between the 2-7/8” / 4-1/2” production tubing and 9-5/8” / 10-3/4” inch production casing. After the plug has been set in the end of the tubing, the tubing will be punched above the production packer to allow fluids to be circulated with new NaCl brine. These fluids will be processed via a fluids handling package and discharged overboard.

Discharge of the brine or packer fluid at the sea surface has the potential to change water quality, potentially causing toxicity to marine species.

5.14.2 Impact Assessment

The packer fluid is approximately 90.3 wt% of freshwater, 9.2% wt NaCl brine with 0.5% wt corrosion inhibitor, Corexit 2478. It has a specific gravity of 1068. The components of the fluid have been assessed against Esso's internal chemical selection procedure (Bass Strait Chemical Environmental Assessment) and ALARP Assessment (Workplace Substances Manual, Form WSM2) and deemed acceptable for planned batch discharge at the initial concentrations of the released fluids. Table 5-3 lists the constituents of the packer fluid and their effective ratings.

Table 5-3 Packer Fluid composition

Packer Fluid composition	wt %	Discharge Concentration ppm	Effective OCNS/CHARM rating	Function
Freshwater	90.3	-	-	
NaCl Brine	9.2	7.08	E	Weighting Agent
Corexit 2478	0.5 (of total)	0.38 (of total)		Corrosion Inhibitor
Isopropyl alcohol #1	0.17	0.13	E (PLONOR)	
Ammonium bisulphite #1	0.17	0.13	E (PLONOR)	
Quaternary Ammonium Compounds #2	0.05	0.04	Gold	
Water	0.12	0.09	-	

#1 Isopropanol (Isopropyl alcohol) and Ammonium bilsuphite are both PLONOR chemicals and E rated Non-CHARMable products.

#2 Based on CHARM batch discharge dilution factors and known toxicity data for quaternary ammonium compounds the hazard quotient is less than 1 and hence effectively a “Gold” class chemical in this discharge scenario.

The volume of the discharge is calculated to be between 80,000 L to 112,000 L per well (400 bbls to 700 bbls per well), discharged over a period of approximately 2 hrs per well. Brine/packer fluid will sink through the water column where it will be rapidly mixed with receiving waters and dispersed by ocean currents. As such, any potential impacts are expected to be limited to the source of the discharge where concentrations are highest. This is supported by studies that indicate effects from increased salinity (the primary hazard of discharging brine /packer fluid) on planktonic communities in areas of high mixing and dispersion are generally limited to the point of discharge only (Azis *et al*. 2003). Due to the short duration over which discharge will occur (approximately 2 hrs per well), the biodegradation of the chemicals and the calculated concentration of discharged fluids falling rapidly to below their no effect concentration (NOEC), the risk is considered low.

In addition to the discharge of the current packer fluid, brine may be discharged. New NaCl brine, lost circulation material (LCM) or sweeps, if needed, will be mixed and used on the rig for the Blackback P&A activities. Any chemicals used to make these fluids will be assessed against Esso’s internal chemical selection procedure and confirmed acceptable for discharge prior to use..

The receptors with the potential to be exposed to an increase in salinity include pelagic fish species and plankton found in surface waters within the operational area. Because of the water depth (>400 m), benthic communities are not affected. Most marine species are able to tolerate short-term fluctuations in salinity in the order of 20% to 30% (Walker and McComb, 1990). However, larval stages, which are crucial transition periods for marine species, are known to be more susceptible to impacts of increased salinity (Neuparth *et al*. 2002). Pelagic species may be subjected to slightly elevated salinity levels (~10-15% higher than seawater) for a very short period which they are expected to be able to tolerate and are able to move away from the plume. As such, transient species are not expected to experience chronic or acute effects.

The duration of fauna exposure to brine/packer fluid discharges is localised and limited to the time it takes to circulate the fluids for each well (expected to be approximately 2 hrs per well). The potential impact associated with this aspect is considered localised and temporary, with full recovery to background levels once the activity ceases. Consequently, this aspect is not considered as having the potential to affect biological diversity and ecological integrity. Therefore, no further evaluation against the Principles of ESD is required. No stakeholder concerns have been raised for brine/packer fluid

discharges Risk has been rated as a Level IV consequence, with the probability of such impacts being very unlikely (D), resulting in a Category 4 risk.

5.14.3 Controls

- All planned chemical discharges shall be assessed and deemed acceptable before discharge in accordance with Esso's chemical selection and screening procedure (Section 7.8.1)

5.14.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.14.5 Demonstration of ALARP

Planned discharges of brine/packer fluid in abandonment activities are a common occurrence both nationally and internationally. Water quality changes in the vicinity of the surface discharge will be quick to dissipate. There is potential for fluid discharges to result in localised impacts to marine fauna. However as discharges of this nature from MODUs in open ocean and resulting dilution are known not to create unacceptable impacts, it is not considered appropriate to undertake ecological monitoring of the discharge.

Alternatives to discharging considered were collecting the fluids on board the MODU and shipping them to shore in bulk for onshore disposal. This would require significant space to store fluids, coupled with the added risks and costs associated with transferring the bulk liquids, increased vessel movements to shore and the need to dispose of the fluids at suitable waste sites. The risks and costs associated with these measures are assessed to be disproportionate to the benefits which may be gained in reducing risk to marine species.

The constituents of the fluid have been assessed to pose a low toxicity based on dilution factors and the nature of their batch discharges. The low discharge volumes and short duration of discharge at surface will allow for rapid dilution. The combined control and effect are considered sufficient measures to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP). The nature of this risk is well understood, the use of brine and discharge of brine is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4).

There are no KEF within the affected area. During stakeholder consultation, no objections or claims regarding planned discharges of brine/packer fluid were made. Given the limited potential impact, ALARP Decision Context A should apply, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4). The potential impact associated with this aspect is considered localised and temporary, with full recovery to background levels once the activity ceases. Consequently, this aspect is not considered as having the potential to affect biological diversity and ecological integrity. Therefore, no further evaluation against the Principles of ESD is required. There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.14.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.15 Planned Discharge – Discharge of interface fluid containing NADF (RA 15)

5.15.1 Hazard

Blackback P&A activities will result in planned discharges of the interface fluids resulting from circulating the pre-existing non-aqueous drilling fluid (NADF) in the production casing annulus between the 9 $^{5}/_{8}$ x 10 $^{3}/_{4}$ inch casing and the 13 $^{3}/_{8}$ inch surface casing. Once the 2 $^{7}/_{8}$ / 4 ½ inch production tubing has been pulled and the first cement plug has been set, the 9 $^{5}/_{8}$ x 10 $^{3}/_{4}$ inch casing will be cut to clear the fluids from the production casing annulus. The fluid is a nonaqueous drilling fluid (NADF) which will be circulated to the MODU. Whole NADF will be returned to shore for disposal. The interface fluid will be processed to acceptable discharge criteria before being discharged overboard.

Discharge of interface/brine fluids containing NADF at the sea surface has the potential to change water quality, with potential toxicity to marine species.

5.15.2 Impact Assessment

NADF will be circulated from the production casing annulus with new NaCl brine. Any chemicals used to make new NaCl brine, LCM or sweeps if needed, will be assessed against Esso's internal chemical selection procedure and confirmed acceptable for discharge prior to use. Whole NADF will be contained onboard the MODU in holding tanks before being shipped to shore for appropriate disposal (approximately 250 bbls to 300 bbls of whole NADF per well, or 40,000L to 48,000L per well). At the interface where majority of the fluid is brine, the returns will be diverted to separate tanks for processing. The interface/brine fluid will be left to settle with the NADF separated out at regular intervals. The remaining fluid will be tested by retort to ensure the Petrofree oil in water content is less than 10% v/v before being discharged overboard. At the end of the activity the holding tanks will be cleaned, using appropriately selected and approved, agents and tank washings will be collected treated and, if the discharge criteria is met, discharged overboard.

The NADF constituents in the interface/brine fluid have been assessed against Esso's internal chemical selection procedure (Bass Strait Chemical Environmental Assessment) and ALARP Assessment (Workplace Substances Manual, Form WSM2) and deemed acceptable for planned batch discharge at the initial concentrations of the discharged fluids. Table 5-4 lists the constituents of the NADF and their ratings. Discharge of brine is covered under Section 5.18.

Table 5-4 NADF composition in Interface Fluid

NADF composition	Wt % In whole NADF	Discharge Concentration ppm	Effective OCNS/CHARM rating	Function
Petrofree[#1]	52.6	5.49	E	Base Fluid
EZ MUL NT	2.29	0.176	D	Emulsifier
Lime	0.36	0.028	E	Water based Fluid Additive
DURATONE-E	2.29	0.176	E[#2]	Filtration control Additive
Water	13.46	-	-	
GELTONE II	0.57	0.044	E	Organophilic clay
Barite	12.44	0.957	E (PLONOR)	Weighting Chemical
Baracarb	7.15	0.55	E (PLONOR)	Lost Circulation Material
Baracarb	5.72	0.44	E (PLONOR)	Lost Circulation Material
$CaCl_2$ Powder	6.49	0.499	E (PLONOR)	Weighting Chemical
RM-63	0.29	0.022	E[#2]	Rheology modifying Additive

#1 Petrofree is no longer listed in the CEFAS database as its certification expired in 2006, prior to 2006 it was however an E rated chemical.

#2 Based on CHARM batch discharge dilution factors and known CEFAS ratings for RM-63 and Duratone-E, the discharged fluids are effectively "E" class chemicals in this discharge scenario due to their initial low concentrations.

Petrofee was listed in the CEFAS database as an E rated chemical however its certification expired in 2006. Petrofree is an ester mixture composed of fatty acids usually derived from vegetable or fish oils. Of the range of NADF base fluids, esters have the highest dispersibility and biodegradation rates (both aerobic and anaerobic), are more water soluble due to their polar nature. They have an LC50 to mysids bahia (Americamysis (Mysidopsis)) of 1,000,000 ppm (or mg/L) and are rated as having little or no toxicity (MMS, 2000).

The interface fluid will be discharged at surface consisting primarily of brine and having less than 10% oil in water content. It will be rapidly mixed with receiving waters and dispersed by ocean currents. As such, any potential impacts are expected to be limited to the source of the discharge where concentrations are highest. The environmental receptors which may be impacted by the potential of elevated chemical toxicity or salinity in the surface waters include pelagic fish and plankton found in surface waters within the operational area. Because of the water depth (>400 m), benthic communities are not affected. Most marine species are able to tolerate short-term fluctuations in salinity in the order of 20% to 30% (Walker and McComb, 1990). However, larval stages, which are crucial transition periods for marine species, are known to be more susceptible to impacts of increased salinity (Neuparth *et al*. 2002). Pelagic species may be subjected to slightly elevated salinity levels (~10-15% higher than seawater) for a very short period which they are expected to be able to tolerate and are able to move away from the plume. As such, transient species are not expected to experience chronic or acute effects.

A concern with discharging NADF in general is the potential for bioaccumulation in tissues of marine species. Due to the low concentration of the NADF in the discharged interface fluid and the rapid dispersion, it is highly unlikely that marine species will ingest sufficient quantities to cause bioaccumulation. In addition although esters are relatively soluble they are also biodegradable and are unlikely to bioaccumulate to significant concentrations. It is also known that the liver and gut enzymes involved in fat metabolism in marine animals can hydrolyze ester bonds and convert the resulting alcohols and fatty acids to low molecular weight organic nutrients (MMS, 2000).

The duration of fauna exposure to interface fluid discharges is localised and limited to the time it takes to empty the holding tanks at the end of this part of the activity for each well (expected to be approximately 3 hrs per well). The potential impact associated with this aspect is considered localised and temporary, with full recovery to background levels once the activity ceases. Consequently, this aspect is not considered as having the potential to affect biological diversity and ecological integrity. Therefore, no further evaluation against the Principles of ESD is required. No stakeholder concerns have been raised for discharges. The risk has been rated as a Level IV consequence, with the probability of such impacts being very unlikely (D), resulting in a Category 4 risk.

5.15.3 Controls

- All planned chemical discharges shall be assessed and deemed acceptable before discharge in accordance with Esso's chemical selection and screening procedure (Section 7.8.1).
- Interface/brine fluids will be tested by retort to confirm Petrofree oil in water content is <10% before being discharged

5.15.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.15.5 Demonstration of ALARP

Whole NADF returned from the well will constitute the bulk of the returns and will be contained and returned to shore for appropriate disposal. The remaining NADF in the interface fluid will be treated in the holding tanks on the MODU until a retort test shows that the Petrofree oil in water content of the residual fluid is < 10% v/v. The constituents of the remaining interface fluid have been assessed to be of low toxicity and acceptable at discharge concentrations. The low discharge volumes and short

duration of discharge at surface will allow for rapid dilution. Water quality changes in the vicinity of the surface discharge may result in localised impacts to marine fauna however this is limited to the time it takes to empty the holding tanks at the end of this part of the activity for each well (expected to be approximately 3 hrs per well).

Alternatives to discharging considered were shipping the interface fluids to shore in bulk for onshore disposal. This is already being done for the whole NADF. Shipping the interface fluid to shore would result in added risks (potentially with higher consequence e.g. loss of containment from vessel collision refer Section 6.26) and costs associated with transferring the bulk liquids, increased vessel movements to shore and the need to dispose of the fluids at suitable waste sites (which still has associated environmental hazards). The risks and costs associated with these measures are assessed to be disproportionate to the benefits which may be gained in reducing risk to marine species.

There are no KEF within the affected area. During stakeholder consultation, no objections or claims regarding planned discharges were made. The combined controls and predicted dispersion, dilution and biodegradation are considered sufficient measures to reduce the impacts and risks associated with this hazard to ALARP. Given the limited potential impact, ALARP Decision Context A should apply in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the original use of Petrofree was to reduce environmental impact from NADF discharges and the residual risk resulting from this activity is considered to be low (Category 4).

5.15.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all existing relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.16 Planned Discharge – Wellhead removal discharges (RA16)

5.16.1 Hazard

The process of physically removing the three BKA trees and wellheads as described in Section 3.5.2 and Section 3.5.8 occurs in stages and requires either unlatching/retrieval or cutting operations, which will result in minor releases of seawater, brine, metal shavings and cement cuttings. Localised turbulence from the cutting activity is also likely to occur. These releases and turbulence have the potential to cause localised and temporary decrease in water quality and minor localised change to sediment quality.

The process will also utilise an ROV and associated hazards are discussed in Section 6.16. Hazards associated with deployment of the BOP are discussed in Section 6.17. The hazards associated with dropped objects whilst retrieving the wellhead components are covered in Section 5.25. Noise and Interference with commercial fishing hazards are covered in Sections 5.19 and 5.21 respectively.

5.16.2 Impact Assessment

Section 3.3.3 describes that well kill was performed on BKA-1A well in 2005 on BKA-2 and BKA-3 in 2010 and the P&A program is designed on this basis.

Removal of the tree cap will result in approximately 15 L of seawater to be released to the environment without causing any impact. The mechanical disconnection of the subsea tree from the wellhead will result in approximately 150-200 L of seawater or NaCl brine to the environment resulting in minor and temporary change in the water quality immediately surrounding the subsea tree. NaCl brines proposed for the BKA abandonment programme are PLONOR /E rated chemicals and acceptable for discharge. Minor quantities of brine released from connections will dilute rapidly to background levels and are deemed insignificant and not considered further. Following the removal of the subsea tree all other steps requiring cutting and removal including tubing and casing is executed with the BOP and riser in place preventing any subsea releases to the environment. Once the barriers required to secure the well are in place and tested (Refer Section 3.5.5 & Section 3.5.6) and the wellbore displaced to seawater, the BOP is unlatched and retrieved.

For the removal of the wellhead a wellhead cutting tool will be landed on drillpipe and the 20” and 30”

casing will be mechanically cut at a depth of approximately 1-10 metres below the seabed (mudline). Seawater will be pumped to aid the cutting. Should the initial retrieval attempt be unsuccessful, an additional cut will be made at a shallower depth. This process will continue until the cut depth is no shallower than 1 m below the seabed. Should the wellhead system not be able to be retrieved at this point it will be left in situ. Impacts associated with this risk are discussed in Section 5.20.

Metal shavings and cement cuttings (approximately 200 kg of each per cut) generated by the cutting process will be released. It is estimated that majority of the metal shavings and cuttings will be circulated to the seabed immediately around the well location however some may settle downhole. This may have a smothering impact on sessile benthic fauna. Because of the water depth and as described in Section 4.10, the seabed at the Blackback location does not support significant benthic communities and therefore smothering of benthic fauna is not assessed to have an effect on the population level and not assessed to be significant. The type of damage that could be sustained by smothering may include destruction of habitat immediately around the well however given the similarity of the surrounding area, recolonization in other areas is likely to occur. Localised and temporary turbulence caused by the cutting and pumping of seawater may also alter the quality of the water immediately surrounding the well. This is expected to settle quickly after cutting of the casing is complete which is expected to take approximately 6-12 hrs per well. The location of the wells within a homogenous seabed area, and lack of sensitive benthic features and communities and the small area that may be impacted from the described activities is not expected to result in any environmental impacts and hence has not been discussed further.

After indications that the cut has been made, overpull from the MODU's drilling system will be used to retrieve the severed wellhead equipment including the high pressure wellhead housing, low pressure wellhead housing, 30" conductor/cement stub and 20" conductor / cement stub. The temporary guidebase is then retrieved thereby completing the P&A activity for the well and allowing the MODU to move to the next well.

5.16.3 Controls

All planned chemical discharges shall be assessed and deemed acceptable before use, in accordance with Esso's chemical selection procedure.

5.16.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.16.5 Demonstration of ALARP

Removal of the subsea tree, completion guidebase, wellhead and temporary guidebase will require disconnection of equipment and loss of seawater or brine. Both fluids are in low volumes and the brine is classed as PLONOR/E and thereby acceptable for discharge. Metal cuttings and cement cuttings resulting from the severing of the 20" and 30" casing will primarily settle on the seabed around the well and some is expected to remain down hole. Given the small quantities of cuttings expected on the seabed and the minor area that is affected, no significant impact is expected.

To avoid discharges the subsea tree and wellhead could remain on the seabed. Whilst the existence of the infrastructure is documented and known to exist by commercial fisheries, it is preferable to have it removed where feasible so as not to leave redundant infrastructure on the seabed and eliminate potential snagging hazards. The residual risk resulting from this activity is considered to be low (Category 4), the proposed control measures are considered to be sufficient to reduce the impacts and risks associated with this hazard to ALARP. Since the potential impact associated with this aspect is considered minor and localised, this aspect is not considered as having the potential to affect biological diversity and ecological integrity. Therefore, no further evaluation against the Principles of ESD is required.

5.16.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.17 Planned Discharge - Cement discharges (RA 17)

5.17.1 Hazard

Cement plugs are installed at specific depths in each of the wells to act as permanent barriers. This is a critical component of the abandonment activity. Cement is transported as dry bulk to the MODU by the support vessels and is mixed with water and chemicals in the cementing unit onboard the MODU to form cement slurry immediately prior to use. The cement slurry is then injected down to the well by the cementing unit high pressure pumps. At the end of each cementing job the cementing pump, piping and blending tanks are washed with seawater to prevent cement-setting. The tank washings containing the cement fluid is discharged overboard. In addition, the remaining cement contained within the batch mixer, tanks and spacers is discharged overboard. Cement mix and additives will also be discharged at surface as part of commissioning of the cementing unit. A small proportion of dry cement may also be blown overboard during bulk transfer operations from supply vessel to MODU. At the end of the abandonment campaign, excess dry cement remaining in the cement storage silos may be discharged overboard.

Discharge of cement fluids at the sea surface has the potential to change water quality, causing toxicity to marine species. Benthic communities may be smothered by solids on the seabed and increased turbidity in the water column may impact marine fauna.

5.17.2 Impact Assessment

The discharge of cement fluids will consist of cement and additives including extenders, accelerators, thinners, fluid loss control agents and defoamers. All the components of the cement mix are of low toxicity. The volume of cement expected to be discharged at the surface is approximately 20 bbl, or 4 m^3 per well.

The cement and chemical additives in the cement are subjected to detailed assessment prior to use to ensure they are of the lowest environmental impact practicable for the application, in accordance with Esso's chemical selection procedure (Section 7.8.1). Cement additives are listed in Table 5-5 and meet Esso chemical selection procedure which includes approval for discharge.

Table 5-5 Cement composition and volumes (preliminary)

Product/Function		Product Code	OCNS Rating	Estimated Quantity*
Sliicate Additive	Schlumberger	D75	E	As required
Cement additive	Schlumberger	D095	E	As required
Cement Retarder	Schlumberger	D110	Gold	As required
Low-Temperature Liquid Dispersant	Schlumberger	D145A	Gold (sub) UK NPL 4	As required
UNIFLAC	Schlumberger	D168	Gold	As required
Antifoam Agent (11958)	Schlumberger	D175A	Gold (sub) UK NPL 4	As required
Antifoam Agent	Schlumberger	D47	Silver	As required
MUDPUSH II Spacer	Schlumberger	S182	Gold (sub) UK NPL 4	As required
Low Temperature Cement Set enhancer	Schlumberger	D186	Gold	As required
Low Temperature Dispersant	Schlumberger	D230	Gold (sub) UK NPL 4	As required
EZEFLOW Surfactant	Schlumberger	F103	Gold (sub) UK NPL 3	As required
Mutual Solvent	Schlumberger	U66	Gold	As required
Cement Class G	-	D907	E	As required

Fluorescein dye	-	Dye	Gold	As required
Liquid retarder	Schlumberger	D81	E	As required
Expanding Cement Additive	Schlumberger	D174	E	As required
Liquid accelerator	Schlumberger	D077	E	As required

* Cement composition is preliminary and operational requirements may require changes to chemical selection. In these instances, Esso chemical selection procedure and MOC Procedure will be applied to ensure that these meet the commitments within this EP.

Additionally, planned discharge of cement will result in increased turbidity, potentially affecting marine fauna, while there are also potential toxicity impacts.

The low quantities of cement that are discharged to sea and the limited occasions where this occurs will cause a temporary and minor reduction of water quality in the area around the point of discharge. As shown in Table 5-5, all constituents of the cement have been chosen because they have been rated as having low toxicity therefore the reduction in the water quality is assessed to be low. The Blackback P&A operational area does not have any significant sensitive receptors. The impact of changes in water quality due to discharged cement causing toxic effects to marine species is assessed to be low.

The liquid cement discharge (or powder form) will be rapidly mixed with receiving waters and dispersed by ocean currents. As Blackback wells are in depths of over 400m and the quantity of discharged liquid cement is low, it is unlikely that solids will accumulate on the seabed in sufficient quantities to cause smothering of benthic communities. Because of the water depth and as described in Section 4.10, the seabed at the Blackback location does not support significant benthic communities and where they exist they are sparse and depauperate. The area is also not known to be a feeding ground for any significant species. Although smothering sessile benthic fauna is highly unlikely, the potential impact of this occurring is not assessed to have an effect at the population level and not assessed to be significant.

5.17.3 Controls

All planned chemical discharges shall be assessed and deemed acceptable before use, in accordance with Esso's chemical selection procedure (Section 7.8.1)

5.17.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
C	IV	4

5.17.5 Demonstration of ALARP

Setting of the cementing plugs is a critical activity for abandonment operations. The mixing of additional (excess) cement is unavoidable and is considered standard practice.

The cementing equipment must be cleaned before the cement cures to allow further use and also to ensure there are no contaminants (including solids) in the next batch of cement to be mixed. The risks associated with discharge of the cement at surface have been reduced to ALARP as the constituents of the cement have been assessed to be acceptable for discharge in accordance with Esso's chemical selection procedure (Section 7.8.1). In addition the quantities discharged are low and any potential effects of the discharge on water quality and marine species are temporary and localised.

In accordance with Section 4.2 (Demonstration of ALARP), other controls and alternatives were considered. Residual cement could be stored in tanks and transported to shore via vessels for disposal however this is impractical as, by its nature it begins to cure and would result in contamination of transfer equipment and tanks which would subsequently need to be cleaned. This alternative would result in added risks (potentially with higher consequence e.g. loss of containment from vessel collision refer Section 5.26, dropped objects refer Section 5.25) and costs, increased vessel movements to shore and the need to dispose of the cement suitable waste sites. The risks and costs associated with these measures are assessed to be disproportionate to the benefits which may be gained in reducing risk to marine species.

The potential impact associated with this aspect is limited to a localised short-term impact, which is not considered as having the potential to affect biological diversity and ecological integrity. The activities

were evaluated as not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required.

The surface discharge of fluids during well abandonment activities is a well practised activity, both nationally and internationally. The release of cement slurry is a standard discharge and is not considered unusual in Commonwealth waters. No stakeholder objections or claims were raised with regards to this activity. ALARP Decision Context A applies. There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.17.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.18 Planned Discharge - Flowline contents (RA 18)

5.18.1 Hazard

In order to remove the completion guide base (CGB) from each well the flexible flowlines between the three wells must be disconnected. The flowlines contain inhibited seawater which will be discharged at the point the flowlines are disconnected.

In addition to removing the flowlines the electrical, hydraulic and chemical connections will also need disconnecting from the CGBs. These have dry break couplings and are designed to be disconnected by ROV and therefore no planned discharge is expected.

The discharged fluid from the flowlines has the potential to alter the water quality causing toxicity to marine species.

5.18.2 Impact Assessment

There are three flexible flowlines (jumpers) connecting the three wells to the pipeline termination assembly (PTA) refer Figure 3.6 (Section 3.3.2). Each section is approximately 50 m in length and has a 200 mm diameter primary production line with a corresponding 65mm diameter gas lift line. Each section holds approximately 1,700 L of seawater mixture containing the corrosion inhibitor and biocide, also referred to as inhibited seawater. When the flowlines are disconnected from the CGBs using the ROV, the contents of the flowlines will be released to the sea. Electrical, hydraulic and chemical connections are dry break and no release is expected from these. As discussed in Section 5.20 the chemical connections will remain in situ so they can be looped back to the umbilical termination assembly and allow the umbilical to be flushed in the future. Looping them back and reconnecting them to the umbilical termination assembly will occur within 12 months of the completion of the BKA P&A activity (Refer Section 5.20) under the existing Central Fields Environment Plan. There are no known examples where breakaway couplings have failed and as the specific gravity of the contents is less than the specific gravity of seawater external head pressure on the valve would be pushing seawater into the leads rather than the contents leaking out. Whilst no release is expected from the couplings, reconnection will mitigate the risk of leakage from couplings in the longer term.

The valves on the PTA for the BKA-MKA 200 and MKA-BKA 65 pipelines are expected to be operational in line with previous tests and will be closed in preparation for the abandonment programme. However if either of the valves fail and cannot be closed, it will result in some of the contents of that pipeline to be released when the flowlines are disconnected during the BKA P&A activity. The pipelines contain inhibited seawater and an estimated maximum volume of 1200L would be lost from the BKA-MKA 200 pipeline, or 130L from the MKA-BKA 65 pipeline. These volumes are calculated based on riser head volumes for each pipeline at the MKA platform. As the valves for the pipelines at the MKA platform end are closed, a vacuum in the line would develop as contents are released and the estimated release volumes will likely be lower than what has been calculated. Once the riser head volume is released the internal pipeline pressure equalises with the seawater and no further loss is expected even if the pipeline were to remain open ended. Plugs will be installed on the ends of disconnected flowlines under the existing Central Fields Environment Plan within 12 months of the completion of the BKA P&A activity

(refer Section 5.24) thereby preventing any further potential loss of contents from the pipelines or flowlines. No additional impact is expected due to the time delay of installing the environmental plugs as, due to the pipeline pressure having equalised with the seawater, no additional pipeline contents are expected to be released in that time.

The composition of the inhibited water and their ratings are shown in Table 5-6 below.

The chemical additives in the inhibited seawater have been assessed against Esso's internal chemical selection procedure (Bass Strait Chemical Environmental Assessment) and ALARP Assessment (Workplace Substances Manual, Form WSM2) and deemed acceptable for planned batch discharge at the initial concentrations of the discharged fluids. Table 5-6 lists the constituents in the flowlines and their effective ratings.

Table 5-6 Flowline content composition and volumes

Flowline Composition	wt% of whole	Discharge Concentration ppm	Effective OCNS/CHARM rating	Function
CRW24340	0.63	0.48	Gold[#1]	Corrosion Inhibitor
XC24007	0.06	0.05	E[#2]	Biocide
Seawater	99.31	-	-	Base fluid

#1 Based on CHARM batch discharge dilution factors and known toxicity data for CRW24340 the hazard quotient is less than 1 and hence effectively a “Gold” class chemical in this discharge scenario.

#2 Based on CHARM batch discharge dilution factors and initial low concentrations, the discharged fluid is effectively an “E” class chemical in this discharge scenario.

Over 99 % of the discharged inhibited water from the flowlines is seawater. The remaining 1% of the fluid is composed of chemicals that have been assessed and deemed acceptable for batch discharges at the concentrations of the discharged levels. The volume from each flowline section is low, approximately 1,700L making any change to the water quality localised and temporary as mixing will occur rapidly due to the presence of tides and currents. In the unlikely event that the pipeline valves can not be closed, an additional estimated maximum volume of 1,330L would be released, still making the overall released volume low and the change to the water quality localised and temporary. Changes in the water quality are only likely to affect the seabed in the immediate vicinity of at the Blackback location which does not support significant benthic communities and where they exist they are sparse and depauperate. The inhibited water has been assessed as acceptable at the discharged concentration, the risk of impact to marine species is not assessed to have an effect at the population level and not assessed to be significant.

5.18.3 Controls

- All planned chemical discharges shall be assessed and deemed acceptable before use, in accordance with Esso's chemical selection procedure
- Chemical connections will be looped back to the umbilical termination assembly within 12 months of the completion of the BKA P&A activity
- PTA valves will be closed prior to disconnection of flowlines

5.18.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.18.5 Demonstration of ALARP

The risks associated with discharge of the fluids in the flowlines at the seabed have been reduced to ALARP as the constituents of the inhibited water have been assessed to be acceptable for discharge

in accordance with Esso's chemical selection procedure. Whilst the PTA valves are expected to operate, loss of inhibited seawater from the BKA-MKA 200 and MKA-BKA 65 pipelines if they do fail, is limited to the low quantities of the riser head volume specified above and pipeline plugs will be installed under a separate activity at the completion of the BKA P&A programme. The quantities discharged from the flowlines and potentially from the pipelines are low and any impacts of the discharge on water quality and marine species are temporary and localised and not assessed to have an impact at the population level.

In accordance with Section 4.2 (Demonstration of ALARP), other controls and alternatives were considered. Flushing of the flowlines through the gas lift line from the Mackerel platform has been considered however this will entail significant topside activities, the flushed water will need to be disposed of and to maintain integrity of the BKA-MKA 200 pipeline some chemical additives will still be necessary and hence flushing was rejected as an ALARP measure. A means of capping the flowline to limit the discharge of the contents was also considered however was unlikely to be effective as some or all of the volume would be released from the flowline, prior to installing the plug.

The plugs for the BKA-MKA 200 and MKA-BKA 65 valves, should they fail, could be installed during this activity rather than being conducted separately however considering there is no additional environmental risk associated with leaving the pipelines unplugged and the cost benefit of utilizing a suitable vessel to install the plugs rather than the high cost of the MODU, this was rejected as an ALARP measure. In addition maneuvering around the flowlines will involve less risk once the wellheads have been retrieved.

No stakeholder objections or claims were raised with regards to this activity. ALARP Decision Context A applies. There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.18.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.19 Physical presence - Noise and light (RA 19)

5.19.1 Hazard

Vessel Operations

MODU and support vessel marine systems require the operation of machinery in the form of engines, turbines, motors and drilling tools.

Noise from the MODU and support vessel operations has the potential to cause disruption to underwater marine fauna. This can include:

- Behavioural change;
- Hearing impairment and pathological damage;
- Increased stress; and
- Disruption to underwater cues.

The Ocean Monarch, ATHs and the PSV are equipped with navigation lights. Ocean Monarch also has crane clearance lights, helipad lights and radio tower lights. The Blackback P&A operational area is remote from seabird and turtle nesting areas and therefore lighting from associated structures and vessels has a low potential for impacting marine fauna. The presence of operational area lighting does not appear to disrupt or disorient fish or marine mammals such as seals or cetaceans.

Helicopter Operations

A fleet of aircraft operate out of the Longford base on a scheduled basis. In addition to transporting personnel, the helicopters carry urgent freight and critical spares for the operation of the facilities in Bass Strait. The helicopter base for the Blackback P&A operations has not been finalised. Refer to Section 2.6 for further details.

5.19.2 Impact Assessment

Noise

Major continuous noise sources in the operational area include the diesel generators and abandonment activities. Major noise generators are the DP thrusters on the support vessels, as well as the helicopter engines. A noise survey for Ocean Monarch was carried out in 2013, confirming that the facility complies with all regulatory requirements regarding noise management. To ensure that all noise hazards are managed to a level that is ALARP, Diamond Offshore developed a noise management plan (NMP) for the facility, in force prior to commencing operations in Australia. After allowing for the protection offered by hearing protectors, the level of operational noise exposure is less than an LA_{eq},12h of 82 dB(A); or an LC_{peak} of 140 dB(C).

The guideline threshold for the level of noise that may cause interference to cetaceans is 155 to 183 dB (SEL_{cum}; impulsive, for HF and LF respectively), with behavioural disturbance occurring between 120-160 dB_{rms} (for non-impulsive and impulsive noise respectively (NOAA (2016). P&A activities are expected to generate peak source levels of 154-170dB re 1 µPa @ 1 m in the range of 10 – 4,000 Hz. Additional noise from the cutting of the casing is likely to be generated. Specific levels for the mechanical cutting is not known however noise generated from diamond cutting of 32" casing at 10m above sea level was recorded to have generated approximately 5 dB -15 dB above the background noise of the surface vessels and ROV making it hardly discernible (Panjerc et al, 2016). The duration of the cutting is short (6-12 hrs per well Refer Section 6.20). AHTs generate underwater noise in the range 145 – 171 dB re 1 µPa @ 1 m in the range of 1,000 – 5,000 (URS 2009).

By comparison, noise from large tankers and container ships ranges between 177 – 186 re 1 µPa @ 1 m over a similar bandwidth (URS 2009). Ambient ocean noise as a result of wind and wave activities have been assessed at 90 to 110 dB re 1 µPa (Cato & Bell 1992, Cato & Tavener 1997, McCauley 1998, McCauley *et al*. 2000). Noise levels underwater as a result of abandonment operations or supply vessel operations are expected to be below NOAA guideline levels, especially when considering that noise levels drop off rapidly beyond 1 m from the abandonment activity.

Although whales are known to migrate through the region during spring and autumn/early winter, the operational area is not a recognised feeding, breeding or resting area for cetaceans. It has been observed that birds habituate well to routine noise (Swan *et al*. 1994) and there are no known rookeries in the operational area. It is common to see some migratory birds rest on the operational area before continuing on their migratory flight, however, the presence of the operational area does not appear to significantly disrupt or divert their migratory route or disorient the birds.

Seals have been observed to congregate and rest on the legs of offshore facilities further inshore, and at times on the sea deck of offshore platforms; they appear to be unperturbed or impacted by noise. Whales are also known, and observed, to play and display normal breaching, blowing, lobtailing and diving behaviour around the offshore facilities and vessels, including with calves, before moving on again.

Esso's helicopter traffic fly at an appropriate altitude for safety reasons and this is not expected and has not been observed to affect whale behaviour to any significant extent in the operational area. Sound levels are generally minimised, where possible, by pilots maintaining a straight flight path and avoiding sharp deviations (which increases rotor blade-vortex interaction noise).

Light studies in the North Sea confirmed that lighting can attract birds from large catchment areas (Weise *et al*. 2001). Although the operational area overlaps several foraging BIAs for seabirds, it is not expected that light emissions acting as an attractant to a small number of individual seabirds would result in any impact to the individual or to the greater population.

Cetaceans predominantly utilise acoustic senses to monitor their environment rather than visual sources (Simmonds *et al*. 2004), so light is not considered to be a significant factor in cetacean behaviour or survival.

Other marine life may also be attracted to the MODU or support vessels (e.g., fish, squid and plankton) that can aggregate directly under downward facing lights. These are prey species to many species of marine fauna and given the nature of the activity, any impacts arising from light emissions will be localised and temporary.

Light pollution can be an issue near turtle nesting beaches where emerging hatchlings orient to, and head towards, the low light of the horizon (EA 2003). Given that the operational area is approximately 90 km offshore, impacts to nesting adult turtles is not expected. Consequently, the potential impacts and risks from light emissions are considered to be negligible.

The duration of fauna exposure to vessel strike is limited to the duration of Blackback field operations (expected to be approximately 60 days). If a fauna strike occurred and resulted in death, it is not expected that it would have a detrimental effect on the overall population. Given the distance offshore the potential impacts and risks for this activity have been identified as acceptable.

Consequently, the potential impacts and risks from noise and light due to activities in the Blackback P&A operational area are considered to be localised and short-term, as this type of event may result in a localised short-term impact to species of recognised conservation value but is not expected to affect the population or local ecosystem function, and have been rated as a Level IV consequence, with the probability to be unlikely (C), resulting in a Category 4 risk.

5.19.3 Controls

- Fauna interaction management actions in compliance with EPBC Regulations Part 8, Division 8.1: Interacting with cetaceans and whale watching.
- Victorian Wildlife (Marine Mammals) Regulations 2009, Part 3: General restrictions on activities relating to marine mammals
- Lighting limited to that required for safe navigation and work requirements, by minimising light spill to sea.
- Planned Maintenance System to maintain vessel engines and propulsion systems to minimise noise impacts.
- Environmental induction on requirements of EPBC Regulations Part 8 Division 8.1 and EPBC Act Policy Statement 2.1, and whale and dolphin identification.

5.19.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
C	IV	4

5.19.5 Demonstration of ALARP

Compliance with EPBC Regulations Part 8, Division 8.1: Interacting with cetaceans and whale watching and EPBC Act Policy Statement 2.1 - Interaction between offshore seismic exploration and whales: Industry guidelines, as well as the controls described above are considered sufficient control measures to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4).

The risk associated with fauna strike is well managed via legislative control measures that are considered industry best practice. These are well understood and implemented by the industry. During stakeholder consultation, no objections or claims were raised regarding physical presence.

Offshore activities involving drilling are widely undertaken both nationally and internationally. Underwater sound emissions from vessel thrusters, ROVs and drilling tools is unavoidable, however will be intermittent during the activity. Other controls and alternatives were considered, in accordance with Section 4.2 (Demonstration of ALARP), including imposing a minimum flight altitude. This may result in a safety risk, and was therefore rejected.

The potential to use vessels to transport personnel around the offshore facilities instead of helicopters to reduce above-water noise levels has been considered and rejected. This would increase the frequency of vessel visits to the operational areas above existing levels, increasing the risk of potential vessel collision into a producing operational area, and transfer of personnel off the vessel to the operational area (e.g. via a billy pugh) poses a greater safety risk than direct disembarkation from a helicopter onto a deck. Other cutting mechanisms for the casing would also generate noise, a

discernable alternative would be the use of explosives which would have a significantly greater noise impact than mechanical cutting and therefore rejected.

The use of navigational lights and other lights to enable 24-hour operations to be undertaken, are routine activities in the offshore petroleum sector and are required for the safety of the MODU/vessels and the crew. The impacts and risks associated with light emissions are well understood, with most significant impacts generally associated with operating within close proximity of shorelines that support light sensitive species.

The potential impact associated with this aspect is limited to a localised short-term impact, which is not considered as having the potential to affect biological diversity and ecological integrity. The activities are not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required.

Because the potential impacts associated with underwater noise and light from these activities is limited, ALARP Decision Context A should apply. No further controls or alternatives have been identified. On this basis Esso considers the risk to be ALARP.

5.19.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.20 Physical presence – Infrastructure integrity (RA 20)

5.20.1 Hazard

If the integrity of the remaining chemical connections, flowlines and possibly the wellheads (if they cannot be retrieved) is compromised it has the potential to limit future decommissioning plans and the ability to apply risk reduction measures. Continued presence of these structures may cause interference with commercial fishing as covered by Section 5.21. The release of the flowline contents is covered under Section 5.18 and the associated flowline NORM hazards are covered under Section 5.24.

5.20.2 Impact Assessment

The chemical connections will be secured subsea and left in situ so that they can be used in future to loop back to the main umbilical and allow the umbilical to be flushed and prepared for further use or treatment. The connections consist of 3 x 25.4mm ND methanol hoses (2 x 80m and 1 x 115m). Retrieval of these connections could limit the ability for the umbilical line to be flushed in the future. With the drybreak couplings sealing the connections, their state is not altered and their rate of degradation will remain as it was prior to disconnection. The chemical connections will be looped back to the umbilical termination assembly within 12 months of the completion of the BKA P&A activity (at the time the caps are installed on the flowlines, see below). Esso manages its equipment in accordance with OIMS System 6-2 Facility Integrity Management System (FIMS). An equipment strategy for the connections will be implemented and stewarded under FIMS Program 06 (Subsea) such that the connections are managed with a risk based Maintenance Plan with the objective to maintain them in a fit-for-service (FFS) condition per Section 572[3] of the Offshore Petroleum and Greenhouse Gas Storage

[3] **S 572 Maintenance and removal of property etc. by titleholder**
Maintenance of property etc.
(2) A titleholder must maintain in good condition and repair all structures that are, and all equipment and other property that is:
(a) in the title area; and
(b) used in connection with the operations authorised by the permit, lease, licence or authority.
Removal of property etc.
(3) A titleholder must remove from the title area all structures that are, and all equipment and other property that is, neither used nor to be used in connection with the operations:
(a) in which the titleholder is or will be engaged; and

Act, 2006, to enable surface retrieval, if required, at field decommissioning. Maintenance activities include a 10 year ROV visual inspection.

The flowlines will remain in situ once disconnected from the wells and plugs will be installed under the existing Central Fields Environment Plan within 12 months of the completion of the BKA P&A activity. Degradation of the flowlines over time has the potential to limit environmental risk reduction options at the time of decommissioning.

The flexible flowlines to be left in-situ consist of several different corrosion resistant layers. The main components are leakproof thermoplastic barriers and corrosion resistant steel wires (it is the helically wound steel wires which give the structure its high-pressure resistance and bending characteristics).

The inner carcass uses a corrosion resistant alloy material (316L stainless steel) as the base internal layer. There will be a limited amount of in-service corrosion (pitting) present at the time of disconnection, however the inner carcass will no longer be exposed to corrosive production fluids following disconnection. The 316L also has the potential to pit in oxygenated seawater however once the disconnected ends of the flowline are plugged the oxygen will be used up and the corrosion pitting will stifle. If the pitting extends through the inner carcass and wets subsequent layers, localised corrosion damage could occur and any insulation could become wet. This is considered unlikely as the corrosion would have to penetrate the inner carcass then leak though the inner and intermediate leakproof plastic sheaths. The flexible flowline also possesses an outer thermoplastic, corrosion resistant sheath for protection from external corrosion.

Esso manages its equipment in accordance with OIMS System 6-2 Facility Integrity Management System (FIMS). An equipment strategy for the flowlines will be implemented and stewarded under FIMS Program 06 (Subsea) such that the flowlines are managed with a risk based Maintenance Plan with the objective to maintain them in a fit-for-service (FFS) condition per Section 572 of the Offshore Petroleum and Greenhouse Gas Storage Act, 2006, to enable surface retrieval, if required, at field decommissioning. Maintenance activities include 10 year ROV visual inspection. Degradation of the flowlines is otherwise not considered to have any impact on the environment.

Best endeavours will be made to remove the wellheads from the seabed. If the wellheads are unable to be pulled free at the first cut, further cuts will be made until a final attempt at 1 m below the mudline (Refer Section 5.16). The risk of the wellheads not being able to be retrieved is considered to be low. If any of the 3 wellheads do remain, their removal will be considered in future decommissioning plans. The remaining structures are made of stainless steel which is resistant to corrosion and is therefore not considered to be at risk of degradation to the point that it would affect future decommissioning plans.

5.20.3 Controls

- Equipment strategy using a risk based Maintenance Plan with the objective to maintain flowlines and chemical connections in a fit-for-service (FFS) condition to enable surface retrieval, if required, at field decommissioning will be implemented and stewarded under FIMS Program 06 (Subsea), including a 10 year ROV visual inspection.

5.20.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
E	IV	4

5.20.5 Demonstration of ALARP

The MODU will be used to undertake the BKA P&A activities and is specifically suited to the scope. The MODU is not designed with the equipment or deck space required to retrieve and store flowlines. Removal of pipelines/flowlines is generally conducted with use of vessels and conducting this activity

(b) that are authorised by the permit, lease, licence or authority.

whilst the MODU is on location would pose unnecessary risks associated with simultaneous operations. If the flowlines were to be retrieved by the MODU it would be introducing tasks outside of the MODU's normal scope of work which poses safety risks to the MODU and its crew and therefore rejected. The potential impacts of leaving the flowlines in situ under the management of OIMS System 6-2 is limited and hence ALARP Decision Context A should apply. No further controls or alternatives have been identified.

The risk of being unable to retrieve the wellheads is considered to be very low. If the first attempt is unsuccessful, the cutting method will be repeated until the maximum height at which the cut can be made (1m below mudline) has been reached. If at that point the wellhead still cannot be retrieved, it will be left in situ. Alternative means considered in accordance with Section 4.2 (Demonstration of ALARP), include the use of explosives however this would potentially have greater impacts on the environment in terms of noise, debris and also has a greater safety risk. This alternative was rejected as it poses higher risks versus the low probability of the wells not being able to be retrieved coupled with the assessment that leaving them in situ will not cause them to degrade to the point that it will impact decommissioning. On this basis Esso considers ALARP Decision Context A should apply. No further controls or alternatives have been identified.

5.20.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and stakeholder concerns have been addressed, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.21 Physical presence - Interference with Commercial Fishing (RA 21)

5.21.1 Hazard

The presence of the MODU and associated supply vessels at the Blackback P&A operational area has the potential to disrupt commercial and recreational fisheries. As the disconnected flowlines (refer Section 5.20) and possibly one or more of the wellheads (if they cannot be retrieved) will remain in situ, the presence of these structures will continue to be a possible snag risk to commercial fisheries.

Vessel collision risk is addressed separately under RA 26.

5.21.2 Impact Assessment

During the plugging and abandonment of the Blackback wells the only vessels that will be present in the operational area are:

- the Ocean Monarch, which is on site for the duration of the P&A campaign;
- support/supply vessels (AHTs, Standby/Guard Vessel) to provide mooring, resupply and safety support (at all times).

OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) requires vessel contractors have trained and qualified Vessel Masters which provides assurance in the process of managing vessel safety and contributes to the controls associated with managing shipping traffic. AMSA, in dialogue with AHS, has established temporary fairways and buffer zones around the Blackback wells (Section 5.22.2.1) in order to minimise the risk of shipping collisions. The establishment of these temporary fairways and buffer zones present no restrictions to commercial fisheries outside the PSZ. Fisheries in Bass Strait are generally focused inshore of the Blackback subsea facility location. As the duration of the P&A campaign is also of limited duration, the presence of the MODU and support vessels are not expected to have a significant impact on commercial fishing activity.

As part of the plug and abandonment, the electrical and hydraulic connections, subsea trees, completion guidebases, wellheads and temporary guidebases will be removed from the seabed which will reduce the risk of entanglement of fishing gear. Failure to retrieve one or more wellheads from the seabed and leaving them in-situ will have minor impacts due to the small footprint given the large regional area for fishing, and protruding height above seabed (approximately 3.25m). There is a continued possibility for fishing gear becoming snagged on equipment on rare occasions. However, this is not considered to be a significantly greater snagging risk than the broader existing environment (e.g.

rock snags, shipwrecks in other areas) and would be a reduced risk of snagging from the current state due to the reduced height protruding from the seabed having removed the subsea tree, completion guidebase and temporary guidebase (current protruding height of 6.5m). Furthermore, there have been no reports of fishing gear snags since the wellheads were put in place and is unlikely to occur at BKA due to its location in deep water (approximately 400m). Similarly, the flowlines will continue to pose a snagging risk, equal to the current state which is assessed to be very low.

The only recreational fishing known to occur in the deep water areas around the Blackback P&A operational area is game-fishing (swordfish, sharks, tuna etc.) and this takes place from a limited number of vessels with the capability to safely fish at this distance offshore. Based on the limited deepwater game-fishing activity and the duration of the P&A campaign the impact is considered insignificant.

This aspect is not applicable to KEF. Fisheries stakeholders considered the removal of the subsea infrastructure a positive aspect. No further evaluation against the principles of ESD is required.

5.21.3 Controls

- **Ongoing dialogue** with fisheries and provision of information material on importance of 500 m PSZ around Blackback well locations and role of temporary fairways in deviating shipping traffic away from the operational area (Section 5.22.2.1).
- Relevant Stakeholders will be notified of activities approximately one month and again one week prior to commencement
- Relevant Stakeholders will be notified of the location of any wellheads that could not be retrieved
- **SMS alerts**: Esso are also planning to have SMS alerts issued to SETFIA fishing contacts to raise the awareness of the project activities, including when and where they are taking place.
- Overarching procedure is MODU SEMS 5.5.1.5: Vessel Safety Zone and Floating Trespass Procedure which incorporates the following requirements
    - **Pre-start notifications**:
        - The AHS will be notified no less than four working weeks before operations commence to enable Notices to Mariners to be published.
        - AMSA's JRCC will be notified 24–48 hours before operations commence to enable AMSA to distribute an AUSCOAST warning
    - **Temporary fairway**: Establishment of temporary fairways and 2 NM buffer zone through AMSA (Section 5.22.2.1)
    - **Petroleum Safety Zone**: A 500m PSZ will be in place around the Blackback well locations
    - **NavAids**:
        - Extensive navigation aids and communication systems on MODU and support vessels
        - Installation of further NavAids in response to MODU Safety Case Revision, and in dialogue with AMSA/AHS
    - **Standby/guard vessel and AHTs**
- Vessel Safety Case Revision : Vessel Collision Avoidance Procedure
- Subsea infrastructure removal: As part of the plug and abandonment, the electrical and hydraulic connections, subsea trees, completion guidebases, wellheads and temporary guidebases will be removed from the seabed

5.21.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
C	IV	4

5.21.5 Demonstration of ALARP

Consultation with the commercial fishing industry occurred prior to mobilisation and no issues or concerns were raised. Notices to Mariners will be issued prior to mobilisation, as well as ongoing communication with the fishing community.

The proposed control measures are considered sufficient to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4). Fisheries has coexisted with petroleum operations in the Gippsland Basin for decades, and the associated risks are well understood by both parties. A tribunal is in place for addressing genuine/validated losses incurred by commercial fisheries impacted by oil and gas equipment not marked on navigational charts and outside the PSZs. Purchasing of available fishing licences was rejected due to the short duration of the campaign, and this was not practicable or commercially feasible, nor likely to be well received by fisheries stakeholders.

The establishment of temporary fairways, established by AMSA after extensive dialogue as part of stakeholder consultations (Section 5.22.2.1), is not particularly relevant to commercial fisheries. However, commercial fisheries are required to abide by the establishment of PSZ. This is considered a minor inconvenience. Notices to Mariners will be issued prior to mobilisation, as well as ongoing communication with the commercial fishing communities. Under an agreement with SETFIA, fisheries will be notified of project activities through a global SMS message system, which has proven to be effective in the past. Other controls and alternatives were considered, in accordance with Section 4.2 (Demonstration of ALARP), including minimising both duration of the campaign and minimising the safety zone around the MODU. However, no additional practical mitigation measures are available, short of not proceeding with the P&A campaign.

The residual risk resulting from this activity is considered to be low (Category 4), the proposed control measures are considered to be sufficient to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, and the activity is a well-established practice.

Because of the location of the Blackback P&A operational area, some interference with commercial fishing is possible. This is a Type B ALARP decision. Commercial fishing operations are expected around the operational area, as the location of the subsea facility coincides with low level fishing activity. The risk associated with marine user interactions is well managed via legislative control measures that are considered industry best practice. These are well understood and implemented by the industry. Vessel operations are not unusual in this area and the risks impact to other marine users is well understood. The implementation of extensive navigational aids and ongoing communication with fishing communities are considered the key controls to address interactions with commercial fishing. Esso considers the risk to be ALARP on this basis.

5.21.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and stakeholder concerns have been addressed, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.22 Physical presence - Interference with Commercial Shipping (RA 22)

5.22.1 Hazard

The presence of the MODU and associated supply vessels at the Blackback P&A operational area has the potential to disrupt marine traffic due to the proximity to the Bass Strait Traffic Separation Scheme. (TSS) and implementation of temporary shipping fairways to protect the MODU while on location in Bass Strait for both the Baldfish Drilling and the Blackback P&A campaigns.

A temporary PSZ is also in place around the Blackback well locations. On completion of P&A activities the wellheads will be removed and the PSZ revoked.

Note that interactions with recreational boating activities have not been considered, due to distance of the operational area from shore, the presence of the temporary PSZ and the water depth.

Vessel collision risk is addressed separately under RA 26 (Section 5.26).

5.22.2 Impact Assessment

During the P&A of the Blackback wells the only vessels that will be present in the operational area are:

- The Ocean Monarch, which is on site for the duration of the P&A campaign;
- Support/supply vessels (AHTs, Standby/Guard Vessel) to provide mooring, resupply and safety support.

OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) ensures vessel contractors have trained and qualified Vessel Masters which provides assurance in the process of managing vessel safety and contributes to the controls associated with managing shipping traffic.

A Traffic Separation Scheme (TSS) and an 'Area to Be Avoided' exist in Bass Strait (Section 3.5). The TSS operates to control coastal shipping whereby all ships operational in or near the scheme must comply with Rule 10 of the International Regulations for Preventing Collisions at Sea 1972. Other navigation and safety measures will be in place for the duration of the campaign.

Stakeholder concerns regarding RA 22 have been addressed through the establishment of temporary fairways (Section 5.22.2.1). The presence of these will impact on commercial shipping activities. However, as these fairways provide clarity on safe shipping routes, it is expected that the benefits outweigh these impacts.

5.22.2.1 Gippsland Basin Temporary Fairways

Esso has undertaken extensive communication with the Australian Maritime Safety Authority (AMSA) and the Australian Hydrographic Service (AHS) in order to find a way to manage shipping interactions and minimise the risk of collisions during both the Baldfish Drilling and the Blackback P&A campaigns.

In dialogue with AMSA and AHS it was agreed that AMSA/AHS will establish temporary fairways around the Baldfish/Hairtail and Blackback well locations, with a 2 NM buffer zone (Figure 5-1, Figure 5-2, Figure 5-3), in order to deviate commercial shipping away from the respective operational areas. However, due to the proximity of the Basker-Manta Gummy (BMG) field in VIC/L25, VIC/L26, VIC/L27 to the temporary fairway, a clearance of only 0.6 – 1.25 NM could be provided to the NW of the three Blackback wells, in order to avoid vessel interaction with the BMG field (Figure 2-2).

These temporary fairways were established in February 2018 (NTM 126(T)/2018 of 9 February 2018, and Admiralty NTM 1143-10 published 8 March 2018), in order to ensure that commercial shipping is accustomed to these deviations well before the start of the campaigns.

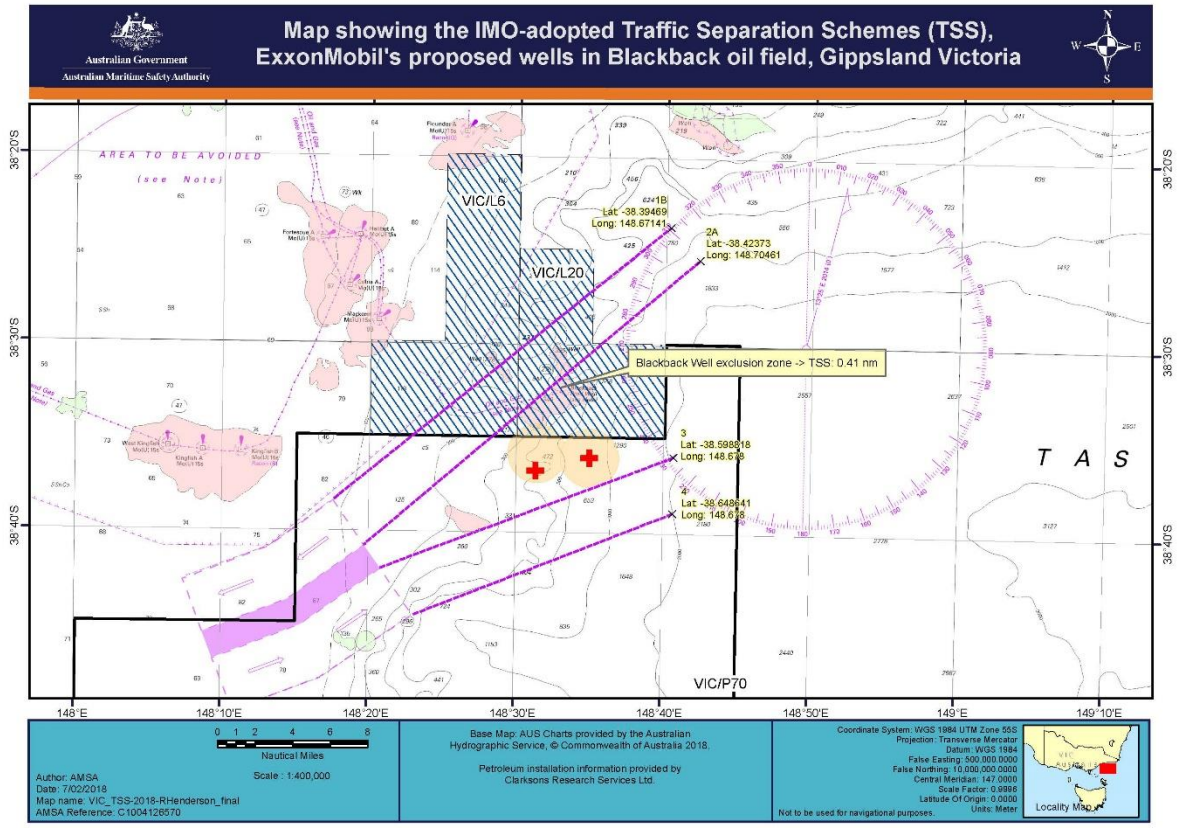


Figure 5-1 **Temporary fairways around the Baldfish-1, Hairtail-1 and Blackback wells as implemented by AMSA and AHS (Feb 2018)**

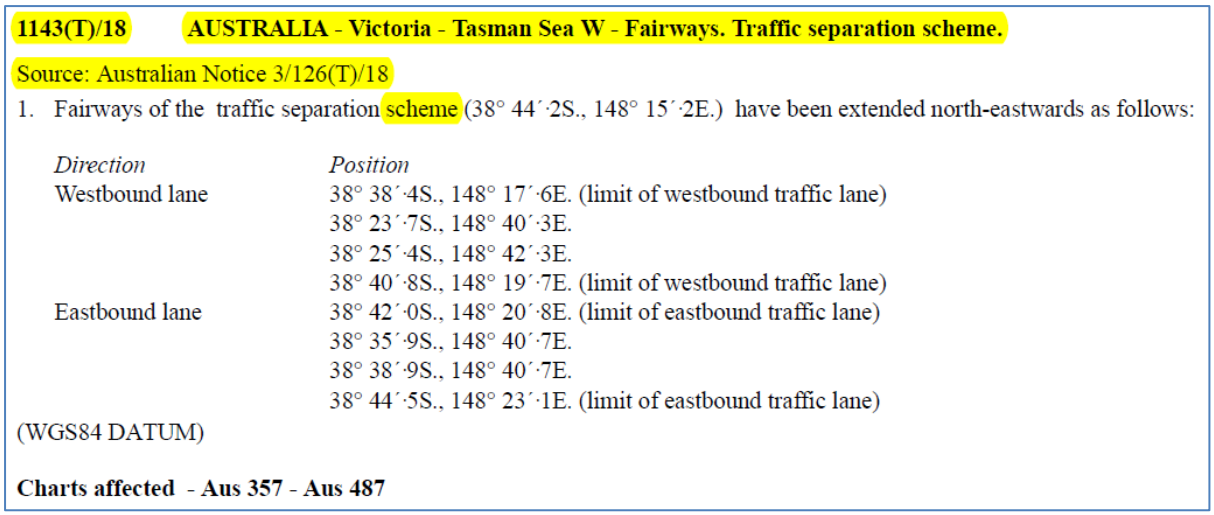
126(T)/2018 AUSTRALIA - VICTORIA - Ninety Mile Beach - Traffic separation scheme southwestwards
Australian Maritime Safety Authority

Two shipping fairways have been established adjoining the existing traffic separation scheme (38° 44'.20 S 148° 15'.20 E) as follows:

Direction	*Coordinates*
Westbound lane	38° 38'.41 S 148° 17'.58 E
	38° 23'.68 S 148° 40'.29 E
	38° 25'.42 S 148° 42'.28 E
	38° 40'.80 S 148° 19'.72 E.
Eastbound lane	38° 42'.02 S 148° 20'.84 E
	38° 35'.93 S 148° 40'.69 E
	38° 38'.92 S 148° 40'.68 E
	38° 44'.51 S 148° 23'.08 E.

Chart temporarily affected - Aus 357 - Aus 487

Figure 5-2 **Notice to mariners 126(T)/2018 Australia - Victoria - Ninety Mile Beach - Traffic separation scheme southwestwards (9 Feb 2018)**



1143(T)/18 **AUSTRALIA - Victoria - Tasman Sea W - Fairways. Traffic separation scheme.**

Source: Australian Notice 3/126(T)/18

1. Fairways of the traffic separation scheme (38° 44´·2S., 148° 15´·2E.) have been extended north-eastwards as follows:

Direction	*Position*
Westbound lane	38° 38´·4S., 148° 17´·6E. (limit of westbound traffic lane)
	38° 23´·7S., 148° 40´·3E.
	38° 25´·4S., 148° 42´·3E.
	38° 40´·8S., 148° 19´·7E. (limit of westbound traffic lane)
Eastbound lane	38° 42´·0S., 148° 20´·8E. (limit of eastbound traffic lane)
	38° 35´·9S., 148° 40´·7E.
	38° 38´·9S., 148° 40´·7E.
	38° 44´·5S., 148° 23´·1E. (limit of eastbound traffic lane)

(WGS84 DATUM)

Charts affected - Aus 357 - Aus 487

Figure 5-3 **Admiralty Notice to mariners 1143(T)/18 AUSTRALIA - Victoria - Tasman Sea W - Fairways. Traffic separation scheme (8 March 2018)**

5.22.3 Controls

- Overarching procedure is MODU SEMS 5.5.1.5: Vessel Safety Zone and Floating Trespass Procedure which incorporates the following requirements
  - Ongoing consultation with shipping groups and AMSA
  - **Pre-start notifications:**
    - The AHS will be notified no less than four working weeks before operations commence to enable Notices to Mariners to be published.
    - AMSA's JRCC will be notified 24–48 hours before operations commence to enable AMSA to distribute an AUSCOAST warning
    - Relevant Stakeholders will be notified of activities approximately one month and again one week prior to commencement
  - **Temporary fairway**: Establishment of temporary fairways and 2 NM buffer zone through AMSA (Section 5.22.2.1)
  - **Safety Zone**: A 500m Petroleum Safety Zone (PSZ) will be in place around the MODU and support vessels.
  - **NavAids**:
    - Extensive navigation aids and communication systems on MODU and support vessels (Section 2.4.11).
    - Installation of further NavAids in response to MODU Safety Case Revision, and in dialogue with AMSA/AHS (Section 2.4.11).
  - Standby/guard vessel and AHTs (Section 2.5).
- Vessel Safety Case Revision : Vessel Collision Avoidance Procedure

5.22.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
C	III	3

5.22.5 Demonstration of ALARP

Consultation with AMSA and ports occurred prior to mobilisation and temporary fairways have been installed around the Blackback well locations in order to minimise collision risk and manage shipping interactions. The Blackback P&A operational area is located close to the Bass Strait TSS (Section 3.5). Commercial shipping passes through this TSS on a daily basis on the way between ports to the west (Melbourne, Geelong and beyond) to eastern locations, including Sydney, Brisbane, New Zealand, Asia and beyond.

The establishment of temporary fairways, established by AMSA after extensive dialogue as part of stakeholder consultations (Section 5.22.2.1), represents a minor inconvenience to commercial shipping. In addition to this, Notices to Mariners will be issued prior to mobilisation, as well as ongoing communication with AMSA, Port of Melbourne and other ports where relevant.

Other controls and alternatives were considered, in accordance with Section 4.2 (Demonstration of ALARP), including minimising both duration of the campaign and minimising the safety zone around the MODU. However, no additional practical mitigation measures are available, short of not proceeding with the P&A campaign.

Because of the location of the Blackback P&A operational area, some interference with commercial shipping is possible. However, the consequence is minor and of short duration, so that the risk is assessed as Category 3 (medium). This is a Type B ALARP decision. Offshore commercial vessel operations are widely undertaken both locally, nationally and internationally. Shipping and commercial fishing activity is expected around the operational area, as the Blackback well locations coincide with major shipping routes near the TSS. The risk associated with marine user interactions is well managed via legislative control measures that are considered industry best practice. These are well understood and implemented by the industry. Vessel operations are not unusual in this area and the risks impact to other marine users is well understood. The implementation of temporary fairways and extensive navigational aids are considered the key controls to address operations near a major shipping route.

Although the residual risk resulting from this activity is considered to be medium (Category 3), the proposed control measures are considered to be sufficient to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, and the activity is a well-established practice.

5.22.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 3 medium risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.23 Physical presence – Seabed Disturbance (RA 23)

5.23.1 Hazard

During P&A activities, the MODU will be anchored to the seabed as a means of maintaining position. Eight anchors are installed (Section 3.6.2), attached by anchor chains and anchor cables to winches on-board the MODU. The positioning of the anchors at each of the three well locations, and sections of the anchor chain dragging over the seabed, will result in seabed disturbance.

Once disconnected, the chemical connections will be secured subsea and the electrical and hydraulic connections will be retrieved by the ROV. The flowlines are planned to remain in situ, with weights if required (Refer Section 5.18 and Section 5.20). Subsea trees, completion guidebases, wellheads and temporary guidebases will be recovered to the MODU for appropriate onshore disposal.

All these activities will result in some seabed disturbance and minor temporary changes to water quality in the immediate vicinity.

5.23.2 Impact Assessment

Anchors are positioned by the AHTs at each of the well locations on commencement of P&A activities and will be retrieved by the AHTs on completion. AHTs and supply vessels will use dynamic positioning (DP) systems while within the PSZ and therefore won't contribute to further seabed disturbance.

Once disconnected, the chemical connections will be secured subsea and the electrical and hydraulic connections will be retrieved by the ROV. The subsea trees, completion guidebases, wellheads, temporary guidebases will also be retrieved to the MODU before appropriate disposal onshore. Removal of this infrastructure will cause loss of habitat to benthic species and disturbance to the seabed. In the unlikely event that the wellheads cannot be retrieved they will remain in situ and the associated risks are discussed in Section 5.20.

Assessment of risks associated with dropped objects are considered under RA 25 (refer Section 6.29).

Seabed disturbance has the potential to impact on receptors, including benthic habitats and assemblages and demersal fish, through smothering, alteration of benthic habitats and localised, temporary increases in turbidity near the seabed. Any impact will be limited to the immediate vicinity of the anchors, the well locations and the area in the path of the flexible flowlines and electrical, hydraulic and chemical connections between the wells and pipeline termination assemblies (refer Figure 3.7). Thus, the extent of potential impact is considered to be limited.

The area of benthic habitat expected to be disturbed by planned activities is approximately 30 m^2 per anchor (8 anchors in total) and 10 m^2 per associated clump weight (8 in total). Some further scouring is likely to occur from the anchor chain. Esso Procedure OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) includes a requirement to conduct mooring analysis which contributes to the controls on anchoring. Retrieval of the subsea trees, completion guidebases, wellheads, temporary guidebases and hydraulic and electrical connections will result in an area of approximately 75 m^2 of benthic disturbance per well. Therefore, the total disturbance area is expected to be relatively small.

The benthic habitat within the operational area is characterised by a soft sediment and shell/rubble seabed, supporting infauna communities. The type of damage that could be sustained by smothering may include destruction of habitat. The removal of the electrical and hydraulic connections will also cause loss of habitat. However, due to the similarity of surrounding habitat, and lack of sensitive benthic habitats, it is expected that recovery and recolonization is likely. There are minimal pressures on this value and the damage would only occur within a small area. It is expected that any localised impacts from anchoring would rapidly recolonise and recover following any disturbance.

Benthic fauna may be disturbed through the temporary increase in turbidity near the seafloor as a result of seabed disturbance during this activity. The area of increased turbidity is likely to be small and localised around the wells, connectors and anchor footprint described above for benthic disturbance. Monitoring of large-scale capital dredging programs has shown that turbidity plumes are highly localised and result in only short-term exposures. The location of the wells within a homogenous seabed area, and lack of sensitive benthic features, means that turbidity resulting from the described activities is not expected to result in any environmental impacts and hence has not been discussed further.

An ROV will be deployed from the MODU to conduct a post P&A survey. This survey records the condition of the seabed at the completion of the program to ensure that no dropped objects or subsea equipment intended for removal remain on the seabed. The ROV survey involves a 50 m radius visual check and 100 m sonar inspection from each wellhead location. Geographic coordinates will be recorded of any equipment which has been left on the seabed.

There are no KEF within the affected area. No stakeholder concerns have been raised on RA22. No further evaluation against the principles of ESD is required.

5.23.3 Controls

- Post-abandonment ROV survey will record the condition of the seabed at the completion of the program to ensure that no dropped objects or subsea equipment intended for removal remain on the seabed.
- Mooring Analysis conducted to confirm adequacy of proposed anchoring system (API RP 2005: Design and Analysis of Station keeping Systems for Floating Structures).
- Mooring line tensions measured, recorded and monitored to prevent anchor drag as per ISO 19901-7:2013.
- Retrieval of anchors and anchor chains, electrical and hydraulic connections, subsea tree, completion guidebase, wellhead and temporary guidebase on completion of P&A activities

5.23.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	III	4

5.23.5 Demonstration of ALARP

The mooring analysis is designed to ensure anchors are laid in locations that have the required conditions thereby minimising additional disturbance through misplacement. All anchors and moorings will be removed on completion of abandonment activities, so that the impact on the seabed is short term and localised. The seabed at the Blackback location has low biodiversity, with no unique features.

To demonstrate that the impacts and risk associated with this hazard have been reduced to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), other controls and alternatives were considered.

Use of a DP rig is not feasible in 400 m of water with Bass Strait metocean conditions. The use of an anchor moored MODU is preferred at this location and the Ocean Monarch is available within the timeframe of the project. Mobilising a DP MODU specifically for this campaign would be cost prohibitive.

To avoid turbidity, the subsea infrastructure could remain on the seabed. Whilst the existence of the infrastructure is documented and known to exist by commercial fisheries, it is preferable to have it removed where feasible so as not to leave redundant infrastructure on the seabed and eliminate potential snagging hazards.

The residual risk resulting from this activity is considered to be low (Category 4), the proposed control measures are considered to be sufficient to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, and the activity is a well-established practice. Since the potential impact associated with this aspect is considered localised to marine / benthic communities, which are expected to recover over the longer term, this aspect is not considered as having the potential to affect biological diversity and ecological integrity. Therefore, no further evaluation against the Principles of ESD is required.

Seabed disturbance from offshore activities is a common occurrence both nationally and internationally. The area of disturbance is known, and benthic habitat within the operational area is characterised by a soft sediment and shell/rubble seabed supporting infauna communities. Managing the risks from anchoring is well understood with good practice controls that are understood and generally well implemented by the industry. During stakeholder consultation, no objections or claims regarding seabed disturbance were made. ALARP Decision Context A applies. On this basis Esso considers the risk to be ALARP.

5.23.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.24 Physical Presence - NORM (RA 24)

5.24.1 Hazard

Naturally occurring radioactive material (NORM) can accumulate in the form of scale on the internal surfaces of equipment which is in contact with the production fluids. As a part of the Blackback P&A activities the flowlines, which will be left in situ until a decommissioning plan is approved, may contain NORM scale which has the potential to impact marine species through exposure to radiation (ARPANSA, 2008).

5.24.2 Impact Assessment

Both uranium and thorium occur naturally in varying concentrations in subsurface formations. Through radioactive fallout or decay, they continually give rise to the radium isotopes ^{226}Ra (radium-226) and ^{228}Ra (radium-228). As radium is more soluble in water than either uranium or thorium, it leaks into the formation water and is transported upwards with the hydrocarbons in the production process. Dissolved

radium either remains in solution in the produced water or, under suitable pressures and temperatures (as temperature and pressure is reduced), co-precipitates with barium, strontium and calcium to form either hard sulphate scales ($BaSO_4$, $SrSO_4$ and $CaCO_3$ respectively) or more granular silicate and carbonate sludges (Norse Decom, 2003). These deposits are known as NORM.

The ocean itself contains large amounts of radioactivity derived from natural sources. A primary source is naturally occurring potassium isotope ^{40}K contributing to about 88% of the activity. As well as other radionuclides, radium-226 and radium-228 (as found in NORM) also occur naturally, particularly at the seabed where they leak from floor sediments (Norse Decom, 2003).

If NORM scale is contained in the flowlines it can emit radiation in the form of higher energy α and γ rays from radium-226 or low energy β rays from radium-228 (APPEA, 2002). The pathways for exposure to marine species are through external γ radiation from radium-226, absorption (e.g. by phytoplankton) or through intake from water or feed of either radium-226 or radium-228. Once absorbed, radium follows potassium in organisms and is primarily deposited in shell and bone tissue. Secretion from these is very slow and in general the deposited radium will remain there throughout the organism's lifetime (Norse Decom, 2003). There is little knowledge about the effects of deposited NORM on marine organisms. Studies have primarily been conducted on impacts of NORM in produced formation water. A North Sea study tells us that there is no evidence of increased accumulation of radium-226 or radium-228 in marine organisms in the North Sea due to produced water inputs and that it is unlikely that the observed levels of radium-226 in seawater or sediments in the North Sea, from produced water, will cause effects on marine organisms (Hylland & Eriksen, 2013). Whilst radium is accumulated in virtually all groups of marine organisms, lowest level organisms tend to have higher concentrations than those that are higher up the food chain, suggesting that there is little upward transport through bioaccumulation (Norse Decom, 2003).

Whilst there have been some studies on the effects of NORM radiation on marine organisms, more investigation is needed to be able to draw accurate conclusions regarding the results. For example, a study measuring oxidative stress in polychaete worms exposed to radium-226 for 4 weeks at various concentrations, showed no impact on the antioxidant defence mechanism of the worms. There was, however, a dose dependent accumulation of radium-226 in the worms' tissues. It is important to note here that the lowest exposure activity in the study, was 5-10 times higher than the activity of radium-226 in sediments of the North Sea (Hylland & Eriksen, 2013). In another study, early stage development of cod embryos (cells in the blastula and gastrula stages) were exposed to radium-226 in varying concentrations for up to 72 hrs and significant changes in the expression of some genes were seen at some concentrations (Olsvik *et al*, 2012). The authors concluded that radium levels expected from formation water may induce cell death in cod embryos, however due to dilution in open waters, radionuclides would be expected to pose a minor threat to early life stages of fish.

Plugs will be installed in the disconnected ends of the flowlines under the existing Central Fields Environment Plan within 12 months of the completion of the BKA P&A activity. This will prevent the risk of NORM exposure to marine organisms beyond the time the plugs are installed and leave NORM in a contained system as per the current situation, reducing the risk to pre-activity levels. When the flowlines are disconnected but the ends not yet plugged organisms would need to enter the flowlines for direct NORM exposure to occur either through radiation, absorption or intake. As the diameter of the flowline and gaslift lines are 200mm and 65mm respectively, only limited sized organisms would have the potential to be exposed. As discussed above the effects of NORM on marine organisms requires additional studies before conclusions can be drawn, however as the impacts of radiation are known to be dose dependant, organisms forming colonies inside the flowlines are the most likely to be impacted and as these colonies grow, they would progressively limit the size and opportunity for other organisms to ingress the flowline. The risk of NORM exposure would likely be limited to colonies growing in the ends of the flowlines. The open ends of the flowlines are small in area (200mm diameter and 65mm diameter) and number and hence the overall area on which colonies can grow and be potentially impacted is considered to be small. The number of individual organisms that could be impacted would be limited to the size of the colonies in the open ends of the flowlines which is assessed to be low, localized and not have an impact at the population level. Exposure to NORM may potentially occur through bioaccumulation from feeding on NORM scale or impacted colonies however this is also unlikely given the small area of potentially impacted colonies over a vast homogenous seabed habitat. In addition studies have shown that there is little upward transport up the food chain through

bioaccumulation. As discussed in other sections, the seabed at the Blackback operational area does not support significant benthic communities and where they exist they are sparse and depauperate. The area is also not known to be a feeding ground for any significant species and there are no KEF in the area.

Recovered equipment containing NORM will be handled and prepared for transport to shore for appropriate treatment/disposal in accordance with the Blackback P&A NORM Management Plan. The equipment to be recovered is hydraulic and electrical connections, subsea tree, completion guidebase, wellhead and temporary guidebase.

5.24.3 Controls

- NORM measurement, handling and preparation for transport will be conducted in accordance with the Blackback P&A NORM Management Plan:
    - Measurement conducted by Radiation Safety Officer (RSO)
    - Measurement of both the gamma ray radiation and alpha/beta radiation component is conducted on both external and accessible internal surfaces.
- Plugs will be installed in the open ends of each flowline to prevent marine organisms from entering the flowlines and minimise any marine environment exposed to the potentially NORM-containing internals.

5.24.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.24.5 Demonstration of ALARP

The risks associated with radiation exposure to marine species from NORM have been reduced to ALARP as disconnected flowlines will be plugged within 12 months of completion of the Blackback P&A campaign. Radiation levels from NORM are low and the potential impacts of exposure are assessed to be limited and localised primarily due to the small area that could be impacted. Any impacts to marine species would be minor and not expected at the population level. After the plugs have been installed the risk will be reduced to pre-activity levels.

In accordance with Section 4.2 (Demonstration of ALARP), other controls and alternatives were considered. Retrieval of the flowlines to the MODU for treatment/disposal as part of the plug and abandonment campaign was rejected as discussed in Section 5.20. Even with the consideration of the additional risks associated with radiation from NORM, the alternative of retrieving the flowlines to the MODU was rejected Retrieval of the flowlines will be considered as part of a separate decommissioning plan, yet to be developed. For management of the flowlines whilst they remain in situ refer to Section 5.20. Lack of an approved decommissioning plan for the flowlines should not prevent approval of the proposed plug and abandonment campaign using the Ocean Monarch “rig of opportunity”, which will reduce the risk to the environment from a well integrity issue.

No stakeholder objections or claims were raised with regards to this activity. ALARP Decision Context A applies. There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.24.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.25 Accidental Release – Dropped Objects (RA 25)

5.25.1 Hazard

Extreme weather events, resulting in wave heights and high winds, can occasionally remove items from offshore facilities. Offshore incidents can also occur, where objects are accidently dropped into the sea causing seabed disturbance. Retrieval of the subsea infrastructure (electrical and hydraulic connections, subsea trees, completion guidebases, wellheads and temporary guidebases), may also result in these items being dropped during the process. Depending on the nature of the dropped object, it could cause a hazard to marine users, could cause an impact to the seabed or could pose a risk to marine fauna, through entanglement, ingestion or impact. Seabed disturbance is covered under RA 23 (Section 5.23). Spills during chemical and oil storage and handling are addressed under RA 28 (Section 5.29).

5.25.2 Impact Assessment

No dropped objects are planned and all lifting will be conducted using certified lifting equipment, in accordance with approved lifting procedures and checks.

The operational area is located on sandy seabed substrate, with no or few features observed on the seabed surrounding the operational area. In the event of an object being dropped in the operational area, any seabed disturbance will be localised. Rough weather conditions in Bass Strait are the main cause of dropped objects, due to the storm dislodging unrestrained objects on the MODU or support vessels.

There are no KEF within the area potentially affected by dropped objects. No stakeholder concerns have been raised on RA 24. No further evaluation against the principles of ESD is required.

5.25.3 Controls

- Maintain operational lifting equipment in compliance with the Ocean Monarch Management Procedures and lifting standards in accordance with SEMS (OM-SC-001-02) and Lifting Equipment and Material Handling requirements (OM-SC-001-03, Section 3.4.9)
- Deck loads are adequately secured at all times
- Subsea equipment retrieved with ROV will be conducted in accordance with approved procedures
- ROV inspection of the seafloor around the wellhead area, post abandonment to confirm that no unplanned retrievable equipment has been abandoned on the seabed and if so that they are removed where practicable.

5.25.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.25.5 Demonstration of ALARP

Dropped objects are a major safety concern and all lifts are strictly controlled and monitored in accordance with the Ocean Monarch safety case. Adherence to approved lifting procedures and house-keeping procedures are considered adequate measures to manage the risk associated with dropped objects to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4).

Other controls and alternatives were considered, in accordance with Section 4.2 (Demonstration of ALARP). There were no further controls identified for dropped objects, however for dropped oils and chemicals consideration was given to additional containment measures which could reduce the risk of spillage during transfer, including (see RA 29, Section 5.29):

- Secondary containment in shipping containers;

- Use of purpose built water tight shipping containers where possible; and
- Use of purpose built roof-opening shipping containers.

Where possible, these measures will be implemented. However, they are not always practicable due to MODU deck space constraints, increased manual handling risks, and cost implications (i.e. when the cost of implementing these measures are grossly disproportionate to the reduction in risk). There were no further controls identified for dropped oils and chemicals. On this basis Esso considers the risk to be ALARP.

5.25.6 Demonstration of Acceptability

For this hazard the residual risk was assessed as a Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.26 Accidental Release - Loss of containment from vessel collision (RA 26)

5.26.1 Hazard

A vessel to vessel or vessel to MODU collision could result in a release of diesel or other hazardous chemicals (in storage in the hull) to the marine environment, which can lead to changes in the water column biochemistry, causing acute or chronic impacts or mortality in seabirds, marine mammals and reptiles, fish and other marine organisms. It could also impact on shoreline and intertidal communities along the mainland or nearby islands.

The Blackback P&A operational area lies to the east of the Bass Strait TSS and near a busy shipping route. This increases the risk of vessel collision. However, vessel drift or powered grounding is not considered credible given the distance from shore of the operational area and the lack of emergent features in the operational area.

Due to the location of the main diesel storage tanks on Ocean Monarch (Section 2.4.2) damage to one of these tanks, resulting in the release of the full inventory (530 m^3) is not considered to be a credible scenario. Release of MDO from one tank as a result from a vessel to vessel collision is considered credible. The AHTs can store a volume of up to 998 m^3 of MDO, distributed over several tanks (Section 2.5).

5.26.2 Modelling Methodology and Thresholds

The modelling undertaken for the MDO spill scenario for the Baldfish Environment Plan at Hairtail-1 located < 20km from the Blackback A-2 well has been used for this risk assessment as the hazard and associated risks are considered to be directly analogous to a spill occurring at the Blackback location.

A vessel collision with another vessel or with the MODU, resulting in a rupture of the hull and the loss of the contents of a single fuel tank (280,000 L of diesel) over 6 hours was modelled. A conservative diesel volume for one of the main tanks of a support vessel was applied (280 m^3), similar to the volume previously applied for Esso activities in Bass Strait (e.g. see Central Fields EP, Document Number: AUGO-PO-EMP-034).

The following parameters were applied for MDO modelling:

- **Density**: 829 kg/m3 @ 15˚C
- **API**: 37.6
- **Dynamic viscosity**: 4.0 cP @ 25°C
- **Pour Point**: -14 ºC
- **Oil Property Category**: Group II (Light-persistent oil)

5.26.2.1 Stochastic modelling

Esso commissioned RPS APASA (APASA) to undertake OSTM using a three-dimensional oil spill trajectory and weathering model, SIMAP (Spill Impact Mapping and Analysis Program) (APASA,

2018a). SIMAP was run multiple times to simulate the defined spill scenarios, using different samples of current and wind data, based on randomly selected historic time-series of wind and current data (5 years duration), representative of the study area as follows:

- 100 simulations were completed.
- The model ran 100 single spill trajectories, using the same spill information (i.e. spill volume, duration and oil type) but with varying start times, and in turn, prevailing wind and current conditions.
- The probability of exposure to the sea surface, in-water and shoreline contacts for the hypothetical spill scenario over a 5-year period was quantified.
- For the diesel spill scenario, the spill was tracked for 20 days
- The stochastic model output does not represent the extent of any one single spill trajectory (which would be significantly smaller) but rather provides a composite outlook of all trajectories run for the scenario.

Results from the simulations were combined and statistically analysed to produce maps or tabulated results at sensitive locations, showing multiple parameters, including the probability of exposure above nominated shoreline, sea-surface and water column thresholds, and minimum time before sea-surface contact, presented on an annualised basis.

One objective of the stochastic spill modelling is to establish a Zone of Potential Impact (Operational ZPI) that may be exposed to surface or in-water hydrocarbons, resulting from a marine hydrocarbon spill. Delineation of the Operational ZPI is based on the furthest feasible extent from the release location (lowest exposure zone) of all modelled scenarios where hydrocarbon thresholds, including surface, entrained and dissolved aromatic hydrocarbons could be exceeded.

The potential for sensitive receptors to be exposed to surface, entrained and dissolved hydrocarbons has been assessed by the application of assessment thresholds. Assessment thresholds for hydrocarbon exposure (sea surface, shoreline, and water column dissolved aromatics and entrained hydrocarbons) are described below.

5.26.2.2 Deterministic modelling

The number of deterministic analyses undertaken is dependent on the stochastic results for each scenario. There are several metrics that are used to select the single spill trajectories for analysis. Where no shoreline contact is predicted by stochastic modelling, only deterministic modelling that results in the largest swept area of actionable sea surface oil is undertaken.

Extensive shoreline contact:

- Largest swept area at or above 10 g/m^2 (actionable sea surface oil),
- Minimum time to shore for visible sea surface oil (0.05 g/m^2),
- Largest volume of oil ashore, and
- Longest length of shoreline contacted at or above 100 g/m^2 (actionable shoreline oil).

Minimal shoreline contact:

- Largest volume of oil ashore, and
- Largest swept area at or above 10 g/m^2 (actionable sea surface oil).

No shoreline contact:

- Largest swept area at or above 10 g/m^2 (actionable sea surface oil).

5.26.2.3 Spill Scenario Identification

Based upon the proposed activities, an assessment of all potential unplanned hydrocarbon release scenarios which could occur was identified at the Environmental Risk Assessment (ERA). These scenarios included:

- Loss of containment from a vessel to vessel collision or vessel to rig collision (RA 26).

- Spills during bunkering (RA 27).
- Spills during chemical and oil storage and handling (RA 29).
- Loss of well integrity (RA 30).

Of the above scenarios, the extended duration loss of well control/well blowout from well integrity failure (loss of containment of a Group I (non-persistent) light crude oil at seabed, RA 30) presented the worst credible discharge scenario (WCDS) and was taken forward to modelling, and is addressed in Section 6.34.

Modelling was also undertaken for the unplanned release scenario resulting from a vessel collision (RA 26). Spill scenarios in RA 27 (bulk transfers and bunkering) and RA 29 (spills during chemical and oil storage and handling), have been determined to result in a release volume less than the WCDS and are considered to result in a smaller Operational ZPI, and are therefore considered adequately addressed by RA 26.

Modelling also considered other fluids that are transported in vessel hulls (e.g. possibly brine or drilling mud). It was determined that the release of these fluids would have a similar or reduced impact to a diesel spill.

The outcomes of the Oil Spill Trajectory Modelling (OSTM) for the selected diesel spill scenario is presented below. It focuses on defining the likelihood of oil contact (surface, entrained and dissolved) with specific sensitive locations above the lowest threshold and shows the furthest possible extent from the release location that oil could reach, at the lowest threshold, if the spill scenario occurred.

5.26.2.4 Thresholds

Surface Hydrocarbon Thresholds

A surface hydrocarbon level of 0.5 g/m^2 equates approximately to an average thickness of ~0.5 µm (Table 5-7). Oil of this thickness is described as a silvery to rainbow sheen in appearance, according to the Bonn Agreement Oil Appearance Code (Bonn Agreement, 2009) is considered the practical limit of observing oil in the marine environment (AMSA 2012). This threshold is considered below levels which would cause environmental harm and it is more indicative of the areas perceived to be affected due to its visibility on the sea surface and potential to trigger temporary closures of areas (i.e. fishing grounds) as a precautionary measure. Hence, the 0.5 g/m^2 threshold has been selected to define the zone of potential low exposure on the sea surface (Table 5-8).

Table 5-7 The Bonn Agreement Oil Appearance Code

Code	Description Appearance	Layer Thickness Interval (g/m^2 or µm)	Litres per km^2
1	*Sheen (silvery/grey)*	0.04 – 0.30	40 – 300
2	*Rainbow*	0.30 – 5.0	300 – 5,000
3	*Metallic*	5.0 – 50	5,000 – 50,000
4	*Discontinuous True Oil Colour*	50 – 200	50,000 – 200,000
5	*Continuous True Oil Colour*	200 –>	200,000 –>

Table 5-8 Hydrocarbon exposure thresholds in surface waters

Threshold	Range	Basis	Receptors*
Low Impact	0.5 – 10 g/m^2	Socio-economic impact. 0.5g/m^2 considered the practical limit of observing oil in the marine environment (AMSA 2012) (French-McCay (2016) concluded 1g/m^2 was an appropriate threshold for sub-lethal effects on water birds, marine mammals and turtles.)	**Social** • Coastal Settlements • Recreation and Tourism • Heritage
Moderate Impact	10 – 25 g/m^2	Lethal threshold for water birds, marine mammals and turtles. 10g/m^2 derived by French-McCay (2016) based on observations made by the Deep Water Horizon Trustees (2015).	**Ecological** • Seabirds and Shorebirds • Marine Reptiles • Marine Mammals **Social** • Commonwealth Areas, Parks and Reserves • State Parks and Reserves
High Impact	>25 g/m^2	Scholten *et al*. (1996) and Koops *et al*. (2004) indicated that a concentration of surface oil equal to 25 g/m^2 or greater would be harmful for all birds that contact the slick.	

* *Based on available information, concentration thresholds for use in the impact assessment have been defined for the different exposure types (surface, in-water, shoreline). These impact thresholds and exposure pathways are then applied at a receptor level for use in the consequence evaluations.*

Shoreline Exposure Thresholds

There are many different types of shorelines, ranging from cliffs, rocky beaches, sandy beaches, mud flats and mangroves, and each of these influence the volume of oil that can remain stranded ashore and its thickness before the shoreline saturation point occurs. For instance, a sandy beach may allow oil to percolate through the sand, thus increasing its ability to hold more oil ashore over tidal cycles and various wave actions than an equivalent area of water; hence oil can increase in thickness onshore over time. A sandy beach shoreline was assumed as the default shoreline type for the modelling herein, as it allows for the highest carrying capacity of oil (of the available open/exposed shoreline types). Hence the results contained herein would be indicative of a worst case scenario, where the highest volume of oil may be stranded on the shoreline (when compared to other shoreline types, such as exposed rocky shores). The thresholds for shoreline impacts are summarised in Table 5-9.

Table 5-9 Hydrocarbon exposure thresholds used to classify the zones of shoreline contact

Threshold	Range	Basis	Receptors*
Low Impact	10-100 g/m^2	French-McCay *et al*. (2005a, 2005b) 10g/m^2 used to define regions of socio-economic impact (e.g. temporary closure of fisheries, need to clean up man-made structures or amenity beaches)	
Moderate Impact	100 – 1000 g/m^2	AMSA's Foreshore Assessment Guide (2012) defines 100g/m^2 as the minimum thickness that does not inhibit recovery and is best remediated by natural processes alone. Sub-lethal and lethal impacts for shorebirds and wildlife (French *et al*. 1996).	**Ecological** • Shoreline (e.g. sandy, rock etc.) • Soft Sediment • Marine Invertebrates • Seabirds and Shorebirds • Marine Reptiles • Marine Mammals **Social** • Commonwealth Areas, Parks and Reserves • State Parks and Reserves • Coastal Settlements • Recreation and Tourism • Heritage
High Impact	>1000g/m^2	Significant impact on marsh plants (Lin & Mendelssohn, 1996) and mangroves (Grant *et al*. 1993; Suprayogi & Murray, 1999).	**Ecological** • Mangroves • Saltmarshes **Social** • Wetlands

* *Based on available information, concentration thresholds for use in the impact assessment have been defined for the different exposure types (surface, in-water, shoreline). These impact thresholds and exposure pathways are then applied at a receptor level for use in the consequence evaluations.*

Water Column Exposure Thresholds

Dispersed oil are small, discrete insoluble dispersed oil droplets, suspended in the water column. In essence the oil has been partitioned (naturally separated) from gas/oil/water mixture by solubility (water washing) and vapour pressure (evaporation) based on the individual hydrocarbon chemical properties.

While dissolved aromatics are the largest contributor to the toxicity of solutions generated by mixing hydrocarbons into water, it is still important to model the fate of entrained hydrocarbons because they are the mechanism of delivering soluble aromatics to the water column.

Dissolved Aromatic Hydrocarbons

The threshold value for species toxicity in the water column is based on global data from French *et al*. (1999) and French-McCay (2002, 2003), which showed that species sensitivity (fish and invertebrates) to dissolved aromatics exposure >4 days (96-hour LC_{50}) under different environmental conditions varied from 6 to 400 ppb, with an average of 50 ppb. This range covered 95% of aquatic organisms tested, which included species during sensitive life stages (eggs and larvae). Thresholds for dissolved hydrocarbons, and their rationale are summarised in Table 5-10.

Entrained Hydrocarbons

There has been a considerable amount of dialogue among scientists on what entrained hydrocarbon levels represent realistic thresholds. The selected thresholds for entrained hydrocarbons are summarised in Table 5-11.

Exposure thresholds used to assess entrained hydrocarbon exposure were based on OSPAR guidelines. OSPAR has published a predicted no effect concentration (PNEC) for produced formation water (PFW), which accounts for the dispersed fractions of oil that is more representative of entrained oil droplets.

There are practical limitations to OSTM as a tool to assess spill risk, and thresholds, no matter how carefully chosen, are a simplification of the actual situation because:

- Thresholds do not distinguish between the various marine species. Instead, a conservative scientifically defensible value is selected, allowing for the generally agreed species protection levels (NOEC is based on to 95% protection of species).
- Thresholds do not distinguish between life stages (eggs, larvae, juveniles, adults).
- Thresholds do not distinguish between the wide range of chemicals that may comprise released hydrocarbons.
- Thresholds do not take into further account the various levels of exposure times, but instead choose between acute (96 hrs) or chronic exposure levels (168 hrs).

Table 5-10 Hydrocarbon exposure thresholds for dissolved aromatic exposure

Exposure level	Threshold	Basis	Receptors
Low Exposure (99% species protection)	6 ppb for 96 hours (576 ppb.hrs)	LC_{50} from French-McCay (2002, 2003), using lower limit of sensitivity range (6 ppb). Exposure of 96 hours chosen as conservative for acute effects (acute studies generally observe toxicity over 48-96 hours).	
Moderate Exposure (95% species protection)	50 ppb for 96 hours (4,800 ppb.hrs)	LC_{50} from French-McCay (2002, 2003), using average of reported sensitivity values (50 ppb). Species sensitivity (fish and invertebrates) to dissolved aromatics exposure >4 days (96-hour LC_{50}) under different environmental conditions varied from 6 to 400 µg/l (ppb), with an average of 50 ppb. An average 96 hr LC50 of 50 ppb could serve as an acute lethal threshold to 5% of biota.	**Ecological** • Seagrass • Algae • Coral • Plankton • Marine Invertebrates • Fish & Sharks • Marine Mammals **Social** • Commonwealth Areas, Parks and Reserves • State Parks and Reserves • Commercial and Recreational Fisheries • Recreation and Tourism
High Exposure (50% species protection)	400 ppb for 96 hours (38,400 ppb.hrs)	LC_{50} from French-McCay (2002, 2003), using upper limit of sensitivity range (400 ppb). An average 96 hr LC_{50} of 400 ppb could serve as an acute lethal threshold to 50% of biota.	

* *Based on available information, concentration thresholds for use in the impact assessment have been defined for the different exposure types (surface, in-water, shoreline). These impact thresholds and exposure pathways are then applied at a receptor level for use in the consequence evaluations.*

Additionally, there are limitations on the model itself (e.g. McKay *et al*., 1999, French-McCay 2004):

- Available temperature, wind, wave and current data,
- Grid resolution and bathymetry simplification,

- Tidal forcing,
- Assumptions made around weathering and fate,
- Limitations to the number of computations which restricts the number of particles that are traced during each run, and which in turn limits the lowest concentrations that can be reliably traced.

A further complication is that modelled volumes and composition of hydrocarbons are conservatively chosen based on theoretical values and the available reservoir data. Released volumes and actual duration of the release is likely to be substantially less.

In order to take above considerations into account, model assumptions and selection of thresholds are conservative. Nonetheless, low level impacts may extend beyond the lowest thresholds. The geographical extent of such impacts was determined by applying the ANZECC criteria for TPH to entrained hydrocarbons.

Table 5-11 Hydrocarbon exposure thresholds for entrained hydrocarbon exposure

Exposure level	Threshold	Basis	Receptors
ANZECC reference criteria	7 ppb for 96 hrs (672 ppb.hrs)	ANZECC (2000) derived a final chronic value of 7 µg/L total petroleum hydrocarbons (TPH), based on Tsvetnenko (1998), who used the USEPA methods (Stephan *et al*. 1985, USEPA 1994d). The threshold is applied for acute exposure (i.e. 96 hrs). This threshold is applied to provide a geographical limit to low level impacts, below the 95%-ile NOEC threshold.	Possible sub-lethal effects to the most sensitive organisms Below limit of detection using standard laboratory techniques
95%-ile No effects concentration (NOEC)	70 ppb for 168 hours (11,760 ppb.hrs)	The OSPAR PNEC is 70 ppb (median estimate at 50% confidence and at 5% of the hazardous concentration (HC5)) and is based on biomarker and whole organism testing to total hydrocarbons (THC). The functioning of any ecosystem in which that species exists is protected provided that the ecological structure is not distorted. The working but arbitrary hypothesis is that protection of the most sensitive species with a 95% confidence limit should protect ecosystem structure and hence function (WHO 1999). This NOEC represents an acceptable long-term (i.e., chronic, >7 days) exposure concentration from continuous point source discharges in the North Sea, which is one of the most concentrated areas in the world for oil and gas production. The 70 ppb is regarded as the maximum allowable exposure level and thus is considered to be the 'low exposure threshold' in this study. The whole organism responses range from oxidative stress and DNA damage to impacts on growth, reproduction and survival. The low exposure level for entrained hydrocarbons is based on an exposure duration of 7 days (168 hours), representative of chronic exposure, compared to the acute 96-hour exposure periods used to classify moderate and high exposures.	**Ecological** • Seagrass • Algae • Coral • Plankton • Marine Invertebrates • Fish & Sharks • Marine Mammals **Social** • Commonwealth Areas, Parks and Reserves • State Parks and Reserves • Commercial and Recreational Fisheries • Recreation and Tourism
Fish Tainting	240 ppb for 96 hours (23,040 ppb.hrs)	Davis *et al* (2002) studied the effect of the exposure of fish to petroleum products, and resulting tainting (oily taste) and rate of depuration (return to normal flavour when returned to clean water). Davis *et al.* (2002) showed that acute exposure to oil in seawater is detectable at between 100 – 330 ppb, and that a lower level of exposure to medium fuel at 240 ppb is an acceptable lower limit for finfish. Tainting thresholds for trout varied from 0.10 mg/L for crude and 0.33 mg/L for medium fuel oil, to 0.25 mg/L for diesel exposure (98 – 331 ppb), and that the rate of update and rate of depuration depended on the petroleum product. Diesel-derived taint persisted for over 10 weeks, much longer than both the medium fuel oil (47 days) and the crude oil (35 – 45 days for finfish) derived taints. However, fish tainting is temporary, and fish returns to natural flavour after 1-2 months in uncontaminated seawater. The lower level concentration for exposure to medium fuel (0.241 mg/L - 241 ppb) formed the basis for this threshold.	**Social** • Commercial and Recreational Fisheries
Low Impact (99% species protection)	700 ppb for 96 hours (67,200 ppb.hrs)	LC_{50} for 99% of species. Exposure thresholds used to assess entrained hydrocarbon exposure were based on OSPAR guidelines. OSPAR has published a PNEC for PFW, which accounts for the dispersed fractions of oil that is more representative of entrained oil droplets. For this study, moderate and high thresholds have been set at 700 ppb and 7,050 ppb, respectively. Exposure of 96 hours chosen as conservative for acute effects (acute studies generally observe toxicity over 48-96 hours).	
Moderate Impact (95% species protection)	7,050 ppb for 96 hours (676,800 ppb.hrs)	LC_{50} for 95% of species protection. Exposure thresholds used to assess entrained hydrocarbon exposure were based on OSPAR guidelines. OSPAR has published a PNEC for PFW, which accounts for the dispersed fractions of oil that is more representative of entrained oil droplets. For this study, moderate and high thresholds have been set at 700 ppb and 7,050 ppb, respectively. Exposure of 96 hours chosen as conservative for acute effects (acute studies generally observe toxicity over 48-96 hours).	
High Impact (50% species protection)	80,400 ppb for 96 hrs (7,718,400 ppb.hrs)	LC_{50} for 50% of species protection. See above.	

5.26.2.5 MDO Weathering and Fate

The weathering and fates volume balance for the spill trajectory (Figure 5-4) indicated rapid evaporation (37% of total spill volume) over the release duration (6 hours). The inverse correlation between entrained oil and sea surface oil can be seen at 2.25 days after the spill, as a strong wind event forced the sea surface oil into the water column. At the end of the simulation 56% of the oil had evaporated, 29% remained entrained in the water column, 16% had decayed and <1% persisted on the sea surface.

Visible oil (low 0.5 g/m^2) did not persist on the sea surface beyond 3 days and actionable oil (moderate 10 g/m^2) was not predicted on the sea surface beyond 2 days.

Maximum extent of the surface plume at low exposure is reached within 2-3 days, with rapid evaporation (37% of total spill volume) over the release duration (6 hours). No actionable sea surface oil remains after 2 days (i.e. >10 g/m^2; Section 5.26.2.4). After 20 days, <1% persisted on the sea surface, while 56% of the oil had evaporated, 29% remained entrained in the water column and 16% had decayed.

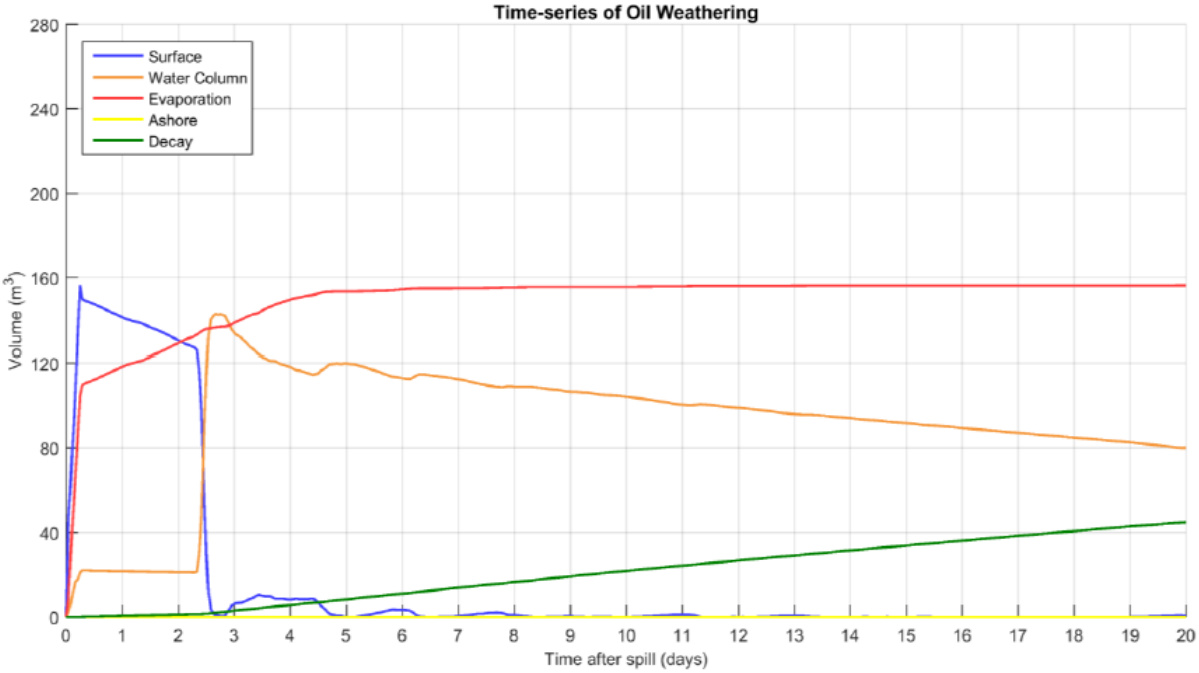


Figure 5-4 **Predicted weathering and fates volume balance for a worst case spill trajectory, resulting from a hypothetical 280 m³ surface release of MDO at Hairtail-1 over 6 hours (tracked for 20 days) commencing 2 am 26th May 2008 (APASA 2018a)**

5.26.2.6 MDO Surface Hydrocarbon Exposure

Modelling results have indicated that low (0.5 to 10 g/m^2), moderate (10 to 25 g/m^2) and high (> 25 g/m^2) zones of sea-surface exposure are not predicted to contact the Victorian coastline or any of the offshore Bass Strait Islands. Low sea-surface exposure levels stretched a maximum distance of 131 km east-northeast from the release site (77 km at 99th percentile), whilst moderate and high sea-surface exposure zones remained within 25 km south-southwest and 8 km south from the release site, respectively (at 99th percentile).

5.26.2.7 MDO In-water Hydrocarbon Exposure - Dissolved Aromatic Hydrocarbon

No dissolved aromatic exposure, above the low dissolved aromatic threshold (576 ppb.hrs), was predicted for the modelled 280 m^3 surface release of MDO over 6 hours.

The potential zone of dissolved aromatic hydrocarbon exposure in the top layer (0 to 10 m) of the water column from a 280 m^3 diesel spill at the Blackback P&A operational area is restricted to the Blackback P&A operational area at moderate exposure (50-400 ppb over 96 hrs).

5.26.2.8 MDO In-water Hydrocarbon Exposure - Entrained Hydrocarbon

Low (≥ 67,200 ppb.hrs), moderate (≥ 676,800 ppb.hrs) and high (≥ 7,718,400 ppb.hrs) exposure is predicted to be restricted to an area immediately around the operational area for this scenario. The

predicted entrained exposure at the NOEC threshold occurred up to 10 km from the Hairtail-1 release site.

Entrained hydrocarbons beyond the 95%-ile NOEC, based on ANZECC criteria (Section 5.26.2.8), may reach into NSW, and also touch the shoreline between Marlo and Mallacoota, as well as the Kent Group Islands and the northern tip of Flinders Island. However, it is unlikely that entrained hydrocarbons are measureable in the water column at these levels with standard laboratory methodology, while impacts on even the most sensitive biota and ecosystems would most likely not be detectable with conventional scientific methods.

5.26.2.9 MDO Shoreline contact

No shoreline contact, above the low shoreline contact threshold (10 g/m^2), was predicted for the modelled 280 m^3 surface release of MDO over 6 hours, except at the ANZECC reference threshold for entrained hydrocarbons.

5.26.3 Impact Assessment

A release of diesel or other hazardous chemicals to the marine environment may result in acute or chronic impacts, or mortality, of marine organisms. A vessel collision event also has the potential to impact on social receptors, resulting from surface; and in water exposure (entrained only).

The potential impacts include direct impacts (potential toxicity effects / physical oiling; potential for reduction in intrinsic values / visual aesthetics) and indirect impacts (potential damage to commercial businesses). Based on the impact thresholds identified in Section 5.26.2, the potential risks are summarised below.

5.26.3.1 MDO Surface Hydrocarbon Exposure

Surface hydrocarbon exposures will only impact those receptors that are exposed to the sea surface. Only those predicted to be exposed to hydrocarbon levels above the threshold value for that receptor (Table 5-8) are evaluated further below. The ecological and social receptors with the potential to be exposed to surface hydrocarbon are evaluated in Table 5-13. There is a 14% probability that surface hydrocarbons will reach the Upwelling East of Eden at low threshold, but not at moderate thresholds (Table 5-12). In addition, whales, seabirds, seals and turtles may be affected by surface hydrocarbon exposure at variable levels.

5.26.3.2 MDO In-water Hydrocarbon Exposure

In-water hydrocarbon exposures (from dissolved and entrained hydrocarbons) will impact those receptors that are exposed to the water column. The ecological and social receptors with the potential to be exposed to in-water hydrocarbons are evaluated in Table 5-13. Only those predicted to be exposed to hydrocarbon levels above the threshold value for that receptor are evaluated further below.

Exposure above the in-water (entrained) NOEC impact threshold (Table 5-11) was predicted to extend up to 10 km around the release site, and is restricted to the surface (0-10 m) layer. The water depth in the area predicted to be exposed above the impact threshold is more than 350 m deep, which generally precludes the more sensitive benthic flora and fauna. No Commonwealth Marine Parks, State marine protected areas, or KEFs were predicted to be exposed to entrained oil above the impact threshold.

Table 5-12 MDO LOC Scenario - Summary of predicted spill impacts

Partition	Blackback* Operational area	Commonwealth waters	Victoria State Waters	Shoreline impact	Biologically Important Areas (BIAs) (APASA 2018a)	Key Ecological Features (KEF) (APASA 2018a)
240 m^3 Diesel Spill	**Distance from release site**				**Probability of hydrocarbon exposure**	
Surface Hydrocarbons	8 km S (high threshold; 99%-ile)	25 km SSW (moderate threshold; 99%-ile)	NC	NC	Probability (at high threshold): whales, sea birds: (43%)	Probability (at low threshold): Upwelling East of Eden: 14% (NE at moderate threshold)
>50% probability of surface oil exposure at low threshold	Immediately around release site only (99%-ile)		-	-		
1-10% probability of surface oil exposure at low threshold	Up to 77 km from release site (99%-ile)		<1%	<1%		
Time to reach outer limit for low sea surface threshold	<6 hours	2-5 days	-	-		
Dissolved Hydrocarbons	No impact predicted		NC	NC	NC	NC
Vertical distribution	0-10 m layer only					
Entrained Hydrocarbons	Low impacts immediately around release site	NOEC & tainting impacts <10 km from release site	At ANZEC reference threshold (7 ppb @ 96 hrs) residual entrained hydrocarbons may reach the Victorian, NSW and Tasmania shoreline, including BIA for whales and seabirds, as well as KEF (including Upwelling East of Eden, Big Horseshoe canyon)			
Vertical distribution	0-10 m layer					
Deterministic modelling (worst case)	Moderate exposure <20 km SE from release site	Low exposure up to 50 km SE from release site	-	-	-	-
Duration of visible sea surface film	<3 days after release	<3 days after release	-	-	-	-
Actionable sea surface oil	< 2 days after release	< 2 days after release	-	-	-	-

*NE=No exposure; NC= No contact; - = not applicable * Data from Modelling of Hairtail-1 MDO LOC scenario assessed to be directly analogous to an equivalent spill at the BLA A-2 location*

Table 5-13 MDO Loss of Containment - Consequence evaluation for Hydrocarbon Exposure

Environment	Type	Exposure Evaluation	Consequence Evaluation
Surface water			
Ecological	Marine turtles	Marine turtles may occur in the area exposed to moderate surface thresholds. However, this area is not identified as critical habitat and there are no spatially defined aggregations, or BIAs for turtles.	Marine turtles are vulnerable to the effects of oil at all life stages. Marine turtles can be exposed to surface oil while swimming through a slick or by ingesting 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 is expected to be low due to the location, and relative short duration in the case of an MDO LOC event. The potential impact would be limited to individuals, with no population impacts anticipated. The potential impacts and risk to marine turtles are Category 4 (low) risk for an MDO LOC.
	Seabirds and shorebirds	Several threatened, migratory and/or listed marine species may occur in the area exposed to moderate surface thresholds. There are foraging BIA's for some species of petrels and albatrosses throughout the area. However, there are no breeding BIAs within this area, as the majority of known breeding habitats are along the coastline and on the islands of Bass Strait.	Individual birds may suffer impacts as a result of a spill, especially nearest to the source of the spill, when toxicity is highest due to the presence of volatile compounds. However, it is unlikely that a large number of birds will be affected. Seabirds that are resting, rafting, diving or feeding at sea have the potential to come into contact with surface sheen and may experience lethal surface thresholds. The area of contact is localised and temporary, especially in the case of an MDO LOC event. Contact with areas of high hydrocarbon exposure is unlikely because of the distance from shore. Acute or chronic toxicity impacts to a small number of birds is possible, especially in the case of an extended blowout event. However, impacts are unlikely to be significant at a population level. The potential impacts and risk to seabirds are Category 4 (low) risk for an MDO LOC
	Seals (Pinnipeds)	Seals are likely to occur within the area exposed to moderate surface thresholds. However, these areas are not identified as critical habitat, and there are no spatially defined aggregations or BIAs for seals)	Exposure to surface oil can result in skin and eye irritations and disruptions to thermal regulation. Fur seals are particularly vulnerable to hypothermia rom oiling of their fur. Since MDO is a light oil, such impact is unlikely. Seal exposure is expected to be low, with impacts restricted to individuals rather than colonies. Due to the rapid

Environment	Type	Exposure Evaluation	Consequence Evaluation
			weathering of MDO, the potential exposure time is limited, especially as a result from an MDO spill. The potential impacts and risks associated with LOC is considered Category 4 (Low) as they could be expected to result in Level III Consequence and very unlikely probability for MDO Spills.
	Whales & Dolphins (Cetaceans)	Several threatened, migratory and/or listed species have the potential to be migrating, resting or foraging within an area exposed to moderate surface thresholds. The Blackback P&A activities are scheduled to commence in the first half of 2019 and may overlap with the Southern Right and Humpback whale migration period in early Winter. The operational area and Operational ZPI overlap foraging/distribution/migration BIAs for Southern right and Pygmy blue whales.	Physical impact by individual whales to MDO exposure 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 area, resulting in a Category 4 (low) risk for an MDO LOC.
Social	Recreation and tourism	Marine pollution can result in impacts to marine-based tourism from reduced visual aesthetic. The modelling predicts no shoreline impact at low level sheen (1 g/m^3), with visible sheen (low impact: <0.50 g/m^2) extending to commonwealth waters only.	Visible sheen has the potential to reduce visual amenity (Section 5.26.2.4). However, because of distance from shore, impact is ranked as Category 4 (low).
	Heritage	No shoreline impact predicted at low level sheen (1 g/m^3), with visible sheen (low impact: <0.50 g/m^2) extending to commonwealth waters only (Section 5.26.2.5), well away from coastal towns or shorelines.	Visible sheen has the potential to reduce the visual amenity of known heritage sites. However, because of distance from shore, impact is ranked as Category 4 (low).
Subsurface			
Ecological	Macroalgae	No dissolved aromatic exposure, above the low dissolved hydrocarbon threshold (576 ppb.hrs), was predicted. The potential zones of entrained exposure at the NOEC (≥ 11,760 ppb.hrs) and tainting (≥ 23,040 ppb.hrs) thresholds may occur within 10 km from the Blackback P&A operational area. Since the operational area is too deep for macroalgae, no impacts on macroalgae from a LOC event are predicted.	Given the lack of dominant macroalgae habitat within the area affected above the NOEC threshold, the potential impacts to macroalgae is considered to be less than a Category 4 (low) risk for an MDO LOC.

Environment	Type	Exposure Evaluation	Consequence Evaluation
	Seagrass	Seagrass may be present in shallower water. They are largely restricted to <35 m, but abundance rapidly declines below 10m depth, especially in high turbulence areas, where light penetration is limited (Cambridge and Kuo 1979). Since the operational area is too deep for seagrasses, no impacts from a LOC event are predicted.	Because much of seagrass biomass is in the rhizomes below the substrate (Zieman *et al*.1984), exposure is more likely to result in sub-lethal impacts, rather than lethal impacts. The potential impacts to seagrass are considered to be less than a Category 4 (low) risk for an MDO LOC and Category 3 (Medium) for an extended blowout.
	Temperate corals, ascidians, bryozoans and sponges	Soft corals may be present on hard substrate, such as intertidal rocky shores or exposed rocky headlands. They may also be found on hard substrate in deeper waters further offshore, including Big Horseshoe Canyon and Beagle Marine Reserve where adequate food is available in the water column, but their presence near the operational area is unlikely due to the lack of hard substrate, and low levels of suspended organic matter in the water column (Butler *et al*.2002). Six sponge beds were reported in Bass Strait, in an arc along the 65-75 m contour near Tasmania. Ascidians and bryozoans occupy a similar habitat (Butler *et al.* 2002). Sponges and ascidians are also found on soft-bottom substrate (see below). However, most barnacle and ascidian species inhabit hard substrates and are generally infrequent in soft bottoms (e.g. Yakovis *et al*. 2005).	Exposure of entrained hydrocarbons to shallow subtidal corals has the potential to result in lethal or sublethal toxic effects (Shigenaka 2001). This may lead to reduced growth rates, tissue decomposition and localised mortality (NOOA, 2001). Because of the depth at the Blackback location, and entrained hydrocarbons restricted to surface waters, impacts on temperate reefs are unlikely. Therefore, the potential impacts to hard substrate communities are considered to be less than a Category 4 (low) risk for an MDO LOC.
	Plankton	Plankton is likely to be exposed to entrained hydrocarbons above the NOEC threshold in an area within 10 km from the operational area. Although surface hydrocarbons are expected to extend to the Upwelling East of Eden, no impacts in-water exposure to any KEFs are predicted for an MDO spill at the NOEC threshold.	Relatively low concentrations of hydrocarbons are toxic to plankton (including zooplankton, fish eggs and larvae) through ingestion, contact and inhalation. Plankton is widespread and abundant, and form the basis for the marine food web. A spill is unlikely to have long-lasting impacts on plankton populations at a regional level. Plankton recovers within weeks to months after water quality has returned to normal (ITOPF 2011) Therefore, the potential impacts to plankton communities are considered to be less than a Category 4 (low) risk for an MDO LOC.

Environment	Type	Exposure Evaluation	Consequence Evaluation
	Soft-bottom invertebrates	Soft bottom communities occur throughout the Operational ZPI, including deep waters around the operational area and much of the Gippsland coastline. As vertical impact resulting from a LOC is largely restricted to the top 20 m of the water column, and no shoreline impact is predicted below the lowest thresholds, direct impact to soft-bottom benthic communities is not expected. Invertebrates include squid, crustaceans (rock lobster and crabs) and molluscs (scallops and abalone), as well as filter feeding benthic invertebrates such as sponges bryozoans abalone and hydroids. Sponges attach to hard bottom using a basal disc or anchoring spicules, or to soft sediment by means of root-like structures. Several soft-bottom invertebrates are target to commercial fisheries, including squid, abalone, rock lobster and crabs.	Acute or chronic exposure through contact and/or digestion can result in toxicological risks. The hard shell of many invertebrates protects them from absorption. Since impacts from a LOC are restricted to the water surface or the top 20 m of the water column, impact from a MDO spill on soft-bottom benthic communities is unlikely. Therefore, the potential impacts to plankton communities is considered to be less than a Category 4 (low) risk for an MDO LOC.
	Fish, sharks, rays	Entrained hydrocarbon droplets can physically affect fish exposed for an extended duration (weeks to months). Effects will be greatest in the upper 10 m of the water column and areas close to the spill source where hydrocarbon levels are highest. Many target fish species are demersal, in deeper waters away from the water surface. Therefore, any impacts are expected to be highly localised. The known distribution and foraging BIA for the Great white shark overlaps the area potentially affected by NOEC entrained thresholds.	Pelagic free-swimming fish and sharks are unlikely to suffer long-term damage from oil spill exposure because dissolved/entrained hydrocarbons in the water column are predicted to be below lethal thresholds, except near the operational area. Although localised tainting may be expected, these effects are reported to be short-term and reversible. Juvenile fish, including larva and zooplankton are more susceptible to hydrocarbons in the water column (see above under "plankton"), although impacts are not expected to cause population levels impacts. Impacts in eggs and larvae are not expected to be significant given the relatively short duration) and the limited extent of the spill. As eggs and larvae are widely distributed in the upper water column it is expected that nearby populations will rapidly drift into affected parts of the water column. Therefore, the potential impacts to fish communities are considered to be less than a Category 4 (low) risk for an MDO LOC.
	Seals	Fur seals may also occur in low numbers within the operational area. Localised areas of the foraging range for New Zealand Fur Seals and Australian fur-seals may	Exposure to low levels of hydrocarbons in the water column or consumption of affected prey may cause sub-lethal impacts. However, given the temporary and localised nature of a spill, the wide distribution

Environment	Type	Exposure Evaluation	Consequence Evaluation
		be temporary exposed to low concentrations of hydrocarbons within an area predicted to be above the NOEC entrained threshold. Low levels of entrained hydrocarbons may be experienced immediately around the operational area, with NOEC thresholds limited to an area <10 km from the spill location for MDO LOC event. No dissolved hydrocarbon exposure is predicted for an MDO spill.	of seals, the low level of exposure zones, except for dissolved hydrocarbons in the upper water column in the case of a blow-out, and rapid loss of o the volatile components following a spill, impacts at a population levels are considered unlikely. The potential impacts to seals are considered to be less than a Category 4 (low) risk for an MDO LOC.
	Whales and dolphins	Several threatened, migratory and/or listed marine species have the potential to be migrating, resting or foraging within an area predicted to be above the NOEC entrained thresholds. Known BIAs are present for foraging Pygmy Blue whale; and distribution for the Southern Right whale. Southern Right Whale and Humpback Whale migration in early Winter may overlap with Blackback field activities. Low levels of entrained hydrocarbons may be experienced immediately around the operational area, with NOEC thresholds limited to an area <10 km from the spill location for MDO LOC event. No dissolved hydrocarbon exposure is predicted for an MDO spill. Cetacean exposure to entrained hydrocarbons can result in physical coating as well as ingestion (Table 5-16). Such impacts are most likely near the release location. The risk of impacts declines further from the spill location due to weathering, and loss of the volatile toxic components.	In the case of an MDO spill, the environmental impact would be limited to a relatively short period following the release and would need to coincide 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 during a single migration event, which could result in temporary and localised consequences. The Blackback P&A activities are scheduled to commence in the first half of 2019 and may overlap with the Southern Right and Humpback whale migration period in early Winter. The potential impacts to seals are considered to be less than a Category 4 (low) risk for an MDO LOC.
Social	Commercial and recreational fisheries	In-water exposure to entrained MDO may result in a reduction in commercially targeted marine species, resulting in impacts to commercial fishing and aquaculture. Actual or potential contamination of seafood can affect commercial and recreational fishing and can impact	Any acute impacts resulting from entrained hydrocarbon exposure above NOEC threshold is 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 around a spill location would be limited to the immediate vicinity of the release point, and due to the rapid weathering of MDO would only be in place 1-2 days after release,

Environment	Type	Exposure Evaluation	Consequence Evaluation
		seafood markets, which can have economic impacts to the industry. Several commercial fisheries may operate in the affected area and overlap the spatial extent of the water column hydrocarbon predictions.	therefore physical displacement to vessels is unlikely to be a significant impact. Tainting occurs at much higher exposure levels, further limiting exposure risk, while fish tainting is largely reversible. Also see above: fish & sharks, and invertebrates. The potential impacts to seals are considered to be less than a Category 4 (low) risk for an MDO LOC.
	Recreation and tourism	Tourism and recreation is also linked to the presence of marine fauna (e.g. whales), to a number of nature areas that are frequented by tourists, and to recreational fishing.	Any impact to receptors that are of interest to nature-based tourism (e.g. whales, recreational fishing, natural parks and reserves) may cause a subsequent negative impact to recreation and tourism activities. The potential impacts to whales, recreational fisheries and impacts to nature are described above and were assessed to be less than a Category 4 (low) risk for an MDO LOC.

5.26.4 Controls

- Overarching procedure is MODU SEMS 5.5.1.5: Vessel Safety Zone and Floating Trespass Procedure which incorporates the following requirements
- **Temporary fairway**: Establishment of temporary fairways and 2 NM buffer zone through AMSA (Section 5.22.2.1)
- **Petroleum Safety Zone**: A 500m Petroleum Safety Zone (PSZ) will be in place around the MODU and support vessels.
- **NavAids**:
    - Extensive navigation aids and communication systems on MODU and support vessels (Section 2.4.11).
    - Installation of further NavAids in response to MODU Safety Case Revision and in dialogue with AMSA/AHS (Section 2.4.11).
- **Standby/guard vessel and AHTs** (Section 2.5) monitor vessel movements near and within the 2 NM buffer zone around the MODU, established as part of the temporary fairways (Section 5.21), and will intervene when an Errant Passing Marine Vessel (commercial/fishing) approaches the 2 NM buffer zone.
- **MODU Procedures:**
    - Station keeping system & SECE 16: Emergency communication systems (SECE 14).
    - Any vessel that enters the 500m PSZ will be required to complete a checklist, before contacting the Ballast Control Operator over the radio and ask for permission to enter the 500m exclusion zone. Once they enter the 500m PSZ the entry is logged.
    - The MODU AIS system will register an unauthorised entry into the 500m PSZ, as will AHT/guard vessel radar, which will intercept any unauthorised vessels breaching PSZ. Any such incidences are logged in MODU log book. A MODU Unidentified Approaching Vessel Plan is in place and made available to all support vessels.
    - MODU Vessel Collision Avoidance Procedure
- **OPEP & ERP**: Project specific Oil Pollution Emergency Plans and Emergency Response Plans (per OIMS System 10-2 Emergency Preparedness and Response) have been developed, in addition to vessel SOPEP requirements under MARPOL.
- **OSMP**: The OSMP details the arrangements and capability in place for operational monitoring (to inform response activities) and scientific monitoring (of environmental impacts of the spill and response activities). Operational monitoring will allow adequate information to be provided to aid decision making to ensure response activities are timely, safe, and appropriate. Scientific monitoring will identify if potential longer-term remediation activities may be required.

5.26.5 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	III	4

5.26.6 Demonstration of ALARP

Adequate procedures and plans (a vessel SOPEP) are in place on the vessel to respond to a spill. Esso also maintains spill response capability for responding in the event of a spill, which is outlined in the OPEP, and considers timeframes to mobilise and stage a response. In accordance with OIMS System 10-2, emergency response procedures are activated when required, which includes bringing the vessel or MODU back into a safe state where possible.

A PSZ of 500m has been gazetted around the Blackback wells to exclude the approach of any vessel not involved in Blackback P&A activities around the MODU. The 500m exclusion zone aims to prevent collision with the MODU while in operation. Although the Blackback P&A operational area is near the

Bass Strait TSS (Section 3.5), extensive safety measures have been put in place to minimise the risk of vessel collisions (Sections 2.3.2, 2.5, 5.22).

Any vessel that enters the 500m PSZ will be required to complete a checklist, before contacting the Ballast Control Operator over the radio and ask for permission to enter the 500m exclusion zone. Once they enter the 500m PSZ the entry is logged.

The MODU AIS system will register an unauthorised entry into the 500m PSZ, as will AHT/guard vessel radar, which will intercept any unauthorised vessels breaching PSZ. Any such incidences are logged in MODU log book. A MODU Unidentified Approaching Vessel Plan is in place and made available to all support vessels.

Further measures include: the establishment of temporary fairways around the Blackback well locations, a 2NM radius buffer zone (Section 5.22.2.1); support from a guard vessel (Section 2.5) and navigational aids (also RA 22 Section 5.22); and the ability for the MODU to disconnect and move when required. Therefore the residual risk of interference with shipping is considered low.

The Blackback P&A OPEP contains information on proposed response actions to a Level 1, 2 or 3 spill event from any of these scenarios.

Esso's OIMS Framework, as described in Section 7.1, establishes expectations for addressing risks inherent in the business and ensuring hazards are safely controlled. OIMS Systems 8-1 (Evaluating, Selecting and Monitoring Third Parties) and 10-2 (Emergency Preparedness and Response) contribute to the control of this risk.

There are no KEF within affected area. Stakeholder (AMSA) concerns regarding RA25 have been addressed through the establishment of temporary fairways (Section 5.22.2.1) and installation of further NavAids. No further evaluation against the principles of ESD is required.

To demonstrate that the impacts and risk associated with this hazard have been reduced to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), other controls and alternatives were considered, including using alternatives to vessels for supply runs (e.g. increased use of helicopters) to eliminate the potential for diesel spills from vessel collisions. This is not considered practicable for the quantities of material that is required to be transported (i.e., diesel, chemicals and equipment, spare operational area equipment etc.).

The control measures described above are considered sufficient to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4).

In the unlikely event of a spill, Esso's well-practised oil spill response systems would be activated (per the OPEP) and the impacts minimised. On this basis Esso considers the risk to be ALARP.

5.26.7 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.27 Accidental Release - Spills during bulk transfer via bunkering hose (RA 27)

5.27.1 Hazard

Oils and chemicals are used as part of the daily operation of the MODU (e.g., cleaning decks, fuelling crane, includes paints and solvents etc.). Oils, including diesel, and chemicals are transferred via crane and stored as either packaged goods, in drums or in intermediate bulk containers (IBCs) or transferred via hose into a tank. Packaged goods are addressed under RA 25 (Dropped Objects) and not further addressed here.

Bulk transfer of cement, brine and diesel fuel from vessel to MODU is conducted using flexible hoses. Accidental release may occur with hose failure. The release of any of these materials, but primarily diesel, into the marine environment can cause changes in the water quality.

5.27.2 Impact Assessment

A spill from a transfer incident is based on the loss of a volume equivalent to the volume in the hose plus the pumped amount before a shutdown is initiated. Due to the small volumes potentially released and dispersion in the high energy environment, the impacts on water quality are expected to be low. Since volumes are substantially less than that modelled for a loss of containment from a support vessel (RA 26), associated impacts are well within the parameters defined for that scenario (RA 26). A loss of 50 m^3 of diesel or chemicals upon release would be expected to result in changes to water quality in both surface waters and the pelagic environment.

As evaluated in Section 6.30 (RA 26), the potential impacts associated with a larger loss of diesel fuel, resulting from a vessel collision, were determined to be a Category 4 risk. Impacts resulting from a spill during bunkering is expected to be less and therefore adequately covered by the impact assessment under RA 24.

Regulation 37 of MARPOL Annex I requires that oil tankers of 150 gross tonnage and above and all ships of 400 gross tonnage and above carry an approved Shipboard Oil Pollution Emergency Plan (SOPEP). Article 3 of the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990, also requires such a plan for certain ships.

Regulation 17 of MARPOL Annex II makes similar stipulations that all ships of 150 gross tonnage and above carrying noxious liquid substances in bulk carry an approved shipboard marine pollution emergency plan for noxious liquid substances.

There are no KEF within the affected area. No stakeholder concerns have been raised on RA25. No further evaluation against the principles of ESD is required.

5.27.3 Controls

- Bulk fluid transfer procedures will be in place before commencing operations ("Fuel Oil and Drilling / Completion Fluid Transfers from Dynamically Positioned Supply Boats Procedure"). The process will include:
    - MODU to vessel communication protocols
    - Transfer hose pressure testing
    - Continuous visual monitoring
    - Tank volume monitoring
- Transfer hoses equipped with sufficient floating devices and self-sealing weak-link couplings in the mid-section of the hose string, in accordance with Guidelines for Offshore Marine Operations G-OMO 0611- 1401
- Bulk fluid transfer hoses will be maintained in accordance with the requirements of the MODU Planned Maintenance System.
- OPEP & ERP: Project specific Oil Pollution Emergency Plans and Emergency Response Plans have been developed (per OIMS System 10-2 Emergency Preparedness and Response), in addition to vessel SOPEP requirements under MARPOL.
- OSMP: The OSMP details the arrangements and capability in place for operational monitoring (to inform response activities) and scientific monitoring (of environmental impacts of the spill and response activities). Operational monitoring will allow adequate information to be provided to aid decision making to ensure response activities are timely, safe, and appropriate. Scientific monitoring will identify if potential longer-term remediation activities may be required.
- OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) premobilisation inspection ensures vessel contractors have a SOPEP in place.

5.27.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.27.5 Demonstration of ALARP

The bunkering procedures, hose maintenance and emergency response plans described above are considered sufficient control measures to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4). The performance of vessel and MODU specific procedures are appropriate for managing the day to day risk of the activity.

Other controls and alternatives were considered, in accordance with Section 4.2 (Demonstration of ALARP). Instead of hose transfer, transfer using bulk containers was considered. This was not considered to provide any significant benefits and would actually increase the safety related level of risk and as such was rejected.

Alternative energy sources were considered instead of using diesel to eliminate the need for diesel bunkering, however powering equipment via solar or wind generation is not considered practical due to limited space on the deck and grossly disproportionate cost to install enough generation and battery storage to enable reliable 24 hr operations. There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.27.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.28 Accidental Release - Foam Deluge System (RA 28)

5.28.1 Hazard

An aqueous film forming foam (AFFF) foam fire-fighting system services the following areas of the MODU:

• Helifuel storage area

• Helifuel pump skid

• Helideck foam deluge system

• Helideck foam firefighting monitors

• Main diesel engine coamings.

AFFFs are water-based firefighting foam products used to suppress flammable liquid fires by cooling the fire and coating the fuel, preventing its contact with oxygen.

AFFFs contain some PFAS (per- and poly-fluoroalkyl substances) – based products (FFFC 2017). PFAS are a class of stable man-made chemical substances containing carbon and fluorine in chemically combined form. These fluorosurfactants are the key ingredient that provide AFFF with the required low surface tension and positive spreading coefficient that enables aqueous film formation, and the foam's effectiveness against Class B flammable liquid fires.

Some PFAS-based products are considered persistent (i.e. do not break down), bioaccumulative and toxic (PBT) are therefore being phased out. In the past PFAS-based products have been used in a range of common household products and specialty applications, including in the manufacture of non-stick cookware; fabric, furniture and carpet stain protection applications; and food packaging (DOD 2017).

Ocean Monarch utilises Fomtec AFFF 3% which;

- does not contain or break down into PFOS (perfluorooctane sulfonate) or homologues of PFOS such as PFHxS (perfluorohexane sulfonate).
- does not contain or break down into any chemicals that are currently listed as persistent organic pollutants (POPs) under the Stockholm Convention.

- is not made with PFOA (perfluorooctanoic acid) or any PFOA-based products.
- is not made with any chemicals that are currently considered to be PBT.

Operation of the foam deluge system occurs either:

- As part of testing of the system. This allows verification of the system functionality, and tests the ability of the system to aspirate a concentrated fire-fighting foam solution and deliver it to the correct dilution and flow rate at the foam application areas. During testing and activation of the foam system AFFF foam may be discharged overboard via the drainage system;
- As demanded during an actual fire event.

5.28.2 Impact Assessment

The AFFF foam selected for use on the MODU is Fomtec AFFF 3% which contains no PFOS or PFOA. It is a C6-based (i.e. short chain flourosurfactant - based) fluorinated foam which has low aquatic toxicity (Environ 2016) and will disperse rapidly in the high energy environment. Consequently in the unlikely event of an unplanned release of foam solution negligible impacts on the marine environment are expected.

There are no KEF within the affected area. No stakeholder concerns have been raised on RA28. No further evaluation against the principles of ESD is required.

5.28.3 Controls

- No testing of the foam fire-fighting system involving release of AFFF to the marine environment.

5.28.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	IV	4

5.28.5 Demonstration of ALARP

To demonstrate that the impacts and risk associated with this hazard have been reduced to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), other controls and alternatives were considered.

The MODU utilises a C6-based fluorinated foam which does not contain PFOS or PFOA. To further minimise the potential environmental impact of a single large release of fire-fighting foam during an incident, its use has been limited to situations which present a significant flammable liquid hazard i.e. the helideck, helifuel storage and main diesel engines. The drill floor is protected by the water deluge system and the well test area by a water monitor. The accommodation, galley, engine room and auxiliary machinery pit, emergency generator room, paint locker and cementing unit are protected by a high pressure water mist system. The use of fluorine free foam is possible but is not considered to provide substantial benefit during the short campaign.

To prevent the potential impacts of smaller releases foam fire-fighting systems may be tested without charging the system with AFFF (seawater only), or using a surrogate foam with similar physicochemical properties. However, this does not provide assurance that the aspiration system used will therefore perform (in terms of concentration delivered and rate of delivery) with the exact foam that would be used in an emergency and such substitution must be approved by the appropriate authority to ensure the adequacy of this testing method. During the P&A campaign there will be no testing of the system which may result in the release of AFFF to the marine environment.

Collection of foam solution from testing, or firewater from an actual event, with subsequent onshore disposal is not considered feasible as:

- This would require edge bunding of every area on the MODU that utilises foam, reducing personnel accessibility to these areas and introducing tripping hazards at stair entrances, compromising escape / evacuation routes.

- Piping would need to be retrospectively fitted to allow collection of the foam from the drain system, in addition to requiring large areas for temporary storage of collected foam on generally space constrained units. This can compromise escape / evacuation routes.
- Additional lifting operations and additional vessel visits would be required, with associated dropped object risks, increased potential for vessel collision and increased consumption of diesel with associated atmospheric emissions.

Testing of the fire fighting system which may result in the release of AFFF to the marine environment will not be undertaken. In case of an emergency, such as a significant flammable fuel fire, safety considerations are the overriding factor. In such a situation the release of firewater directly to the marine environment may be unavoidable, however as the foam is PFOS and PFOA free and a low aquatic toxicity foam Esso considers the risk to be ALARP.

5.28.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.29 Accidental Release - Spills during chemical storage and handling (RA 29)

5.29.1 Hazard

Some hydrocarbons or chemicals in equipment (e.g., coolers, diesel engines and fire pumps, hydraulic equipment) are required to be changed out or topped-up and the excess or replaced fluids disposed. Where possible, these chemicals are collected for onshore disposal (e.g. using waste containers such as IBCs). No offshore chemical disposal is acceptable, unless discharge to sea is approved in accordance with Esso's chemical selection procedure (Section 7.8.1). Examples where these exceptions apply include chemicals that are used in sewage treatment systems (Section 6.5), deck drainage (Section 5.5), bilge water discharges (Section 5.6) and brine discharges (Section 5.11) (planned discharges). Packaged goods are addressed under RA 25 (Dropped Objects) and not further addressed here.

A spill of water-soluble chemicals on the MODU or support vessel to the drain could result in release to the marine environment causing a reduction of water quality or toxic impacts to marine species. A spill of chemicals or oils that overcomes secondary containment may also result in similar impacts to the environment.

5.29.2 Impact Assessment

Spills due to failure of primary containment may be either fully contained within a bund (or other secondary containment) or discharged into the drain system (such as from chemical tanks, chemical store, IBC or topsides equipment). Hydrocarbons spilled to the drain are recovered back, while water-soluble chemicals may be released to the marine environment (RA 5, Section 5.5).

A potential spill to the sea is likely to be of a small to moderate volume, which would disperse and dilute rapidly in the open ocean environment. Any change in water quality would be temporary and is assessed to have a small impact.'

As evaluated in Section 6.30 (RA 26), the potential impacts associated with a larger loss of diesel fuel, resulting from a vessel collision, were determined to be a Category 4 risk. Impacts resulting from a spill during bunkering is covered under RA 27 (Section 6.31). The management of hazardous waste is addressed under RA 4 (Section 5.4). Impacts resulting from a spill during chemical and oils storage and handling is considered adequately covered under these risks.

There are no KEF within the affected area. No stakeholder concerns have been raised on RA27. No further evaluation against the principles of ESD is required.

5.29.3 Controls

- Storage of chemicals in bunds and handling and storage of hazardous waste in accordance with approved rig/vessel waste management procedures
- Project specific Oil Pollution Emergency Plans and Emergency Response Plans have been developed, in addition to vessel SOPEP requirements under MARPOL.
- Bulk fluid transfer procedures will be in place before commencing operations. The process will include:
    - MODU to vessel communication protocols
    - Transfer hose pressure testing
    - Continuous visual monitoring
    - Tank volume monitoring
- OPEP & ERP: Project specific Oil Pollution Emergency Plans and Emergency Response Plans have been developed (per OIMS System 10-2 Emergency Preparedness and Response), in addition to vessel SOPEP requirements under MARPOL.
- OSMP: The OSMP details the arrangements and capability in place for operational monitoring (to inform response activities) and scientific monitoring (of environmental impacts of the spill and response activities). Operational monitoring will allow adequate information to be provided to aid decision making to ensure response activities are timely, safe, and appropriate. Scientific monitoring will identify if potential longer-term remediation activities may be required.
- OIMS System 8-1 (Evaluating, Selecting and Monitoring Third Parties) premobilisation inspection ensures vessel contractors have a SOPEP in place.

5.29.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
D	III	4

5.29.5 Demonstration of ALARP

Project chemical selection, handling and waste management procedures, as well as emergency response procedures, are considered sufficient control measures to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be low (Category 4). The vessel and MODU specific procedures are appropriate for managing the day to day operations.

Other controls and alternatives were considered, in accordance with Section 4.2 (Demonstration of ALARP). Disposal to sea is minimised, and restricted to chemicals which are low toxicity. However, use of chemicals is unavoidable (e.g. cleaning chemicals) in order to maintain a safe environment, free from contaminants. Oily decks represent a slip risk, so that occasional deck cleaning is a requirement.

There were no further controls identified. On this basis Esso considers the risk to be ALARP.

5.29.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.30 Accidental Release - Loss of well integrity (RA 30)

5.30.1 Hazard

During the abandonment operation there is a risk of a loss of well control (LOWC) event, leading to a well blowout. Uncontrolled hydrocarbon fluids released into the marine environment could lead to changes in the water column biochemistry and could impact seabirds, marine mammals and reptiles, fish and other marine organisms through surface fouling, ingestion or inhalation. It could also result in impacts on shoreline and intertidal communities along the mainland or nearby islands.

5.30.2 Modelling Methodology and Thresholds

5.30.2.1 Spill Scenario Identification

The extended duration loss of well control/well blowout from well integrity failure (loss of containment of a Group I (non-persistent) oil at seabed) presented the worst credible discharge scenario (WCDS) and was taken forward to modelling.

The outcome of the Oil Spill Trajectory Modelling (OSTM) for the selected worst case credible spill scenario is presented below. It focuses on defining the likelihood of oil contact (surface, entrained and dissolved) with specific sensitive locations above the lowest threshold and shows the furthest possible extent from the release location that oil could reach, at the lowest threshold, if the spill scenario occurred.

5.30.2.2 Stochastic and Deterministic modelling

See Section 5.26.2.1 and 5.26.2.2 for background on stochastic and deterministic modelling.

The potential for sensitive receptors to be exposed to surface, entrained and dissolved hydrocarbons has been assessed by the application of assessment thresholds. Assessment thresholds for hydrocarbon exposure (sea surface, shoreline, and water column dissolved aromatics and entrained hydrocarbons) are described in Section 5.26.2.4.

The WCDS for the loss of hydrocarbon is a subsea release of oil resulting from a loss of well control (well blowout event). The assumptions for the blowout scenario are summarised in Table 5-14.

Table 5-14 Worst Credible Spill Scenario – Well blow-out (WCDS) assumptions

Parameter	Details
EP Reference	RA 30: Loss of Well Integrity (Section 5.30)
EP Scenario	Loss of well control / well blowout. Loss of well control/well blowout (subsea release) can eventuate from a blowout during abandonment. Release would be from the production tubing.
Product	• Blackback A-2 oil (Group I: Non-persistent) • A density of 777.4 kg/m^3 and a dynamic viscosity of 1 cP @ 25°C, • Gas-Oil Ratio (GOR) of 3000 scf/bbl • 97% volatiles and semi to low volatiles, and 3 % persistent compounds.
Modelled release depth	Subsea release at 403 m water depth (Blackback A-2) was modelled.
Modelled location of release	Blackback A-2: A **subsea** loss of well control/well blowout event at Blackback A-2 (based on **38° 32' 26" S 148° 33' 16" E)** resulting in a subsea release of light crude over 88 days.
Modelled blowout duration – relief well	13 weeks (88 days), based on initial estimates for relief well completion and well kill. (88 days for wet-tow scenario; 70 days for HLV transport; See Section 6.5 for further details). This conservative early estimate was calculated based on the time to mobilise a rig from Australia or South East Asia, drill and intersect the well and complete the well kill activities. Subsequent review indicates that well kill can be achieved more quickly, thereby further reducing the released hydrocarbon volume.
Modelled blowout duration – capping stack	Early estimates of 38 day (6 weeks) release at seabed due to early intervention and installation of a capping stack. This option would result in halving of total release volume, from 28,874 kL to 16,154 kL (181,600 bbls to 101,600 bbls).
Scenario basis	Two scenarios were reviewed: • 88 days release at seabed • 38 day release at seabed due to early intervention and installation of a capping stack. This option would result in halving of total release volume, from 28,874 kL to 16,154 kL

Modelled release volume	• 3 days @ 2,416 kl/d (no water cut) and 85 days @ 254 kl/d (total over 88 days) • Tubing flow: 4-1/2" tubing • No hydrate blockage or choke effects: hydrate formation, however, is highly likely, substantially reducing release rates.
WCDS assumptions	• Based on the ExxonMobil WCDS Process Guide • Blowout through tubing during abandonment • A sea-floor release immediately on removal of the subsea tree cap • Requiring a relief well to be drilled
Modelled reservoir parameters	• Reservoir temperature is 87.4 ^{o}C. • Permeability is approximately 4000mD • Prosper models were used to calculate inflow and outflow performance

5.30.2.3 Defining a Zone of Potential Impact

One objective of the stochastic spill modelling is to establish a Zone of Potential Impact (Operational and Environmental Monitoring ZPIs) that may be exposed to surface or in-water hydrocarbons, resulting from a marine hydrocarbon spill. Delineation of the ZPIs is based on the furthest feasible extent from the release location (lowest exposure zone) of all modelled scenarios where hydrocarbon thresholds, including surface, entrained and dissolved aromatic hydrocarbons could be exceeded.

In the unlikely event of a worst case credible spill event (i.e. subsea well blowout scenario), the Operational ZPI could include sensitive marine environments, although shoreline impact is only predicted below the thresholds defined in Section 5.26.2.4. The Operational ZPI is largely defined by the surface hydrocarbon spread (Table 5-15) and is summarised in Section 3.1.

Only at levels below the adopted 95%-ile NOEC (Table 5-11), entrained hydrocarbons are predicted to extend beyond this Operational ZPI (See Figure 3-2 in Chapter 3). Impacts resulting from these exposures, based on ANZECC reference criteria, would be sub-lethal and minor (e.g. water quality impacts). This area is defined as the Environmental Monitoring ZPI. At this highly conservative threshold, it is unlikely that entrained hydrocarbons are measureable in the water column with standard laboratory methodology, while impacts on even the most sensitive biota and ecosystems would most likely not be detectible with conventional scientific methods.

The potential impacts to offshore (potentially occurring within the Blackback P&A operational area) and nearshore (potentially occurring within the Operational ZPI) environments and the Key Ecological Features (KEF) within the Operational ZPI that may be contacted are summarised in Table 5-17.

The key environmental sensitivities within and immediately outside the Operational ZPI are described in Section 3.3.

Operational and scientific monitoring will utilise hydrocarbon thresholds (as defined in the OSMP Operational Monitoring Modules and Scientific Monitoring Modules) to determine the termination point for operational and scientific monitoring.

5.30.2.4 Blowout scenario - Weathering and fate

The weathering and fates volume balance of the deterministic spill trajectory indicated very little oil would persist on the sea surface as it rapidly evaporated over the 88 days release. Decay steadily increased over 118 day simulation, as the oil entrained in the water column underwent natural biodegradation processes (Figure 5-4).

Visible oil (low 0.5 g/m^2) did not persist on the sea surface beyond 3 days following well intervention (101 days) and actionable oil (moderate 10 g/m^2) was not predicted on the sea surface following successful well intervention (88 days) (APASA 2018b).

Note that review of timing for well intervention indicates that this can be achieved within 70 days when an HLV is used and within 88 days for the wet tow scenario (Section 6.5).

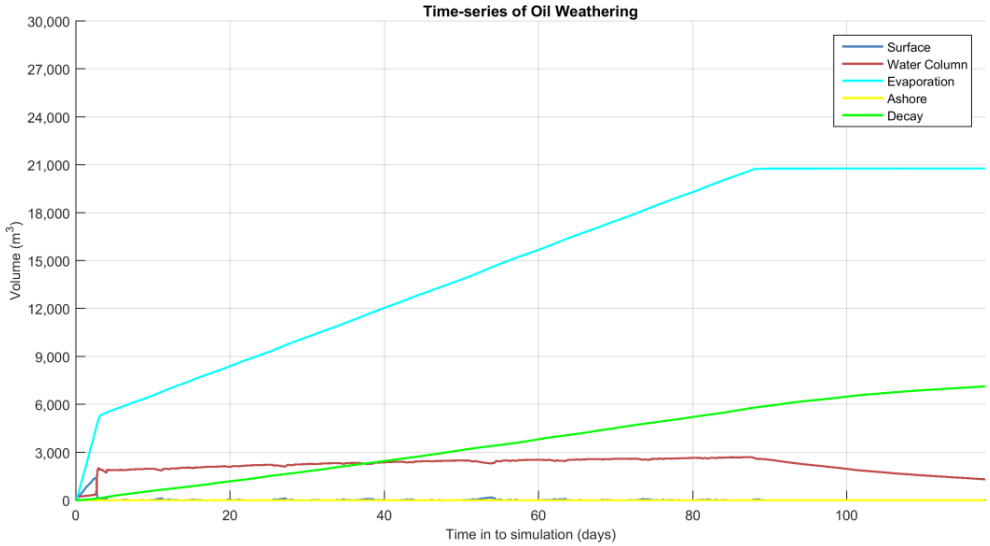


Figure 5-5 **Well Intervention: Predicted weathering and fates volume balance for a single spill trajectory, based on a well blowout (1 am, 31 May. 2012) over 88 days at Blackback (tracked for 118 days) (APASA 2018b)**

5.30.2.5 Blowout scenario - Surface Hydrocarbon

Sea-surface exposure levels stretched a maximum distance of 299 km northeast from the release site at 99th percentile, whilst moderate and high sea-surface exposure zones remained within 26 km northeast and 14 km southeast from the release site, respectively (APASA 2018b).

Modelling results have indicated that sea-surface exposure is not predicted to contact the Victorian coastline or any of the offshore Bass Strait Islands at low (0.5 to 10 g/m^2, used to define the Operational ZPI), moderate (10 to 25 g/m^2) or high (> 25 g/m^2) thresholds.

No surface hydrocarbon exposure is predicted to the upwelling east of Eden, Big Horseshoe Canyon or at Canyons on the Eastern Continental Slope high thresholds and only at 1% probability at upwelling east of Eden at moderate thresholds. Potential surface exposure at low threshold is predicted at the upwelling east of Eden (100% probability; after 20 hrs), Big Horseshoe Canyon (30% probability; after 48 hrs) and Canyons on the Eastern Continental slope (1% probability; after 167 hrs).

5.30.2.6 Blowout scenario In-water Hydrocarbon Exposure - Dissolved Aromatic Hydrocarbon

Low dissolved aromatic exposure (576-4,800 ppb.hrs) in the 0-10 m depth layer was observed up to 75 km from the Blackback A-2 release site while moderate exposure (4,800 -38,400 ppb.hrs) was limited to within 7 km of the release site.

No dissolved aromatic hydrocarbon exposure is predicted to any KEFs at moderate or high thresholds, although one KEFs was predicted to be impacted in the 0-10 m depth layer at low threshold: Upwelling East of Eden (15% at low dissolved thresholds.

Several Biologically Important Areas (BIAs; whales, sharks and foraging sea birds) were predicted to have up to 99% probably of low dissolved aromatic exposure (576-4,800 ppb.hrs) in the 0-10 m depth layer.

5.30.2.7 Blowout scenario In-water Hydrocarbon Exposure - Entrained Hydrocarbon

The predicted entrained low threshold exposure (67,200 ppb.hrs) was minimal and occurred within 3 km of the Blackback A-2 release site, while sub-lethal effects (23,040 ppb.hrs) may extend up to 40 km from the release site.

Figure 3-2 represents the geographical extent of water quality impacts from entrained hydrocarbons beyond the 95%-ile NOEC, based on ANZECC reference criteria (672 ppb.hrs) (Section 5.26.2.8). At this conservative threshold, entrained hydrocarbons may reach as far north as Ulladulla in NSW, westwards past Venus Bay and southwards along the Tasmanian islands and the northern-eastern shores of Tasmania. However, it is unlikely that entrained hydrocarbons are measureable in the water

column at these levels with standard laboratory methodology, while impacts on even the most sensitive biota and ecosystems would most likely not be detectable with conventional scientific methods.

5.30.2.8 Blowout scenario - Shoreline contact

No shoreline contact was predicted for the modelled well blowout at a Blackback A-2. There are also no predicted impacts within state waters of Victoria or Tasmania or New South Wales, except at the ANZECC reference threshold for entrained hydrocarbons.

5.30.3 Impact Assessment

A well blowout was identified as a worst case spill scenario and may result in acute or chronic impacts, or mortality, of marine organisms.

The potential impacts include direct impacts (potential toxicity effects / physical oiling; potential for reduction in intrinsic values / visual aesthetics) and indirect impacts (potential damage to commercial businesses). Based on the impact thresholds identified in Section 5.26.2.4, the potential risks associated with a hydrocarbon spill are summarised below.

5.30.3.1 Potential Impacts to Offshore Open Water Environments and Receptors

As discussed in Chapter 3, a number of EBPC-Act listed species, including marine mammals, seabirds and marine reptiles could be present in an offshore spill affected area. A spill will potentially expose the fauna to surface, entrained or dissolved hydrocarbons, resulting in physical oiling and toxicity effects.

The possible effects of such an event on the offshore environment are further detailed below (Table 5-17). Our understanding of the environmental impacts resulting from a subsea blowout was greatly expanded by scientific studies following the subsea blowout at the Macondo field in the Gulf of Mexico (April 2010).

This event generated a large body of scientific research on the potential impacts from a deepwater hydrocarbon blow-out on marine and coastal ecosystems. However it should be noted that there are several significant differences between the Macondo blowout and Blackback potential spill scenarios, including water depth, oil flow rate and reservoir pressure all of which are considerably less for the Blackback wells. The main difference however, is that Macondo was an oil exploration drilling activity while this Blackback campaign will involve plug & abandonment of former production wells in a field that is greater than 90% water cut.

Table 5-15 Well blow-out Scenario: Summary of predicted spill impacts

Partition	Blackback P&A Operational area	Commonwealth waters	Victoria State Waters	Shoreline impact	Biologically Important Areas (BIAs) (APASA 2018b)	Key Ecological Features (KEF) (APASA 2018b)
Actionable sea surface oil (10mg/m^2)	< 2 days after release	< 2 days after release	-	-		
Blow-out over 88 days	**Distance from release site**				**Probability of hydrocarbon exposure**	
Surface Hydrocarbons	<1 km E (high threshold; 99%-ile)	<3 km E (moderate threshold; 99%-ile)	NC	NC	Probability (at high threshold): whales, sea birds, sharks: 100%	Probability (at low threshold): Upwelling East of Eden: 100% Big Horseshoe Canyon: 30% Canyons on the Eastern Continental Shelf: 1% Probability (at moderate threshold): Upwelling East of Eden: 1%
>50% probability of surface oil exposure at low threshold	<30 km from release site (99%-ile)		-	-		
1-10% probability of surface oil exposure at low threshold	Up to 238 km from release site (99%-ile)		<1%	NC		
Time to reach outer limit for ~~low~~ sea surface threshold	>5 days (high threshold; 99%-ile)	<24 hrs (moderate threshold; 99%-ile)	-	-		
Dissolved Hydrocarbons (0-10m & 10-20m)	Moderate impact immediately around release site	Low impact up to 75 km from release site	NC	NC	Probability (at low threshold): whales, sea birds, sharks: 0-10 m: 99%; 10-20 m: 8%	Probability (at low threshold): Upwelling East of Eden: 0-10m: 15%; 10-20m: 0 (NEx at moderate threshold)
Vertical distribution	0-20 m layer (NEx below 20m)		-	-		
Entrained Hydrocarbons	Low impacts within 3 km from release site	NOEC & tainting impacts <40 km from release site	At ANZECC reference threshold (7 ppb @ 96 hrs) residual entrained hydrocarbons may reach the Victorian, NSW and Tasmania shoreline, including BIA for whales, sharks and seabirds, as well as KEF (including Upwelling East of Eden, Big Horseshoe canyon, Shelf rocky reefs)			
Deterministic modelling (worst case)	Moderate exposure <20km E from release site	Low exposure up to 45 km S from release site	-	-	-	-
Duration of visible sea surface film (0.5g/m^2)	Continues for duration of blowout (up to 86 km^2 around blowout location)		-	-		
Actionable sea surface oil (10g/m^2)	Continues for duration of blowout (approx.. 10 km^2 around blowout location)		-	-		

NEx=No exposure; NC= No contact; - = not applicable

Despite these significant differences, the Deepwater Horizon incident provided a plethora of scientific data, greatly expanding our understanding of the impacts from a deepwater blow-out. Azwell *et al*. (2011) summarised the impacts from the DWH spill:

- The event resulted in a significant volume of entrained hydrocarbons, trapped in the water column. This slowed natural weathering and increased the risk of interaction with marine life.
- Additionally, the spill resulted in widespread emulsification, further slowing down natural degradation. When the emulsion reached the shore, it resulted in damage to root systems, inhibiting the plants' ability to regenerate.
- The National Incident Command's Flow Rate Technical Group estimated that 25% of the oil was skimmed, burned or captured, 24% was either naturally or chemically dispersed, 25% was evaporated or dissolved, and 26% remained in the water, 4 months after the start of the blow-out
- Although widespread use of subsea dispersant injection reduced the volume of oil reaching the surface, it resulted in an increase in dissolved and entrained hydrocarbon, affecting subsurface marine life, while slowing down natural decomposition.
- Burning of surface oil – as a means to reduce the volume of oil reaching the shore - resulted in the release of airborne toxicants. These posed a health threat to clean-up workers.
- The spill resulted in a large volume of waste (80, 276 MT of solid waste and almost a million bbls of liquid waste).

Recent research on the potential impact from a hydrocarbon spill on a range of ecosystems is summarised in Table 5-16.

Table 5-16 Potential Environmental receptors that may be affected by an Oil Spill

Region	Group	Summary of impacts
Offshore marine environment, deep water	Fish	Mass fish mortalities are rare following oil spills, particularly in open ocean waters (Scholtz *et al*. 1992). Due to their high mobility, this is generally attributed to the ability of pelagic fish to avoid surface waters underneath oil spills by swimming into deeper water or away from the affected areas (ITOPF 2011.) Indirect exposure may occur via consumption of contaminated prey. Owing to their ability to metabolise hydrocarbon toxicants, fish exposed to sub lethal dissolved aromatics are likely to recover (NOAA 2002). A condensate or oil release may result in stress in fish in spill affected areas. Modification of habitat due to the effects of hydrocarbon on other marine organisms (such as seagrasses) may adversely affect some fish species (Jewett *et al*. 1999 in Ecos 2001). Turbulent waters can disperse hydrocarbon throughout the water column, thereby exposing fish at depths to contamination or by reducing the amount of dissolved oxygen, which could potentially cause suffocation. Dispersal throughout the water column is highly likely in these scenarios due to high-energy oceanic conditions in Bass Strait. Gagnon and Rawson (2011) studied the effect from the Montara spill on fish. The study concluded that for each species, all individuals were in good physical condition at all sites, suggesting good health status. In the short-term, fish were exposed to, and metabolised petroleum hydrocarbons, however no consistent adverse effects on fish health or on their reproductive activity were detected. Continuing exposure to petroleum hydrocarbons was evidenced by elevated liver detoxification enzymes and PAH biliary metabolites in three out of four species collected close to the rig; in addition, red emperor collected close to the MODU had enlarged livers and elevated oxidative DNA damage. Biomarkers of fish health showed a trend towards a return to reference levels with often, but not always, comparable biomarker levels in fish collected from reference and impacted sites. Burns *et al*. (2011) analysed demersal and pelagic fish species after the Montara oil leak had stopped, although some were collected only a few days after the 'well kill", two months after capping of the leak. It concluded that the fish species would probably have been safe to eat as no detectable petroleum hydrocarbons were found in the fish muscle samples.
	Sharks and Rays	No reported studies of the impacts of oil spills on cartilaginous fish (including sharks, rays and sawfish) were found in the literature. It is not known how the data on the sensitivity of bony fishes would relate to toxicity in cartilaginous fishes. All EPBC listed sharks and rays in the area of interest are viviparous or ovoviviparous and so

Region	Group	Summary of impacts
		do not have a free swimming larval stage. These species are also larger than the bony fish species for which toxicity has been studied. Sharks may be exposed to and ingest hydrocarbons entrained in the water column. Dispersal throughout the water column is highly likely in these scenarios, due to high-energy oceanic conditions of Bass Strait.
	Marine Reptiles	Marine turtles exhibit no avoidance behaviour to oil spills. Physical oiling may lead to irritation of mucous membranes in the nose, throat and eyes leading to inflammation and infection or irritation and injury to skin where oil adheres (Etkins 1997; IPIECA 1995). Inhalation of vapours may lead to lung and other internal damage including neurological impairment (IPIECA 1995). Marine turtles are likely to occur in low densities in spill affected areas. The effects of the Deepwater Horizon (DWH) oil spill on protected marine species, and specifically sea turtles and marine mammals was studied as part of the DWH Natural Resource Damage Assessment (NRDA) (e.g. Wallace *et al* 2017). The research by NOAA scientists on some of the long term effects of the Deepwater Horizon oil spill indicates that populations of several sea turtle species will take decades to rebound, while requiring significant habitat restoration in the region (e.g. Wallace *et al*. 2017; Ylitano *et al*. 2017, Stacy *et* al. 2017, Mitchelmore *et al*. 2017, McDonald *et al.* 2017, Lauritsen *et al.* 2017, Reich *et al.* 2017).
	Seabirds	Seabirds typically exhibit no avoidance behaviour to oil spills and may contact surface slicks when foraging or resting on the water surface. Matting of feathers on heavily oiled birds may lead to hypothermia, starvation due to loss of ability to fly and forage, and drowning due to loss of buoyancy. Oiled birds will directly ingest hydrocarbons when preening or indirectly by consuming contaminated prey. Ingestion and oiling can also lead to internal injury to sensitive membranes and organs (IPIECA 2004; AMSA 2012). Longer term exposure effects that may potentially impact seabird populations include a loss of reproductive success due to loss of breeding adults and malformation of eggs or chicks (AMSA 2012). Watson *et al.* (2009) undertook a rapid survey of the 'megafauna' in the Montara oil spill region. The surveys at sea revealed a high level of diversity and abundance of birds while surveys on land found 35 bird species of which 10 species were in a stage of breeding. Presence of a dead or dying birds was evidence that some species are negatively affected by the oil spill. Although some birds appeared to avoid slicks, a number of bird, cetacean and sea snake species were found in higher numbers in oil affected waters. The study could not confirm the true impact and recommended it be followed up by a long term toxicological study to assess if toxic chemicals are present in the tissue of the animals.
	Marine Mammals - Seals	Oiling of pinniped mammals (seals and sea lions) may destroy the waterproofing and insulating properties of their feathers or fur resulting in hypothermia and affecting balance. The matted oil can also inhibit limb movement making swimming difficult and may also cause skin lesions and eye irritations (NRC 1989, Walraven 1992, Volkman *et al*. 1994; Jenssen 1996). Toxic effects following ingestion of oil from grooming as well as the consumption of food items that have been exposed to oil can include ulceration and bleeding in the gastrointestinal tract, kidney damage and altered reproductive cycles (Volkman *et al*. 1994 in Brady *et al.* 2002). However, internal effects of oil ingestion after the Exxon Valdez oil spill were observed to be not serious and although some pups lost weight, all recovered (Michel *et al*. 1992 in Ecos 2001).
	Marine Mammals - Cetaceans	In the event of an extended duration loss of well control event, there is potential for surface slick and entrained hydrocarbons exceeding threshold concentrations to sweep across the seasonal migratory routes of EPBC Act listed whale species, including Humpback whales, Southern right whales and Blue whales. Marine mammals that have direct physical contact with surface slicks and entrained oil may suffer surface fouling or ingestion of hydrocarbons and inhalation of toxic vapours. This may result in the irritation of sensitive membranes such as the eyes, mouth, digestive and respiratory tracts and organs, impairment of the immune system or neurological damage (IPIECA 1995). Observational evidence indicates in some instances cetaceans may detect and exhibit avoidance behaviour and potentially move away from the spill-affected area (IPIECA, 1995). Previous studies have suggested that cetaceans would be able to detect and avoid oiled waters and, when in contact, oil would not adhere to their slick skin. However, recent studies (Aichinger Dias *et al*. 2017), following the Deepwater Horizon oil spill at the Macondo field (Gulf of Mexico, April – July 2010), confirmed persistence of the oil on their skin of cetacean response to an oil spill, so that direct exposure should be taken into account during response activities.

Region	Group	Summary of impacts
		Other NOOA studies on marine mammal (whales, dolphins) impacts from the DWH event include Takeshita *et al.* 2017, Wilkin *et al.* 2017, Aichinger Dias *et al.* 2017, Smith *et al.* 2017, Kellar *et al.* 2017, Wells *et al.* 2017, Hornsby *et al.* 2017, McDonald *et al.* 2017, Fauquier *et al.* 2017, Rosel *et al.* 2017, Hohn *et al.* 2017, Thomas *et al.* 2017, Schwacke *et al.* 2017, De Guise *et al.* 2017. Given that the Blackback location is not a known breeding, feeding or aggregation area for marine mammals, only low numbers of individuals that are transiting through the area would be potentially impacted. Fin, Humpback, Blue, Southern right and Sei whales are likely to forage in the area during transit. Humpback whales pass along the Gippsland Basin during late Autumn on their annual migratory route to the tropical calving grounds, returning south in Spring. The campaign is scheduled to commence in the first half of 2019 and therefore may overlap with the migration period in early Winter. Southern right whales have a similar migration pattern. On the east coast, southern right whales tend to migrate between Cape Byron and Antarctica, but have been seen as far north as Hervey Bay, Queensland.
	Invertebrates and Plankton	Deep-water benthic invertebrates are usually protected from oiling by the buoyant nature of hydrocarbons, although the depth of oil penetration is dependent on turbulence in the water column. Hydrocarbons can also reach the benthos through the settlement of oiled particles such as faeces, dead plankton or inorganic sand particles (Jewett *et al.,* 1999 in Ecos 2001). Like protected shorelines, intertidal areas are sensitive to heavy oiling and contaminated sediments. Exposure to oil can induce changes in burrowing depth into the substrate (which can lead to higher predation rates on some species) and can limit the growth, recruitment and reproductive capacity of some marine invertebrates (Fukuyama *et al.* 1998 in Ecos 2001). Benthic communities may also be at risk from sinking oil. Both oil and oil dispersants can be toxic to crustaceans, limpets, bivalves and sea stars (Michel *et al.,* 1992; Fukuyama *et al.,* 1998; Jewett *et al*., 1999). Commercial invertebrates, such as lobsters or scallops, may become tainted or suffer from sub-lethal effects. Polychaetes are less susceptible to the negative effects of oil and can show large fluctuations in abundances and species composition over time (Fukyama *et al*. 1998; Jewett *et al.* 1999 in Ecos 2001). Impacts on plankton communities are likely to occur in areas where dissolved or entrained hydrocarbon threshold concentrations are exceeded. Exposure to hydrocarbons in the water column can lead to changes in species composition with declines or increases in one or more species or taxonomic groups (Batten 1998). Exposure can lead to reduced photosynthetic rates in phytoplankton (Tomajka 1985) and suffocation, or behavioural changes or environmental changes that make them more susceptible to predation (Chamberlain, 1999). Due to rapid turnover, planktonic communities recover quickly (within weeks or months) (ITOPF 2011). Further note that plankton concentrations generally are higher in shallow inshore waters, with phytoplankton largely restricted to less than 100m water depth (Section 6.4.2). Felder *et al* 2014 reported that crustacean communities on Gulf Deep Banks (55–80 m deep in the Gulf of Mexico) declined in both abundance and diversity after the Macondo oil spill and exhibited major shifts in species dominance. The study postulated that this decline was due to decreased seaweed abundance having a cascading effect on direct consumers and higher trophic levels.
	Heritage Values and Shipwrecks	There are a number of shipwrecks in proximity to the operational area and Operational ZPI. No impacts are expected on shipwrecks from the worst case credible scenario.
	Commercial Fisheries	In the event of a loss of well containment, fishers may be excluded from the spill affected area for an extended period. Exposure to hydrocarbons can result in tainting (off-flavour) of seafood at very low concentrations (e.g. Davis *et al.* 2002). Tainting may be reversible depending on the magnitude of exposure and type of organism affected. For example, fish have a high capacity to metabolise these hydrocarbons while crustaceans (such as prawns) have a reduced ability (NOAA 2002). Concern for seafood safety can affect the marketability of seafood including long after any actual risk has subsided (NOAA 2002). In the event of a major spill, economic impacts to fisheries can therefore occur due to lost fishing effort from the exclusion zone set up around spill affected areas and impacts to seafood markets.
	Oil and Gas Industry	Worst case hydrocarbon spills imposing exclusion zones and requiring response activities could potentially impact other operators within the Operational ZPI.

Region	Group	Summary of impacts
		Exclusion zones are likely to be imposed for the duration that the hydrocarbon poses a safety risk or may cause additional contamination. Impacts are also possible where surface hydrocarbons can interrupt operations/structures for Esso and other operators within the Operational ZPI (e.g. interference can occur with water intakes).
	Shipping	Shipping traffic is likely to be affected by the imposition of exclusion zones in case of a major spill. The Blackback P&A operational area coincides with intensive shipping activity near the Bass Strait TSS. AMSA has established temporary fairways around the Blackback P&A operational area, and established a 2 NM buffer zone around the Blackback wells, for the duration of the campaign. In addition to this a temporary 500 m PSZ has been established around the wells, in order to deviate vessel traffic away from the Blackback P&A operational area and minimise the risk of shipping collisions.
Nearshore marine environments and shoreline	Fish	Fish spawning including for commercially targeted species occurs in nearshore waters at certain times of the year. The early life stages (eggs, larvae and juveniles) of fish and other commercially-targeted taxa are at their most sensitive to exposure to hydrocarbons and the most sensitive habitats include seagrass beds and mangroves which in particular may serve as nursery areas (ITOPF 2011). A major blowout scenario, coinciding with fish spawning periods, has the potential for lethal effects to fish larvae in affected areas. However, based on the outcome of modelled spill scenarios such impacts to nearshore waters are not predicted.
	Seabirds and Shorebirds	A major blowout scenario has the potential for surface slicks and entrained oil to contact nearshore waters and shoreline habitats such as sandy shores, marshes, mangroves and reef flats that seabirds and resident and non-breeding overwintering shorebirds utilise for foraging and resting. However, based on the outcome of modelled spill scenarios such impacts on seabirds and shorebirds are not predicted in coastal waters. While breeding oceanic seabird species can travel long distances to forage in offshore waters, most breeding seabirds will tend to forage in nearshore waters near their breeding colony resulting in higher seabird densities in nearshore waters and therefore higher sensitivity of these areas during breeding season. Consumption of contaminated fish from nearshore waters or invertebrates from intertidal foraging habitats such as sandy shores, mudflats and reef flats has the potential for lethal or sub lethal effects in seabirds and shorebirds. Ingestion can lead to internal injury to sensitive membranes and organs (IPIECA, 2004; AMSA, 2012). Longer term population effects may occur if there is a decline in reproductive performance and survivorship of chicks and adult birds.
	Crustaceans	Felder *et al*. 2014 reported that crustacean communities on Gulf Deep Banks declined in both abundance and diversity after the Macondo Oil Spill and exhibited major shifts in species dominance.
	Heritage Values and Shipwrecks	There are a number of shipwrecks in proximity to the operational area and Operational ZPI. No impacts are expected on shipwrecks or other areas of heritage value from the worst case credible scenario.
	Nearshore Commercial Fisheries (State)	In the event of a loss of well containment, fishers may be excluded from the spill affected area. Exposure to hydrocarbons can result in tainting (off-flavour) of seafood at very low concentrations. Tainting effects crustaceans (e.g., prawns) more than fish as fish have the ability to metabolise hydrocarbons. Concern for seafood safety can affect the marketability of seafood including long after any actual risk has subsided. Predicted tainting impacts are restricted to an area immediately around the Blackback P&A operational area and are not predicted to affect nearshore commercial fisheries.
	Recreational Fishing	A major impact on survival of pelagic fish populations in open waters of the region may result in sub-lethal impacts on fish. Recreational users unlikely to be impacted if an exclusion zone were to be established around the spill affected areas due to the distance of the Operational ZPI from the shore.
	Tourism	Typically, an oil spill that results in a visible oil slick in coastal waters and reaching shorelines will disrupt recreational activities, particularly tourism and its supporting services. For large scenarios, the tourism sector of the region may experience economic impacts. However, spill modelling indicates that in case of a major blowout scenario from the Blackback P&A operational area, no visible sheen is expected to reach state waters.
	Shipping and Ports	Impacts are expected where surface hydrocarbons can interrupt shipping operations and by the imposition of exclusion zones. No impacts to ports are predicted, based on spill modelling in case of a major blowout scenario from the

Region	Group	Summary of impacts
		Blackback P&A operational area. However, impacts on commercial shipping, as outlined in Section 6.9, are possible in case of a major spill.

5.30.3.2 Blow-out - Surface Hydrocarbon Exposure

Surface hydrocarbon exposures will only impact those receptors that are exposed to the sea surface. The ecological and social receptors with the potential to be exposed to surface hydrocarbon are evaluated in Table 5-16 and Table 5-17. Only those predicted to be exposed to hydrocarbon levels above the threshold value for that receptor (Table 5-8) are evaluated.

Surface hydrocarbons are predicted to extend approximately 1 km from the release site at high thresholds (99%-ile) and approximately 3 km at moderate thresholds. There is >50% probability that the surface hydrocarbons would extend to 30 km from the release site, and <10% probability that it would extend up to 238 km from the release site.

BIAs for whales, seabirds and one shark species falls within the Operational ZPI, with surface hydrocarbons overlapping this BIA at high thresholds (92% probability). Whales, seabirds, seals and turtles may be affected by exposure to surface hydrocarbons, as summarised in Table 5-16 and Table 5-17.

Surface hydrocarbons resulting from a blow-out are expected to overlap three KEFs at low threshold: Upwelling east of Eden (100% probability), Big Horseshoe Canyon (30% probability) and Canyons on the eastern continental slope (1% probability). As Big Horseshoe Canyon and the Canyons on the eastern continental slope are subsurface, surface hydrocarbons are not expected to affect these features. Potential impacts to the Upwelling east of Eden is largely restricted to in-water hydrocarbon exposure (see below).

5.30.3.3 Blow-out - In-water Hydrocarbon Exposure

In-water hydrocarbon exposures (from dissolved and entrained hydrocarbons) resulting from a blow-out will impact those receptors that are exposed to the water column. The ecological and social receptors with the potential to be exposed to in-water hydrocarbons are evaluated in Table 5-16 and Table 5-17. Only those predicted to be exposed to hydrocarbon levels above the threshold value for that receptor (Table 5-11) are evaluated further below.

Exposure above the in-water (entrained) NOEC impact threshold (Table 5-11) was predicted to extend up to 40 km around the release site, and is restricted to the surface (0-20 m) layers. The water depth in the area predicted to be exposed above the impact threshold is more than 200 m deep, which generally precludes the more sensitive benthic flora and fauna. No Commonwealth Marine Parks or State Marine Protected Areas were predicted to be exposed to entrained oil above the impact threshold, although low level ecological and water quality impacts may extend beyond the Operational ZPI (Section 5.30.2.3).

The probability of dissolved hydrocarbons reaching the nearby BIA at low thresholds is 99% for the 0-10 m layer and 8% for 10-20 m water depth (Table 5-15). The potential effects of this hydrocarbon exposure, especially to whales, seabirds and sharks but also seals and turtles is summarised in Table 5-17.

One KEF may be affected by dissolved hydrocarbons resulting from a blow-out (Table 5-15): Upwelling east of Eden (15% probability for 0-10 m; no exposure for the 10-20 m water depth). The potential effects of this hydrocarbon exposure is summarised in Table 5-17. Exposure of the Upwelling East of Eden is expected to mainly affect plankton, with potential indirect impacts on the local food chain, which is localised and of relatively short duration, until successful source control (38 – 88 days; Section 6.5).

Table 5-17 Well blow-out - Consequence evaluation for Hydrocarbon Exposure

Environment	Type	Exposure Evaluation	Consequence Evaluation
Surface water			
Ecological	Marine turtles	There may be marine turtles within the operational area or Operational ZPI. However, this area is not identified as critical habitat and there are no spatially defined aggregations, or BIAs for turtles.	Marine turtles are vulnerable to the effects of oil at all life stages. Marine turtles can be exposed to surface oil while swimming through a slick or by ingesting 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 is expected to be low due to the location, and relative short duration in the case of a blow-out event. The potential impact would be limited to individuals, with no population impacts anticipated. The potential impacts and risk to marine turtles are Category 3 (Medium) for an extended blowout
	Seabirds and shorebirds	Several threatened, migratory and/or listed marine species may occur in the operational area or Operational ZPI. There are foraging BIA's for some species of petrels and albatrosses throughout the area. However, there are no breeding BIAs within this area, as the majority of known breeding habitats are along the coastline and on the islands of Bass Strait.	Individual birds may suffer impacts as a result of a spill, especially nearest to the source of the spill, when toxicity is highest due to the presence of volatile compounds. However, it is unlikely that a large number of birds will be affected. Seabirds that are resting, rafting, diving or feeding at sea have the potential to come into contact with surface sheen and may experience lethal surface thresholds. The area of contact is localised and temporary, especially in the case of a blow-out event. Contact with areas of high hydrocarbon exposure is unlikely because of the distance from shore. Acute or chronic toxicity impacts to a small number of birds is possible, especially in the case of an extended blowout event. However, impacts are unlikely to be significant at a population level. The potential impacts and risk to seabirds is Category 3 (Medium) for an extended blowout
	Seals (Pinnipeds)	Seals are likely to occur within the operational area and Operational ZPI. However, these areas are not identified as critical habitat, and there are no spatially defined aggregations or BIAs for seals.	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. Since Blackback light crude is a light oil such impact is unlikely. Seal exposure is expected to be low, with impacts restricted to individuals rather than colonies. Due to the rapid weathering of light crude, the potential exposure time is limited, especially as a result from a blow-out. The potential impacts to seals are considered to be less than a Category 4 (low) risk for a blow-out
	Whales & Dolphins (Cetaceans)	Several threatened, migratory and/or listed species have the potential to be migrating, resting or foraging within the area predicted to be above the 10 g/m^2 surface threshold, and immediately around the operational area may also be exposed	In the case of a well blow-out, the environmental impact would be limited to a relatively short period following the release and would need to coincide 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.

Environment	Type	Exposure Evaluation	Consequence Evaluation
		to low levels of water column hydrocarbons in the case of a loss of well integrity. Known BIAs are present for foraging Pygmy Blue whale; and distribution for the Southern Right whale. Southern Right Whale and Humpback Whale migration in early Winter may overlap with Blackback field activities.	A proportion of the migrating population of whales could be affected during a single migration event, which could result in temporary and localised consequences. The Blackback P&A activities are scheduled to commence in the first half of 2019 and may overlap with the Southern Right and Humpback whale migration period in early Winter. Physical impact by individual whales to hydrocarbon exposure is unlikely to lead to any long-term impact. Given the mobility of whales, only a small proportion of the migrating population would surface in the affected area, resulting in a Category 3 (Medium) for an extended blowout
Social	Recreation and tourism	Marine pollution can result in impacts to marine-based tourism from reduced visual aesthetic. The modelling predicted no shoreline impact with visible sheen (low impact: <0.30g/m^2) extending to commonwealth waters.	Visible sheen has the potential to reduce visual amenity. However, because of distance from shore, impact is ranked as Category 4 (low)
	Heritage	No shoreline impact. Vertical impact restricted to top 20 m.	Sheen has the potential to reduce the visual amenity of known heritage sites. However, because of distance from shore and limited vertical distribution, impact is ranked as Category 3 (Medium) for an extended blowout
Subsurface			
Ecological	Macroalgae	Macroalgae may be present within reef and hard substrate within the Operational ZPI, but this is not a dominant habitat in Gippsland Basin. Since the Operational ZPI excludes shallow waters along the coastline, and the operational area is too deep for macroalgae. Vertical distribution of hydrocarbons as a result of a spill is largely restricted to the top 20 m therefore significant impacts on macroalgae from a LOC event are unlikely	Given the lack of dominant macroalgae habitat within the Operational ZPI and the operational area, impacts in macroalgae are considered to be limited. Reported toxic responses to oils include physiological changes to enzyme systems, photosynthesis, respiration and nucleic acid synthesis (Lewis & Pryor 2013). Macroalgae respond differently to a spill but appear to be able to recover rapidly (Connell *et al*.1981). The potential impacts to macroalgae are considered to be a Category 3 (Medium) for an extended blowout
	Seagrass	Seagrass may be present in shallower water within the Operational ZPI. However it is not a dominant ecosystem, and is restricted to shallow water, largely due to light attenuation (Duarte 1991). They are largely restricted to <35 m, but abundance rapidly declines below 10m depth, especially in high turbulence areas, where light penetration is limited (Cambridge and Kuo 1979).	Because much of seagrass biomass is in the rhizomes below the substrate (Zieman *et al*. 1984), exposure is more likely to result in sub-lethal impacts, rather than lethal impacts. The potential impacts to seagrass are considered to be less than a Category 3 (Medium) for an extended blowout
	Temperate corals, ascidians, bryozoans and sponges	Soft corals may be present on hard substrate within the Operational ZPI, such as intertidal rocky shores or exposed rocky headlands. They may also be found on hard substrate in deeper waters further offshore, including Big Horseshoe Canyon and Beagle	Exposure of entrained hydrocarbons to shallow subtidal corals has the potential to result in lethal or sublethal toxic effects (Shigenaka 2001). This may lead to reduced growth rates, tissue decomposition and localised mortality (NOOA, 2001).

Environment	Type	Exposure Evaluation	Consequence Evaluation
		Marine Reserve where adequate food is available in the water column, but their presence near the operational area is unlikely due to the lack of hard substrate, and low levels of suspended organic matter in the water column (Butler *et al*. 2002). Six sponge beds were reported in Bass Strait, in an arc along the 65-75 m contour near Tasmania. Ascidians and bryozoans occupy a similar habitat (Butler *et al.* 2002). Sponges and ascidians are also found on soft-bottom substrate (see below). However, most barnacle and ascidian species inhabit hard substrates and are generally infrequent in soft bottoms (e.g. Yakovis *et al.* 2005).	However, given the distribution of hard substrate relative to Operational ZPI and operational area, and the limit of entrained hydrocarbons to top the 20m of the water column, such impacts are considered limited to isolated organisms. The risk of impact resulting from a blow-out to canyons is limited to surface hydrocarbons and is considered to be low; Horseshoe Canyon 30% surface hydrocarbon at low threshold and canyons on the eastern continental slope 1% surface hydrocarbon at low threshold. No dissolved hydrocarbons or entrained hydrocarbon exposure was predicted. Therefore, the potential impacts to hard substrate communities are considered to be less than a Category 3 (Medium) for an extended blowout
	Plankton	Plankton is likely to be exposed to entrained hydrocarbons above the NOEC threshold in an area within 40 km from the operational area. The probability of Upwelling East Of Eden to be affected by surface hydrocarbons at low threshold is 100% for a well blowout. Dissolved hydrocarbons may affect the upper layers of the water column around the Upwelling East of Eden at low threshold (0-10m: 15%; 10-20m: nil). However, no impact from entrained hydrocarbons is predicted.	Relatively low concentrations of hydrocarbons are toxic to plankton (including zooplankton, fish eggs and larvae) through ingestion, contact and inhalation. Plankton is widespread and abundant, and form the basis for the marine food web. A spill is unlikely to have long-lasting impacts on plankton populations at a regional level. Plankton recovers within weeks to months after water quality has returned to normal (ITOPF 2011) Therefore, the potential impacts to plankton communities are considered to be less than a Category 3 (Medium) for an extended blowout
	Soft-bottom invertebrates	Soft bottom communities occur throughout the Operational ZPI, including deeper waters around the operational area and much of the Gippsland coastline. As vertical impact resulting from a LOC or blowout is largely restricted to the top 20 m of the water column, and no shoreline impact is predicted, direct impact to soft-bottom benthic communities is not expected. Invertebrates include squid, crustaceans (rock lobster and crabs) and molluscs (scallops and abalone). Filter feeding benthic invertebrates such as sponges bryozoans, abalone and hydroids may be exposed to sub-lethal impacts. However, population level impact are unlikely. Sponges attach to hard bottom using a basal disc or anchoring spicules, or to soft sediment by means of root-like structures. Several soft-bottom invertebrates are target to commercial fisheries, including squid, abalone, rock lobster and crabs.	Acute or chronic exposure through contact and/or digestion can result in toxicological risks. The hard shell of many invertebrates protects them from absorption. Since no shoreline impact is predicted, and impacts from a LOC are restricted to the water surface and the top 20 m of the water column, impact from a well blow-out on benthic communities are unlikely. Therefore, the potential impacts to soft-bottom invertebrates are considered to be less than a Category 3 (Medium) for an extended blowout
	Fish, sharks, rays	Entrained hydrocarbon droplets can physically affect fish exposed for an extended duration (weeks to months). Effects will be greatest in the upper 10 m of the water column and	Pelagic free-swimming fish and sharks are unlikely to suffer long-term damage from oil spill exposure because dissolved/entrained hydrocarbons in the water column are predicted to be below lethal thresholds, except near the operational area.

Environment	Type	Exposure Evaluation	Consequence Evaluation
		areas close to the spill source where hydrocarbon levels are highest. Many target fish species are demersal, in deeper waters away from the water surface. Therefore, any impacts are expected to be highly localised. There is a known distribution BIA for the Great white shark within the Operational ZPI.	Although localised tainting may be expected, these effects are reported to be short-term and reversible. Juvenile fish, including larva and zooplankton are more susceptible to hydrocarbons in the water column. Although impacts are not expected to cause population levels impacts. Impacts in eggs and larvae are not expected to be significant given the relatively short duration even in the case of a blow-out) and the limited extent of the spill. As eggs and larvae are widely distributed in the upper water column it is expected that nearby populations will rapidly drift into affected parts of the water column. Therefore, the potential impacts to fish communities are considered to be Category 3 (Medium) for an extended blowout
	Seals	Fur seals occur within the Operational ZPI and may also occur in low numbers within the operational area. Localised areas of the foraging range for New Zealand Fur Seals and Australian fur-seals may be temporary exposed to low concentrations of hydrocarbons within an area predicted to be above the 10g/m^2 surface threshold, while an area immediately around the operational area may also be exposed to low levels of water column hydrocarbons in the case of a spill or loss of well integrity. Low thresholds of entrained hydrocarbons may be experienced immediately around the operational area extending to about 3 km from the release. NOEC and tainting thresholds are predicted to be limited to an area <40 km from the spill location for a blow-out event. Low thresholds of dissolved hydrocarbons are predicted to extend up to 75 km from the release site (in the upper 20 m of the water column).	Exposure to low levels of hydrocarbons in the water column or consumption of affected prey may cause sub-lethal impacts. However, given the temporary and localised nature of a spill, the wide distribution of seals, the low level of exposure zones, except for dissolved hydrocarbons in the upper water column in the case of a blow-out, and rapid loss of o the volatile components following a spill, impacts at a population levels are considered unlikely. The potential impacts to seals are considered to be Category 3 (Medium) for an extended blowout
	Whales and dolphins	Several threatened, migratory and/or listed marine species have the potential to be migrating, resting or foraging within an area predicted to be above the surface thresholds. Known BIAs are present for foraging Pygmy Blue whale; and distribution for the Southern Right whale. Low levels of entrained hydrocarbons may be experienced immediately around the operational area, with NOEC thresholds limited to an area <10 km from the spill location for a blow-out event. In the case of a major well blow-out, low thresholds of dissolved hydrocarbons are predicted to extend up to 167 km from the release site (largely in the upper 20 m of the water column), with low thresholds of entrained hydrocarbons	In the case of a blow-out event, the environmental impact would be limited to a relatively short period following the release and would need to coincide 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 during a single migration event, which could result in temporary and localised consequences. The Blackback P&A activities are scheduled to commence in the first half of 2019 and may overlap with the Southern Right and Humpback whale migration period in early Winter. Physical impact to individual whales from hydrocarbon exposure is unlikely to lead to any long-term impacts. Given the mobility of whales, only a small

Environment	Type	Exposure Evaluation	Consequence Evaluation
		extending to about 2 km from the release site and <15 km for NOEC threshold. Cetacean exposure to entrained hydrocarbons can result in physical coating as well as ingestion. Such impacts are most likely near the release location. The risk of impacts declines further from the spill location due to weathering, and loss of the volatile toxic components.	proportion of the migrating population would surface in the affected area, resulting in a Category 3 (Medium) for an extended blowout
	Commercial and recreational fisheries	In-water exposure to entrained hydrocarbons may result in a reduction in commercially targeted marine species, resulting in impacts to commercial fishing and aquaculture. Actual or potential contamination of seafood can affect commercial and recreational fishing and can impact seafood markets, which can have economic impacts to the industry. Several commercial fisheries may operate in the affected area and overlap the spatial extent of the water column hydrocarbon predictions.	Any acute impacts resulting from entrained hydrocarbon exposure above NOEC threshold is 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 around a spill location would be limited to the immediate vicinity of the release point, and due to the rapid weathering of Blackback light crude would only be in place 1-2 days after release, therefore physical displacement to vessels is unlikely to be a significant impact. Tainting occurs at much higher exposure levels, further limiting exposure risk, while fish tainting is largely reversible. Also see above: fish, sharks and rays, and invertebrates. The potential impacts to commercial and recreational fisheries are considered to be less than a Category 3 (Medium) for an extended blowout
	Recreation and tourism	Tourism and recreation is also linked to the presence of marine fauna (e.g. whales), to a number of nature areas that are frequented by tourists, and to recreational fishing.	Any impact to receptors that are of interest to nature-based tourism (e.g. whales, recreational fishing, natural parks and reserves) may cause a subsequent negative impact to recreation and tourism activities. The potential impacts to whales, recreational fisheries and impacts to nature are described above and were assessed to be less than a Category 3 (Medium) for an extended blowout

5.30.4 Controls

An approved WOMP, in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011 will be in place prior to the start of P&A activities. This WOMP demonstrates how the integrity of wells is maintained by ensuring that risks to well integrity are reduced to as low as reasonably practicable. '

Esso's OIMS Framework establishes expectations for addressing risks inherent in the business and ensuring hazards are safely controlled. OIMS Systems 5-1 (Personnel Selection, Training and Competency) and 10-2 (Emergency Preparedness and Response) contribute to the control of this risk.

- Compliance with an approved Well Operations Management Plan (WOMP); this includes:
  - Selection of kill fluid weights to balance the well
  - Pressure and kill brine return monitoring
  - Pressure control equipment specification and validation
  - Cementing and cement test to confirm barrier integrity
  - Presence of two barriers to the reservoir at all times
  - Training and competency of personnel involved with the well
  - Well designed in accordance with ExxonMobil Standards for well control
  - Emergency Response and Well Control Contingency plans
- Compliance with an approved Safety Case; this includes;
    - Well operations reviewed and approved
    - Maintained and operational BOP installed on well head prior to completing the abandonment program
- Well control equipment is maintained and tested per Esso Australia OIMS requirements and MODU Maintenance Procedures (see D-180: Well control readiness checklist; and D-210: Rig inspection report.
- Project specific Oil Pollution Emergency Plans (OPEP), Operational and Scientific Monitoring Plan (OSMP) and Emergency Response Plans (ERP) have been developed (per OIMS System 10-2 Emergency Preparedness and Response), including procedures for oil spill response, the mobilisation of a capping stack and for the drilling of a relief well.

All well control incidents will be managed using Ocean Monarch Well control procedures as outlined in the Ocean Monarch Safety Case, in the BAP WOMP, the Blackback Safety Case Revision and the Ocean Monarch Well Control Bridging Document (Bridging documentation to Esso well control procedures). The MODU response plans for well control will also be applied in the event of a well blowout.

In the event of a blowout occurring, spill response measures will be activated in accordance with the Blackback P&A OPEP, OSMP and WOMP, which includes measures for controlling the well (source control) and managing impacts of the spill.

Personnel involved in the operation of a MODU (including wellbore integrity testing) are required to have specific training and competencies (RCs, Required Competencies) appropriate for that facility.

Abandonment activities are subject to stringent safety measures, including pressure monitoring and testing as part of routine operational activities.

Esso maintains spill response capability for responding in the event of a spill, which is outlined in the OPEP and considers timeframes to mobilise and stage a response. These complement MODU procedures, which form part of the safety case. In accordance with OIMS System 10-2, emergency response procedures are activated when required, which includes bringing the facility back into a safe state where possible.

5.30.5 Risk Ranking

The consequences of a LOWC are High (I), as it may lead to localised, medium term, significant adverse effects. This results from a medium term duration, moderate impact, high intensity, moderate irreplaceability, and of moderate influence. Probability is very highly unlikely (E). However, LOWC is a primary concern for stakeholder as an event could impact their livelihoods and amenities.

Likelihood	Consequence	Risk Ranking
E	I	3

5.30.6 Demonstration of ALARP

Well intervention and abandonment operations are standard offshore activities. The risks associated with a loss of well control are well understood. The consequences of a LOWC are High (I). Consequently, ALARP Decision Context C should be applied.

MODU operation in accordance with an approved Safety Case, abandonment activities in compliance with an approved WOMP and emergency response procedures as described in the OPEP, ERP, WOMP and OSMP, are considered sufficient control measures to reduce the impacts and risks associated with this hazard to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), as the nature of this risk is well understood, the activity is a well-established practice and the residual risk resulting from this activity is considered to be medium (Category 3).

Other controls, such as adding a third level of well control barriers could be implemented, however the subsea tree and BOP stack already has multiple barriers with redundancy specifically designed to reduce the risk to ALARP (refer to WOMP).

The existing controls, the regime for function testing, together with the procedural safeguards during operations, as accepted by the regulatory authorities through the Well Operations Management Plan (WOMP) and the Ocean Monarch Safety Case Revision, incorporate industry best practice for well control. As part of the preparation of the WOMP, emergency intervention procedures have been evaluated by WWC (WWC 2017). This evaluation included means of well intervention, the drilling of a relief well, and the installation of a capping stack. WWC findings are summarised in the WOMP.

In the unlikely event of a spill, Esso's well-practiced oil spill response systems would be activated (per the OPEP and source control procedures; Chapter 6) and the impacts minimised.

KEF within the affected area and risks associated with a potential spill event are identified in Section 4.5.3. No further stakeholder concerns have been raised on RA 30. Adequate controls are in place to manage associated impacts to ALARP (Section 5.30.4). No further evaluation against the principles of ESD is required. On this basis Esso considers the risk to be ALARP.

5.30.7 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 3 medium risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.31 Accidental Release - Mooring failure/Emergency Disconnect (RA 31)

5.31.1 Hazard

In the unlikely event of a mooring failure or emergency disconnect (e.g. during heavy weather conditions) at a time when abandonment activities is occurring, the MODU could drift off its position, requiring the riser to be disconnected from the BOP to maintain well integrity. The emergency disconnect would lead to a loss of containment from the riser which could reduce water quality and potentially cause toxicity to marine species. The BOP is configured with autoshear / deadman functionality which is a safety feature that automatically closes the blind shear rams if all electrical and hydraulic pressure communication between the pod and the receiver manifolds is interrupted.

5.31.2 Impact Assessment

In the event that the riser is disconnected then a release of kill weight fluid would occur. As described in Section 6.19 the kill weight fluid are low toxicity fluids, so that the impacts from such an unplanned release are considered negligible. Furthermore the length of time during which these fluids will be circulating is only approximately 2 hours per well thereby limiting the period during which such a release could potentially occur.

There are no KEF within the potentially affected area. No stakeholder concerns have been raised on RA 31. No further evaluation against the principles of ESD is required.

5.31.3 Controls

- As described by NOPSEMA (2015), the API Recommended Practice 2SK: Design and Analysis of Station keeping Systems for Floating Structures (API RP, 2005) is common industry practice for MODUs operating in Australian waters. Specifically, this recommended practice describes the approach for designing mooring systems.
- ISO 19901-7:2013: Station keeping systems for floating offshore structures and mobile offshore units (ISO 19901-7, 2013) states that mooring line tensions should be measured and recorded during normal operations to ensure that drag is reduced.
- Use and discharge of low toxicity constituents which meet Esso's chemical selection procedure (Section 7.8.1). This Risk Control Practice requires that new chemicals must be approved prior to use. This practice assesses chemicals that have the potential to be discharged to the environment (i.e. not household chemicals) to ensure the lowest toxicity, most biodegradable and least accumulative chemicals are selected which meet the technical requirements of the application.

5.31.4 Risk Ranking

Likelihood	Consequence	Risk Ranking
E	IV	4

5.31.5 Demonstration of ALARP

The ability to maintain position is critical for abandonment activities and hence the highest level of control has been applied. In addition to this, a trained operator must be continuously monitoring the system and prevent a need for emergency disconnect resulting in loss of riser fluids.

The volume of brine that would be released is based on the length of the riser which is determined by the water depth and therefore cannot be reduced. The volume is already limited as the shear rams would prevent additional fluids being released from the well and all drilling systems are shut down before disconnect is activated. On this basis Esso accepts the risk to be ALARP.

5.31.6 Demonstration of Acceptability

For this hazard the residual risk was assessed at Category 4 low risk. As all relevant standards (Esso, Australian Standards and Industry best practice) have been met and there were no valid claims or objections to this risk from relevant persons, Esso considers the impacts and risk are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.32 Impacts resulting from Spill Response Strategies (RA 32)

5.32.1 Hazard

Table 5-18 lists the values and sensitivities within and near the Operational ZPI (Figure 3-1), based upon the modelling outcomes for both spill events described in Section 5.26 (vessel collision) and Section 5.30 (blow-out event) ; to support response planning in the event of a spill. No shoreline contact is predicted, so that no formal protection priorities were identified. However, Esso has sufficient capability to respond to the worst-case shoreline as part its Gippsland Basin operations. The information provided in Table 5-18 would support activation of operational and scientific monitoring programs in the event of a worst-case spill event.

5.32.2 Impact Assessment

The sensitivities within and near the Operational ZPI that may be impacted by spill response activities are summarised in Table 5-18. Associated impacts are as described for planned activities:

Source Control

As described in Section 6.32 and Chapter 6, source control to respond to a LOWC emergency event may include drilling a relief well and deploying a capping stack. The potential impacts and risks associated with performing these activities is covered in Chapter 5, and thus are not considered further.

Monitoring, Evaluation and Surveillance (MES)

Specific risks associated with MES include:

- Localised and temporary fauna behavioural disturbance that significantly affects migration or social behaviours;
- Auditory impairment, Permanent Threshold Shift (PTS).
- Physical interaction with marine fauna.

Oiled Wildlife Response (OWR) Impact Evaluation

Although OWR activities have the potential to generate environmental aspects, the potential impacts and risks associated with physical interaction with marine fauna are evaluated in Section 5.9 (Interaction with fauna). Based upon the nature and scale of the activities, and the low likelihood for OWR, the evaluation is considered appropriate for any physical interaction with marine fauna, and thus has not been considered further in this Section. See OPEP Section 7.2.1 for further details.

5.32.3 Controls

Emergency response planning is outlined in Chapter 6. Well-related source control activities (RA 32) 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 is covered under the aspects evaluated in this EP (Sections 5.1 to 5.29), and thus are not considered further.

Source control arrangements for LOC from vessel failures (RA 26) includes:

- Closing water tight doors;
- Checking bulkheads;
- Determining whether vessel separation will increase spillage;
- Isolating penetrated tanks;
- 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)
- National Plan for Maritime Environmental Emergencies (NationalPlan)

Table 5-18 List of values and sensitivities identified within and near the Operational ZPI

Sensitivity	Distance and direction from Blackback wells	Actionable thresholds (Operational ZPI Figure 3-1)	Environmental Monitoring ZPI* (Figure 3-2)	Values and Sensitivities
Upwelling East of Eden (KEF)	20 km N	Y	Y	• KEF associated with high productivity and aggregations of marine life • Dynamic eddies of the East Australian Current cause episodic productivity events when they interact with the continental shelf and headlands. The episodic mixing and nutrient enrichment events drive phytoplankton blooms that are the basis of productive food chains including zooplankton, copepods, krill and small pelagic fish. • The upwelling supports regionally high primary productivity that supports fisheries and biodiversity, including top order predators, marine mammals and seabirds. • This area is one of two feeding areas for Blue Whales and Humpback Whales, known to arrive when significant krill aggregations form. • The area is also important for seals, cetaceans, sharks and seabirds
Big Horseshoe Canyon (KEF)	100 km NE	Y	Y	• KEF associated with high productivity and aggregations of marine life • The Big Horseshoe Canyon is the easternmost arm of the Bass Canyon System • The steep, rocky slopes provide hard substrate habitat for attached large megafauna. • Sponges and other habitat forming species provide structural refuges for benthic fishes, including the commercially important Pink Ling • It is the only known temperate location of the stalked crinoid *Metacrinus cyanea*
Canyons of the eastern continental slope (KEF)	350 km NE	N	Y	• KEF associated with high productivity and aggregations of marine life • The canyons run along the east coast of southern NSW and have a marked influence on the diversity and abundance of species, driven by the combined effects of steep and rugged topography, ocean currents, sea-floor types and nutrient availability. • This turbulence caused by the interruption of flow along the sea floor transports bottom waters to the surface, creating localised upwellings of cold, nutrient-rich waters, which result in regions of enhanced biological productivity relative to surroundings waters (Prince 2001). The enhanced food availability acts to aggregate marine species, including top order predators and seabirds. • Habitat diversity of the sea floor is increased as hard surfaces occur in depth zones where soft sediment habitats usually prevail. Large benthic animals such as sponges and feather stars are abundant, with particularly high diversity found in the upper slope regions (150–700 m).

Sensitivity	Distance and direction from Blackback wells	Actionable thresholds (Operational ZPI Figure 3-1)	Environmental Monitoring ZPI* (Figure 3-2)	Values and Sensitivities
Seamounts south and east of Tasmania (KEF)	375 km NE	N	Y	• KEF associated with high productivity and aggregations of marine life. • Seamounts can sometimes influence and intensify currents, creating localised upwelling and turbulent mixing.
Batemans Marine Park	400 km NE	N	Y	• Indigenous heritage associated with Yuin Nation • Covers a range of habitats including sponge gardens, beaches, rocky shores, kelp beds, coralline algal banks, rocky reefs, islands, seagrass, mangroves and estuarine.. • Montague Island Nature Reserve is a breeding and nesting place for over 40,000 sea birds including Shearwaters, Little penguins, Crested terns and Silver gulls and is a haul out site for Australian and New Zealand fur seals. • Both Montague Island and the Tollgate Islands are aggregation sites for Grey nurse sharks.
Croajingolong National Park (The Skerries)	175 km NE	N	Y	• Together with Nadgee Nature Reserve (NSW) is a designated UNESCO World Biosphere Reserve • The Skerries, offshore from Wingan Inlet, is a major seal breeding colony with an estimated population of 11,500 representing approximately 12% of the national population. • The near-coastal areas are significant breeding and foraging habitat for the Eastern bristlebird and seabirds such as the Short-tailed shearwater, Crested tern and Gannet.
Beware Reef Marine Sanctuary	100 km NE	N	Y	• Indigenous heritage associated with the Bidwell and Gunai-Kurnai Indigenous people • Maritime heritage including three steamship wrecks (Auckland, Ridge Park and Albert San) • The sanctuary is in Tourism Victoria's Destination Gippsland marketing and promotion for the East Gippsland region • Range of habitats, including subtidal and intertidal reefs, exposed reefs and subtidal soft sediment; with coverage including soft corals, sponges and Bull Kelp • Haul-out area for Australian and New Zealand Fur-seals • Diverse range of fish, invertebrate, mammal and bird species
Point Hicks Marine National Park	110 km NE	N	N	• Indigenous heritage associated with the Bidwell and Gunai-Kurnai Indigenous people • Maritime heritage including two steamship wrecks (Kerangie and Saros) Range of habitats, including subtidal and intertidal reefs, subtidal soft sediment and sandy beaches; with coverage including brown macroalgae, sponges, and soft corals

Sensitivity	Distance and direction from Blackback wells	Actionable thresholds (Operational ZPI Figure 3-1)	Environmental Monitoring ZPI* (Figure 3-2)	Values and Sensitivities
				• Very high diversity of fauna, including intertidal and subtidal invertebrates, marine mammals (whales, dolphins, pinnipeds), birds
Southern right whale Connecting Habitat BIA	100 km SW	N	Y	• Biologically important areas, including calving and aggregation areas, within the South-east Marine Region have been identified • Southern right whales regularly aggregate for breeding and calving off Warrnambool, Victoria, with calving areas tending to be very close to the shore
Humpback Whale BIA	200 Km NE	N	Y	• Humpback feeding has been observed close to shore off Eden, New South Wales, from late September until late November (SPRAT 2013a).
Pygmy blue whale BIA	Overlaps	Y	Y	• The South-east Marine Region is an important migratory area for the pygmy blue whale and also provides one of the most significant feeding aggregation areas for blue whales in Australian waters. • The Bonney Upwelling and adjacent waters off South Australia and Victoria are the most important feeding areas. (November to May). • Pygmy blue whales predominately occupy the western area of the Bonney Upwelling from November to December, and then expand south-east during January to April,
Beagle AMP	160 km WSW	N	Y	• Multiple Use Zone, IUCN Category VI • Beagle AMP is a shallow reserve that surrounds a collection of Bass Strait islands. • Support a rich array of life, • Provides homes and feeding grounds for seabirds, little penguins and Australian fur seals. • Located near the Hunter group of islands which is an important breeding area for the fairy prion, shy albatross, silver gull, short tailed shearwater, black faced cormorant, Australian gannet, common diving petrel and little penguins.
Great White Shark Breeding BIA	100 km E	N	Y	• The nearshore region from Corner Inlet to Lakes Entrance is one of three identified residency regions in Australia for juvenile Great White Sharks • Sharks will aggregate in this area seasonally
East Gippsland AMP	150 km E	Y	Y	• Multiple Use Zone, IUCN Category VI • Ecosystems, habitats and communities associated with the Southeast Transition, and associated with the sea-floor features including abyssal plain/deep ocean floor, canyon, escarpment and knoll/abyssal hillslope • Features with high biodiversity and productivity: Bass Cascade; Upwelling East of Eden

Sensitivity	Distance and direction from Blackback wells	Actionable thresholds (Operational ZPI Figure 3-1)	Environmental Monitoring ZPI* (Figure 3-2)	Values and Sensitivities
				• Important foraging area for the Wandering, Black-browed, Yellownosed and Shy Albatrosses, Great-winged and Cape Petrels, and the Wedge-tailed Shearwater • Important migration area for the Humpback Whale
Flinders AMP	210 km SSE	Y	Y	• Marine National Park Zone, IUCN Category II • Features with high biodiversity: sheer rocky walls, large rocky outcrops and expanses of sandy and muddy sediments • Important habitat to the White Fronted Tern, Australian Gannet, Black Faced Cormorant, Common Diving Petrel, Fairy Prion, Little Penguin, Shy Albatross, Silver gull, Crested tern, Short Tailed Shearwater, and White Faced Storm Petrel
Freycinet AMP	370 km S	N	Y	• Marine National Park Zone, IUCN Category II • Features with high biodiversity: large offshore saddle inlcuding large offhsore • Important migration area for humpback and southern right whales • Important foraging area for Wandering, Black-browed and Shy Albatros, Cape Petrel and Fairy Prion, Sei Whales and Killer Whales
Gabo Island	200 km NE	N	Y	• Significant breeding colony (possibly largest in world) for the Little Penguin • Breeding colony for Short-tailed Shearwaters • Foraging area for a number of birds including the White-belled Sea Eagle • Marine mammals regularly sighted off Gabo Island, including Southern Right Whales, Humpback Whales and Killer Whales; and the Common and Bottlenose Dolphins • Australian and New Zealand Fur-Seals are also often seen basking on the rocks surrounding the island
Cape Howe Marine National Park	210 km NE	N	Y	• Indigenous heritage associated with the Bidwell Indigenous people • The sanctuary is in Tourism Victoria's Destination Gippsland marketing and promotion for the East Gippsland region • Range of habitats, including subtidal and intertidal reefs, subtidal soft sediment and sandy beaches; with coverage including kelp forests, sponges, and soft corals • Foraging area for significant colony of Little Penguins • Humpback Whales pass by Cape Howe on their migration from Antarctica • Diverse range of invertebrates, mammals (whales, dolphins, pinnipeds) and birds

Sensitivity	Distance and direction from Blackback wells	Actionable thresholds (Operational ZPI Figure 3-1)	Environmental Monitoring ZPI* (Figure 3-2)	Values and Sensitivities
Ninety Mile Beach Marine National Park	125 km WNW	N	Y	• Subtidal sandy expanses exhibit particularly high species diversity including tube building worms, small molluscs and many tiny crustaceans. • Many pelagic fish species feed on the benthos, and young Great white sharks have also been observed feeding in the area.
Wilsons Promontory Marine and Marine National parks	200 km WSW	N	Y	• Located at the southern tip of Wilsons Promontory. • Largest Marine Protected Area in Victoria • The offshore islands support many colonies of fur seals and oceanic birds such as Little penguins, Fairy prions, Silver gulls and Pacific gulls.
Corner Inlet and Nooramunga Marine & Coastal parks	190 km WSW	N	Y	• A diverse range of habitats including large stands of white mangrove and saltmarsh areas. • Extensive areas of intertidal mud and sand flats which provide food for thousands of migratory wading birds each year. • The largest concentrations of Bar tailed godwit and Great knot in south eastern Australia. • Beaches and sand spits provide nesting sites for shorebirds such as the Pied oyster catcher, Crested tern, Caspian tern, Fairy tern, Hooded plover and Little tern. • Recognised as wetlands of international importance under the Ramsar convention.
Corner Inlet Marine National Park	190 km WSW	N	Y	• Protects large areas of seagrass including the only extensive Posidonia australis meadow in southern Australia. • Important habitat for international migratory birds such as the Eastern curlew. • Area included as part of the Corner Inlet Ramsar Site.
Bunurong Marine & Coastal Park, Marine National Park	250 km WSW	N	Y	• Protect a remarkable range of habitats including intertidal reefs, subtidal rocky reefs, algal gardens and seagrass beds. • Coastal waters share the cool waters of Victoria's central and western coasts but are relatively protected from the oceanic south-westerly swell by the position of distant King Island. The unusual set of environmental conditions result in special set of marine life. • Intertidal sandstone reefs boast the highest recorded diversity of intertidal and subtidal invertebrates in eastern Victoria.

Sensitivity	Distance and direction from Blackback wells	Actionable thresholds (Operational ZPI Figure 3-1)	Environmental Monitoring ZPI* (Figure 3-2)	Values and Sensitivities
Shallow Inlet Marine & Coastal Park	250 km WSW	N	Y	• Significant area for breeding shorebirds. • Many migratory wading birds including pied oystercatcher and Red-capped plovers nest in the dunes and on the spit. • Extensive seagrass meadows.
Seabirds BIAs	Some foraging BIAs overlap	Y	Y	• No islands are located within the Operational ZPI, however islands within the Environmental Monitoring ZPI are nesting sites for many seabird species, many of which migrate to these islands each year. • Colonies of seabirds occur to the west of the operational area in Corner Inlet and on the islands around Wilsons Promontory, to the east at The Skerries, Tullaberga Island and Gabo Island and to the south on Curtis Island and the Hogan Island Group (Harris & Norman 1981).

* The Environmental Monitoring ZPI is and is based on the ANZECC Reference Criteria for entrained hydrocarbons (Section 5.26.2.4).

The controls that relate to response strategies are summarised in Table 5-19 and include:

- Esso maintains capability to implement operational monitoring in a Level 2 or 3 spill event.
    - Agreements: AMOSC membership, AMSA MoU, Aviation support, Marine support services
    - Oil Spill Tracking Buoys
- As requested by the relevant CA, Esso implements operational monitoring to inform spill response (Level 2 or 3 spill only). Key tools include:
    - Oil Spill Tracking Buoy Deployment
    - Response - Observation
    - Oil Spill Trajectory Modelling
    - Response – Oil Spill Vector Calculation
- Esso maintains capability to implement its Blackback Blowout Contingency Plan (part of WOMP). For this, it has access to Well Response Resources (Well Control Specialists, including capping stack capability); ROV Contractors; Subsea Engineering Company; Well Engineering Contractor; APPEA Mutual Assistance Agreement, SFRT agreements with AMOSC.
- Implement Blackback Blowout Contingency Plan:
    - Level 2 Response:
        - Inspection class ROV
        - SFRT
    - Level 3 Response:
        - Well control specialists
        - Capping stack installation
        - Relief Well
- Esso maintains capability to support oiled wildlife management in a Level 2 or 3 spill event.

Esso provides resources to support oiled wildlife response strategies as directed by DELWP.

5.32.4 Risk Ranking

The risks evaluation for emergency response tools are outlined in Chapter 6. The environmental risks associated with emergency response are largely addressed under the risks for planned operations.

- Table 6-2: Response technique evaluation for MDO Spill
  Risks are as per project activities: Noise, Vessel collisions, Spills etc. (as described in Chapter 6)
- Table 6-3: Response technique evaluation for Loss of Well Control
- Table 7-20: Response technique evaluation for Source Control

  Risks are as per planned activities (drilling fluid discharge, cement discharge, bunkering, noise / light, etc.) – no additional controls

5.32.5 Demonstration of ALARP

To demonstrate that the impacts and risk associated with response strategies have been reduced to ALARP, in accordance with Section 4.2 (Demonstration of ALARP), other controls and alternatives were considered as summarised in Chapter 7.

Modelling shows that shoreline contact is not expected to occur after a spill, either resulting from a major collision or from a well blowout event (Section 5.26.3 and 5.30.3). Therefore no specific shore-based contingencies will be in place for the Blackback P&A campaign, other than those already in place as part of Esso operations in Bass Strait.

There were no further alternatives identified to the response strategies as they are defined in Section 6 and the OPEP. On this basis Esso considers the risk to be ALARP.

5.32.6 Demonstration of Acceptability

Details of Esso's capability to mount a suitable spill response is included in Chapter 6, the OPEP (Appendix D) and OSMP.

The response strategies, as detailed in Chapter 6, are consistent with standard industry practice. This includes:

- Having a well-resourced response team, equipment, resources and logistics for industry to consult with relevant authorities on spill plans in line with the "Polluter pays" principle in the OPGGS Act and 'consultation' principles in the OPGGS(E) Regulations.
- Isolating the spill source by means of transfer, shut-in, dynamic kill, drilling a relief well.
- Establishing exclusion zones (which are commonly established for any emergency operations).
- Developed procedures as part of the WOMP for the mobilisation of a second MODU in case the drilling of a relief well is required.
- Simultaneously, establish procedures as part of the WOMP for the mobilisation of a capping stack in order to further minimise the environmental impact from a potential well blow-out.

Esso considers the impacts and risks of response strategies are acceptable in accordance with the criteria defined in Section 4.3 (Demonstration of Acceptability).

5.33 Environmental Performance Outcomes, Performance Standards and Measurement Criteria

This section outlines:

- The environmental performance outcomes against which the performance in protecting the environment can be measured and set the overall goals for the project.
- The performance standards that are applied to ensure control measures are operational at a level of performance which will manage the identified environmental impacts and risks of the activity to ALARP and acceptable levels.
- The measurement criteria that will define how environmental performance is measured against performance outcomes and performance standards.

The list of performance outcomes, performance standards and measurement criteria that have been developed for Esso's Blackback P&A campaign are tabled under each risk element in the following sections. The responsibility for each performance standard has been assigned and accepted by the person in the designated role.

Note each line item numbered refers to the environmental "RA" Number for each item listed in Chapter 5.

Every control listed in Chapter 5 is listed with the corresponding Environmental Performance Outcomes (EPO), Environmental Performance Standards (EPS) and Measurement Criteria.

Table 5-19 Environmental performance outcomes, standards and measurement criteria

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
Routine Offshore Activities							
1	Sewage discharge from MODU/vessels	Impact from sewage disposal to the marine environment.	Sewage discharges comply with Marine Order 96 (Marine pollution prevention – sewage) 2018 (MARPOL Annex IV requirements.)	MARPOL-compliant Sewage Treatment Plant	A MARPOL-approved sewage system will be fitted to the MODU and support vessels	Valid International Sewage Pollution Prevention certificate.	MODU OIM/Vessel Master
				MARPOL sewage discharge conditions	Discharge of comminuted and disinfected sewage using a MARPOL-compliant sewage treatment plant at a distance of no less than 3NM from nearest land. Discharge of untreated sewage at a distance of no less than 12 NM from nearest land.	Daily report to confirm treated or untreated sewage discharged no less than 3NM or 12NM distant from nearest land, respectively.	MODU OIM/Vessel Master
				Diamond MODU and vessel Planned Maintenance System (PMS)	Sewage treatment plants are maintained in accordance with the corrective and preventative maintenance program.	MODU inspection records confirm the on-board Sewage Treatment Plant is maintained as per equipment maintenance schedules	MODU OIM
2	Seawater intakes	Injury to marine mammals at water intakes	No injury to marine mammals at water intakes	Seawater intakes are designed to minimise the risk of entrapment of marine fauna	• All seawater intakes on MODU and support vessels are designed so that the risk of entrapment of marine fauna is minimised.	• Pre-mobilisation inspection confirms that MODU/vessel seawater intakes have been fitted with grates or other measures to minimise the risk of entrapment of marine mammals.	Contract Administrator
				Diamond MODU and vessel Planned Maintenance System	• The PMS confirms record of maintenance of seawater intakes.	• PMS records confirm that vessel & MODU contractors have met their environmental performance requirements and deficiencies have been corrected in relation to seawater intakes.	MODU OIM

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
3	Food discharge from MODU/vessels	Impact from food disposal to the marine environment.	Putrescible waste discharge complies with Marine Order 95 (Marine pollution prevention – garbage) 2018 (MARPOL Annex V requirements.)	Food waste macerated	Discharge of food waste shall be controlled by macerating galley waste to ≤25 mm (using an onboard food macerator) before discharge	Garbage Record Book shows that putrescible waste is macerated before discharge	MODU OIM/Vessel Master
				Food waste discharges	Macerated putrescible waste is only discharged overboard when the vessel is greater than 3 NM from the coastline and while proceeding en-route. Un-macerated putrescible waste is only discharged overboard when the vessel is more than 12 NM from the coastline and while proceeding en-route.	Discharge log verifies location of vessel is >3 NM from the coast (if waste is macerated) of >12 NM at time of discharge (if waste is not macerated).	MODU OIM/Vessel Master
						All crew are aware of the garbage management arrangements through the information provided in the induction	
				Diamond MODU and vessel Planned Maintenance System	Macerators are maintained in accordance with the corrective and preventative maintenance program.	MODU inspection records confirm the on-board macerator is maintained and operational as per equipment maintenance schedules	MODU OIM/Vessel Master
4	Disposal of solid/general waste from MODU/vessels	Accidental release of solid general / hazardous waste to marine environment from MODU/vessels.	No discharge of solid general or hazardous waste to the marine environment from MODU/vessels.	Garbage / waste management plan	A Garbage Management Plan will be in place and implemented by the MODU and support vessels	Review of the Garbage Management Plan confirms it is in place and maintained	MODU (OIM)/Vessel Master
				Garbage record book	A garbage record book /log will be in place and maintained for the MODU and support vessels	Review of the garbage record book confirms it is in place and maintained	
				Waste management training / induction	All MODU crew undertake site inductions, which include a component on storing and handling hazardous materials and wastes	Presentation and attendance sheets verify that MODU personnel attended the induction	
				Waste Handling and Disposal	Handling of solid and hazardous wastes on-board the MODU and support vessels will comply with the requirements of Protection of the Seas (Prevention of Pollution from Ships) Act 1983, Marine Order – Part	Garbage Record Book verifies relevant garbage transferred to shore for treatment/ disposal.	
						Visual inspection verifies that waste is stored and handled	

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					95 – Garbage. This may include measures such as: • No discharge of general wastes or plastics to the marine environment. • Waste containers covered with lids to prevent any solid wastes from blowing overboard. • All solid, liquid and hazardous wastes (other than bilge water, sewage and food wastes) are incinerated or compacted (if possible) and stored in designated areas before being sent ashore for recycling, disposal or treatment. • Any liquid waste storage on deck must have at least one barrier (i.e. bunding) to prevent deck spills entering the marine environment. This can include primary bunding and/or secondary containment measures. • Containment pallets, absorbent pad barriers in place and storage at designated waste location onboard vessel or MODU. • Correct segregation of solid and hazardous wastes. containment pallet, transport	according to its waste classification. Waste receptacles are properly located, sized, labelled, covered and secured for the waste they hold.	
5	MODU/Vessel deck drainage	Impact on marine ecosystems.	Discharge of contaminated deck drainage to marine environment is in accordance with MARPOL Annex I (Regulations for the Prevention of Pollution by Oil) requirements.	Separation of uncontaminated and contaminated open drain system	Non-hazardous water from the decks (e.g. stormwater) passes through a scupper system directly to the sea by way of piping chutes or dumps. Drainage from separate higher risk collection areas is led directly to the skimmer tank and automatic Oily Water Separator (OWS).	Oil record book verifies deck drainage systems discharges were compliant with these requirements	MODU OIM/Vessel Master
				MARPOL Compliant Oily Water Separation (OWS)	For vessels > 400 tonnes, bilge water passes through a MARPOL approved	OWS International Oil Pollution Prevention (IOPP) certificate or equivalent	MODU OIM/Vessel

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
				Equipment	Oily Water Separator (OWS).	documentation appropriate to vessel class.	Master
				Comply with MARPOL Annex I bilge discharge requirements.	For vessels > 400 tonnes, discharge of contaminated deck drainage occurs if: • Treatment is via a MARPOL compliant oily water separator; • The OIW content is less than 15 ppm; • Oil Detection Monitoring Equipment (ODME) and control equipment are operating. For vessels < 400 tonnes treated bilge is discharged if: • Vessel is proceeding en-route; • Approved treatment equipment ensures oil content less than 15 ppm. • If the above is not met the oil residue must be retained in on-board storage tanks for onshore disposal or further treatment.	Pre-mobilisation inspection confirms that oily water discharges comply with MARPOL Annex I bilge discharge requirements.	Vessel Contract Administrator
						Oil record book verifies bilge discharges were compliant with these requirements	MODU OIM/Vessel Master
				Oil-in water separators (OWS) System Reliability	OWS and Oil Detection Monitoring System (ODME) (appropriate to vessel size) are routinely maintained and system elements calibrated to ensure reliable discharge concentrations are being met.	Planned Maintenance System (PMS) records confirm OWS and ODME are routinely calibrated and maintained	MODU OIM/Vessel Master
				Onshore disposal of residual oil	The residual oil from the OWS is pumped to tote tanks and disposed of onshore.	The Oil Record Book verifies that bulk oil is transferred to shore.	MODU OIM/Vessel Master
6	MODU/Vessel oily water (bilge) discharge	Impact on marine ecosystems	Bilge discharges from vessels and MODU comply with Marine Order 91 (Marine pollution prevention – Oils) 2018 (MARPOL Annex I) bilge	Oily-water Separation (OWS) Equipment	For vessels > 400 tonnes, bilge water passes through a MARPOL approved Oily Water Separator (OWS).	OWS International Oil Pollution Prevention (IOPP) certificate or equivalent documentation appropriate to vessel class.	MODU OIM/Vessel Master
				Comply with MARPOL Annex I bilge discharge requirements.	For vessels > 400 tonnes, treated bilge water discharge occurs if:	Pre-mobilisation inspection confirms that an OIW Separator is in place, that an	Vessel Contract Administrator

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
			discharge requirements.		• Treatment is via a MARPOL compliant oily water separator; • The OIW content is less than 15 ppm; • Oil Detection Monitoring Equipment (ODME) and control equipment are operating. For vessels < 400 tonnes treated bilge is discharged if: • Vessel is proceeding en-route; • Approved treatment equipment ensures oil content less than 15 ppm. • If the above is not met the oil residue must be retained in on-board storage tanks for onshore disposal or further treatment.	ODME is operational, and certification demonstrates compliance with MARPOL Annex I for bilge discharge requirements.	
						Vessel/MODU oil record book shows all discharges met <15ppm oil in water requirements	MODU OIM/Vessel Master
				Oil-in water separators (OWS) System Reliability	OWS and Oil Detection Monitoring System (ODME) (appropriate to vessel size) are routinely maintained and system elements calibrated to ensure reliable discharge concentrations are being met.	Planned Maintenance System (PMS) records confirm OWS and ODME are routinely calibrated and maintained	MODU OIM/Vessel Master
				Onshore disposal of residual oil	The residual oil from the OWS is pumped to tote tanks and disposed of onshore.	The Oil Record Book verifies that bulk oil is transferred to shore.	MODU OIM/Vessel Master
7	Ballast water discharge	Unplanned introduction and transmission of invasive species.	No introduction of non-endemic marine species through ballast water.	Maritime Arrivals Reporting System (MARS)	DAWR clearance is obtained to enter Australian waters through pre-arrival information reported through MARS	Records confirm pre-arrival report submitted to DAWR	MODU OIM/Vessel Master
				Ballast Water Management Plan (BWMP) and Certificate (BWMC)	Ballast Water Management Plan approved in accordance with IMO Ballast Water Management Convention - Guidelines for Ballast Water Management and Development of Ballast Water Management Plans including • vessel name and IMO number • rank(s) of the responsible officer and crew	Vessel holds an approved BWMP and BWMC	MODU OIM/Vessel Master

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					• ballast water management method and pumping rates Ballast Water Management Certificate approved in accordance with Regulation E-1 of the Ballast Water Convention including • vessel name and IMO number • principal ballast water method(s) used end date up to five years from time of inspection		
				Exchange of MODU and support ballast water outside Australian waters	Ballast water exchange in accordance with the requirements of the Australian Ballast Water Management Requirements (2017) before entry into Commonwealth waters	Reports of ballast water discharges and the ballast water record system demonstrate that the Australian Ballast Water Management Requirements were met	MODU OIM/Vessel Master
				Only discharge low-risk domestic ballast water into Victorian state waters	Vessels only discharge low-risk domestic ballast water into Victorian state waters (on entry to a Victorian port and throughout the survey) in accordance with: • The Victorian Environment Protection (Ships Ballast Water) Regulations 2017 (EPA 2017a). • EPA Protocol for Environmental Management: Domestic Ballast Water Management in Victorian Waters (Publication 949.7, EPA 2017b).	Records confirm that only discharge low-risk domestic ballast water into Victorian state waters	Vessel Master
					DAWR ballast water risk assessment undertaken ("Australian Ballast Water Management Information Tool") and submitted prior to entering Victorian state water.	Records confirm that DAWR Ballast water risk assessment was undertaken and submitted prior to entering Victorian state waters	Vessel Master
				Report ballast water	All ballast water discharges from the	Records confirm all ballast	MODU

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
				discharges	MODU and support vessels will be reported in accordance with the requirements of the Australian Ballast Water Management Requirements (2017)	water discharges were reported.	OIM/Vessel Master
					Non-compliant discharges of domestic ballast water are reported to the EPA Victoria immediately.		
					Suspected or known introductions of IMS will be reported to the DELWP immediately		
				Maintain a ballast water record system	A ballast water record system will be maintained by the MODU	Review of the ballast water record system confirms it is being maintained.	MODU OIM/Vessel Master
8	MODU/Vessel biofouling & biosecurity	Unplanned introduction and transmission of invasive species.	No introduction of non-endemic marine species through hull fouling or quarantine breaches	Anti-fouling certificate	MODU/Vessel Antifouling Coating (AFC) certification is current in accordance with AMSA Marine Order Part 98 (Anti-fouling systems)	Pre-mobilisation inspection confirms that the vessel's Anti-fouling System Certificates are valid	Contract Administrator
				IMS Risk Assessment (IMS-RAP)	The IMS-RAP will be available for the MODU and each support vessel and implemented	Pre-mobilisation inspection confirms that the IMS-RAP is in place and maintained, and implemented as appropriate.	Contract Administrator
					MODU/Vessels will undergo IMS risk assessment in accordance with Esso IMS-RAP to confirm that IMS risk is acceptably low	Pre-mobilisation inspection confirms that IMS Risk Assessment has been undertaken and that mitigating measures are implemented where IMS Risk is not acceptable	Contract Administrator
				Biofouling record book	A biofouling record book will be maintained separately for the MODU and each support vessel	Review of the record books confirm they are in place and maintained.	MODU OIM/Vessel Master
				In-water Equipment Cleaning	All in-water equipment has been removed from the water, inspected and cleaned (where required) prior to deployment within Australian Territorial Sea (<12 NM from nearest shore).	Records verify in-field equipment does not present an IMS risk.	Contract Administrator

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
				Reporting	Suspected or known introductions of IMS will be reported to the DELWP immediately	Records confirm that suspected or known introductions of IMS are reported to the DELWP immediately	MODU OIM/Vessel Master
			No introduction of non-endemic terrestrial species into Australia	Customs clearing for all international goods	All international goods are cleared through Customs prior to mobilisation to MODU or Support vessels, in accordance with the DAWR requirements	Records confirm that all international goods have been clear through Customs prior to mobilisation to site	Contract Administrator
9	Vessel movements	Unplanned collision & interference with marine fauna	No injuries or death of macrofauna resulting from vessel strike within operational area.	Caution and 'no approach zones	Vessel masters will be briefed on caution and 'no approach zones' and interaction management actions as defined in the EPBC Regulations 2000 – Part 8 Division 8.1 A vessel master (or delegate) will be on duty at all times.	Training records confirm that vessel masters have been briefed on caution and 'no approach zones' and interaction management actions as defined in the EPBC Regulations 2000 – Part 8 Division 8.1.	Contract Administrator
					A vessel master (or delegate) will be on duty at all times	Bridge watch records confirm vessel master (or delegate) on duty at all times.	Vessel Master
				Fauna interaction management actions - vessels	Vessels adhere to the distances and vessel management practices of EPBC Regulations (Part 8) and Wildlife (Marine Mammals) Regulations 2009 (Part 3(9)): • Vessels will travel at less than 5 knots within the caution zone of a cetacean and minimise noise (Caution Zone is 150m radius for dolphins, 300 m for whales and 50m for seals). • The vessel must not drift closer than 50 m (dolphins and seals) and 100 m (whale); • If whale comes within above limits, the vessel master must disengage gears and let the whale approach or	Daily operations reports note when cetaceans were sighted in the caution zone and if interaction management actions were implemented.	Vessel Master

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					reduce the speed of the vessel and continue on a course away from the whale; • The vessel must not restrict the path of a marine mammal. • The vessel must not separate any individual from a group of marine mammals or come between a mother whale and calf or a seal and pup; • If the vessel is within the caution zone of a marine mammal the vessel must move at a constant speed that does not exceed 5 knots, avoids sudden changes in speed or direction and manoeuvres the vessel to outside the caution zone if the marine mammal shows any sign of disturbance; Additionally, if a vessel is within the caution zone of a marine mammal, the vessel shall not approach a marine mammal from head on, from the rear or be in the path ahead of a marine mammal at an angle closer than 30° to its observed direction of travel.		
				Fauna interaction management actions - helicopters	A helicopter maintains a minimum distance of 500-metre from a marine mammal in accordance EPBC Regulations (Part 8) and Wildlife (Marine Mammals) Regulations 2009 Part 3(8). Further it will not: • approach a marine mammal from head on; • fly directly over or pass the shadow of the aircraft directly over a marine mammal; • land on water to observe marine	Helicopter flight records confirm flight path avoids interaction with marine mammals	Helicopter pilot

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					mammals • operate a helicopter in the vicinity of a marine mammal if the marine mammal shows signs of disturbance. Unless it is necessary for the helicopter to: • avoid damage or prevent further damage to person or property; allow take-off or landing • comply with an Act or regulations relating to the operation of a helicopter.		
				Fauna observation	Trained crew members on active duty will report observations of megafauna located within the cautionary zone (as defined in The Australian Guidelines for Whale and Dolphin Watching) to the vessel master (or their delegate), as soon as it is safe to do so.	Daily vessel reports note when cetaceans were sighted in the caution zone and if interaction management actions were implemented.	Vessel Master
				Environmental Induction	All personnel have completed an environmental induction covering the requirements for marine mammal/vessel interaction consistent with EPBC Regulations 2000 (Chapter 8) and Victorian Wildlife (Marine Mammals) Regulations 2009 (Part 2/Part 3) and are familiar with the requirements. This includes a requirement to notify the bridge if marine mammals are sighted in the caution zone.	Induction records verify that all personnel have completed an environmental induction	Contract Administrator
			Injury or death to listed macrofauna from vessel strike will be reported	Incident reporting	Any injury to, or mortality of, an EPBC Act Listed Threatened or Migratory Species (including those from a vessel strike) will be recorded on the National Ship Strike database within 72 hours	Submission date on the National Ship Strike Database confirm that any injury to, or mortality of, an EPBC Act Listed Threatened or Migratory Species (including	Vessel Master

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					(https://data.marinemammals.gov.au/report/shipstrike).	those from a vessel strike) is reported within 72 hours of the incident.	
10	Air emissions during Blackback P&A operations	Impacts from Greenhouse gas (GHG) emissions Chronic effects to sensitive receptors from air emissions	Fuel-combustion equipment operates in compliance with Marine Order 97 (Marine pollution prevention – air pollution) 2013 (MARPOL Annex VI (Prevention of Air Pollution from Ships)) requirements.	Use of low sulphur diesel	Only low-sulphur (<3.5% m/m) marine-grade diesel will be used in order to minimise SOx emissions.	Manifests for fuel transfers will record that diesel was received; MDO SDS confirms low sulphur.	MODU OIM/Vessel Master
				Equipment Maintenance (PMS)	All combustion equipment on MODU and vessels are maintained in accordance with the MODU/Vessel PMS (or equivalent).	PMS records verify that combustion equipment is maintained to schedule.	MODU OIM/Vessel Master
				Certified emission standards as per Ship Energy Efficiency Management Plan	Vessel operators are operating in accordance with certified emission standards as per Ship Energy Efficiency Management Plan	Pre-mobilisation inspection confirms that vessel operators are operating in accordance with certified emission standards as per Ship Energy Efficiency Management Plan	Contract Administrator
				Vessels with diesel engines>130 kW must be certified to emission standards (e.g. IAPP, EIAPP).	Certification documentation	Certification documentation verified via pre-mobilisation inspection	MODU OIM/Vessel Master
					Vessels >400 gross tonnes and involved in an international voyage implement their Ship Energy Efficiency Management Plan (SEEMP) as per MARPOL Annex VI.	Records verify energy efficiency records have been adopted.	
					Vessel engine NOx emission levels will comply MARPOL Annex VI.	Records verify compliance with Regulation 13 of MARPOL Annex VI.	
11	Brine discharge from RO Units	Impacts to marine environment	RO and brine discharges are within manufacturer operating parameters.	RO Units are operating in accordance with manufacturer specifications	RO units are operating in accordance with manufacturer operating specifications.	Documentation provided during pre-mobilisation inspecting confirms that RO units are operating in accordance manufacturer operating specifications.	Contract Administrator MODU OIM/Vessel Master
				RO Units are maintained in accordance with manufacturer specifications	RO Units will be maintained in accordance with the vessel PMS so that they are operating within	PMS Records/Work orders verify that RO units are maintained to schedule.	MODU OIM/Vessel Master

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					manufacturer operating specifications.		
				Monitoring of fresh water output	The quality of fresh water is monitored and if not within specification for drinking water, then RO will be taken offline for servicing	Records show that RO drinking water output meets drinking water standards. Where output is out of specification, records show that RO was taken offline for servicing	MODU OIM/Vessel Master
				Use of stored potable water as back-up	Where RO are not operating in accordance with manufacturer specifications, the vessel will use stored potable water as a backup.	Records confirm that stored potable water is used as a backup	MODU OIM/Vessel Master
	Cooling water discharges	Impacts to marine environment	Engines and associated equipment that require cooling by water are within manufacturer operating parameters.	Engines and associated equipment that require cooling by water are operating in accordance with manufacturer specifications	Engines and associated equipment that require cooling by water are operating within manufacturer specifications	Documentation provided during pre-mobilisation inspecting confirms that equipment is operating in accordance with manufacturer specifications	Contract Administrator MODU OIM/Vessel Master
				Engines and associated equipment that require cooling by water are maintained in accordance with manufacturer specifications	Engines and associated equipment that require cooling by water will be maintained in accordance with the vessel PMS	PMS records verify that the equipment is maintained to schedule.	MODU OIM/Vessel Master
Operational Area Presence and P&A Operations							
12	ROV operations	Release of hydraulic fluid to marine environment may cause ecosystem toxicity.	No routine releases of hydraulic fluid to the marine environment	Closed loop system	The ROV and tools system are a closed loop system, designed not to leak	Records confirm that there are no routine hydraulic fluid discharges to the marine environment	ROV Operator
				Equipment maintenance	Equipment maintenance in accordance with manufacturer specifications. Hoses checked and hose register in place. Bunding and containment around maintenance area	Records confirm equipment maintenance in accordance with supplier specifications	ROV Operator

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
				Third party equipment inspection	Monthly inspection of third party equipment per Computerised Maintenance Management System (CMMS)	CMMS reports show that monthy inspection has been completed	MODU OIM/ Vessel Master
			Only approved low impact hydraulic fluid to be used	The hydraulic fluid used is a low environmental impact fluid.	Only CHARM gold / silver or OCNS E / D rated or equivalent hydraulic fluids are approved for use where planned discharge may occur, in accordance with Esso Chemical Selection Procedure.	Hydraulic fluid used for ROV operations will be listed in chemicals database as acceptable for use (CHARM gold/silver or OCNS E/D or equivalent)	Drilling Supervisor
13	BOP Operations	Release of hydraulic fluid to marine environment may impact on marine communities.	Only approved low impact hydraulic fluid to be used	The hydraulic fluid used is a low environmental impact fluid.	Only CHARM gold / silver or OCNS E / D rated or equivalent hydraulic fluids are approved for use where planned discharge may occur, in accordance with Esso Chemical Selection Procedure.	Hydraulic fluid used for BOP operations will be listed in chemicals database as acceptable for use (CHARM gold/silver or OCNS E/D or equivalent)	Drilling Supervisor
14	Abandonment operations – Discharge of brine/packer fluid at the surface	Change in water quality leading to toxicity to marine species	No discharge of fluids unless classified as approved for discharge according to the Esso Chemical Selection procedure	Assess chemicals in brine/ packer fluid to determine if acceptable for discharge	Only CHARM gold / silver or OCNS E / D rated chemicals or equivalent are approved for discharge in accordance with Esso Chemical Selection Procedure (Section 7.8.1)	Brine/packer fluid chemicals are listed in the List of approved chemicals for discharge available to the onsite drilling supervisor.	Drilling Supervisor
15	Abandonment operations – Discharge of interface fluids containing NADF at the surface	Change in water quality resulting in toxicity to marine species	No discharge of fluids unless classified as approved for discharge according to the Esso Chemical Selection procedure	Assess chemicals in interface fluid to determine if acceptable for discharge	Only CHARM gold / silver or OCNS E / D rated chemicals or equivalent are approved for discharge in accordance with Esso Chemical Selection Procedure (Section 7.8.1)	NADF fluids and chemicals listed in the list of approved chemicals for discharge available to the onsite drilling supervisor.	Drilling Supervisor

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
			No discharge of interface fluids unless Petrofree oil in water content is <10% v/v	The procedure for discharge of interface fluids includes a check to confirm Petrofree oil in water content is <10% v/v otherwise discharge not permitted. Interface fluids will be tested by retort to calculate oil in water content	<10% v/v Petrofree oil in water test by retort method before interface fluids can be discharged	The procedure for discharge of interface fluids includes a check / retort test to confirm Petrofee oil in water content to be < 10% v/v The daily report will include the quantity of any interface fluids discharged and will provide corresponding analysis by retort test to show Petrofree oil in water content to be <10% v/v	Drilling Supervisor
16	Planned discharge – brine from subsea tree cavity	Change in water quality resulting in toxicity to marine species	No discharge of unapproved fluids as a result of removing subsea trees	Assess chemicals in brine to determine if for discharge	Only CHARM gold / silver or OCNS E / D rated chemicals or equivalent are approved for use in accordance with Esso Chemical Selection Procedure	Brine/packer fluid chemicals are listed in the List of approved chemicals for discharge available to the onsite drilling supervisor.	Operations Superintendent
17	Planned discharge – Cement at the sea surface	Change in water quality resulting in toxicity to marine species	No discharge of cement unless constituents classified as approved for use according to the Esso Chemical Selection procedure	Ensure chemicals used in cement are acceptable for use	Only CHARM gold / silver or OCNS E / D rated chemicals or equivalent are approved for use in accordance with Esso Chemical Selection Procedure	Each constituent of the final cement mixture is listed in the list of approved chemicals for use as available to the onsite drilling supervisor.	Drilling Supervisor

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
18	Planned discharge – flowline contents	Change in water quality resulting in toxicity to marine species	No discharge of flowline constituents unless classified as approved for discharge according to the Esso Chemical Selection procedure	Discharges are assessed and only approved where the impacts are low and acceptable	Only CHARM gold / silver or OCNS E / D rated chemicals or equivalent are approved for discharge in accordance with Esso Chemical Selection Procedure	Flowline contents are approved for discharge.	Drilling Supervisor
			Limit discharge from main pipeline	PTA valves will be closed prior to flowline disconnection.	PTA valves will be closed prior to flowline disconnection.	As left status confirms valves closed post disconnection.	Drilling Supervisor
			Mitigate risk of failure of drybreak couplings in the longer term	The chemical connections will be looped back to the umbilical termination assembly within 12 months of the completion of the BKA P&A activity	Connections to the umbilical termination assembly to be made and tested in line with acceptance criteria	Regulatory Deadlines Database will show that 12 month deadline for looping back connections to the umbilical termination assembly has been met	Central Fields Asset Manager
19	Noise from MODU / vessels and helicopters during normal operations	Noise and light affecting marine fauna or cetacean behaviour.	All personnel are aware of marine mammal/vessel interaction regulations	Environmental Inductions	All personnel have completed an environmental induction covering the requirements for marine mammal/vessel interaction consistent with EPBC Regulations 2000 (Chapter 8) and Victorian Wildlife (Marine Mammals) Regulations 2009 (Part 2/Part 3) and are familiar with the requirements. This includes a requirement to notify the bridge if marine mammals are sighted in the caution zone.	Induction records verify that all personnel have completed an environmental induction	Contract Administrator
			Reporting of megafauna sighting	Fauna observation	Trained crew members on active duty will report observations of megafauna located within the cautionary zone (as defined in The Australian Guidelines for Whale and Dolphin Watching) to the vessel master (or their delegate),	Daily vessel reports note when cetaceans were sighted in the caution zone and if interaction management actions were implemented.	Vessel Master

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					as soon as it is safe to do so.		
			Injury or death to listed macrofauna from vessel strike will be reported	Incident reporting	Any injury to, or mortality of, an EPBC Act Listed Threatened or Migratory Species (including those from a vessel strike) will be recorded on the National Ship Strike database within 72 hours.	Submission date on the National Ship Strike Database confirm that any injury to, or mortality of, an EPBC Act Listed Threatened or Migratory Species (including those from a vessel strike) is reported within 72 hours of the incident.	Vessel Master
			No injuries or death of macrofauna resulting from vessel strike within operational area.	Caution and 'no approach zones	Vessel masters will be briefed on caution and 'no approach zones' and interaction management actions as defined in the EPBC Regulations 2000 – Part 8 Division 8.1 A vessel master (or delegate) will be on duty at all times.	Training records confirm that vessel masters have been briefed on caution and 'no approach zones' and interaction management actions as defined in the EPBC Regulations 2000 – Part 8 Division 8.1.	Contract Administrator
					A vessel master (or delegate) will be on duty at all times	Bridge watch records confirm vessel master (or delegate) on duty at all times.	Vessel Master
				Fauna interaction management actions - vessels	Vessels adhere to the distances and vessel management practices of EPBC Regulations (Part 8) and Wildlife (Marine Mammals) Regulations 2009 (Part 3(9)): • Vessels will travel at less than 5 knots within the caution zone of a cetacean and minimise noise (Caution Zone is 150m radius for dolphins, 300 m for whales and 50 m for seals). • The vessel must not drift closer than 50 m (dolphins and seals) and 100 m (whale); • If whale comes within above limits, the vessel master must disengage	Daily operations reports note when cetaceans were sighted in the caution zone and if interaction management actions were implemented.	Vessel Master

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					gears and let the whale approach or reduce the speed of the vessel and continue on a course away from the whale; • The vessel must not restrict the path of a marine mammal. • The vessel must not separate any individual from a group of marine mammals or come between a mother whale and calf or a seal and pup; • If the vessel is within the caution zone of a marine mammal the vessel must move at a constant speed that does not exceed 5 knots, avoids sudden changes in speed or direction and manoeuvres the vessel to outside the caution zone if the marine mammal shows any sign of disturbance; Additionally, if a vessel is within the caution zone of a marine mammal, the vessel shall not approach a marine mammal from head on, from the rear or be in the path ahead of a marine mammal at an angle closer than 30° to its observed direction of travel.		
			Minimise noise	Diamond Planned Maintenance System	PMS ensures that engines and propulsion systems are maintained in accordance with manufacturer specifications to reduce noise radiated from vessels to as low as possible.	Records show routine completion of maintenance in accordance with manufacturer specifications or preventative maintenance system	MODU OIM/Vessel Master
			Helicopter operations in accordance with regulatory requirements	Fauna interaction management actions - helicopters	A helicopter maintains a minimum distance of 500-metre from a marine mammal in accordance EPBC Regulations (Part 8) and Wildlife (Marine Mammals) Regulations 2009	Helicopter flight records confirm flight path avoids interaction with marine mammals	Helicopter pilot

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					Part 3(8). Further it will not: • approach a marine mammal from head on; • fly directly over or pass the shadow of the aircraft directly over a marine mammal; • operate a helicopter in the vicinity of a marine mammal if the marine mammal shows signs of disturbance. Unless it is necessary for the helicopter to: • avoid damage or prevent further damage to person or property; allow take-off or landing • comply with an Act or regulations relating to the operation of a helicopter.		
	Lighting from MODU / vessels	Light affecting marine fauna and sea birds	Lighting will be limited to that required for safe navigation and work requirements	Lighting will be limited	Lighting will be limited to that required for safe navigation and work requirements by minimising light spill to sea.	Inspection verifies light spill to sea is minimised, except where required for safe work/navigation.	MODU OIM/Vessel Master
20	Physical presence – Infrastructure integrity	Degradation of infrastructure leading to limitation of risk reduction options at time of decommissioning	Flowlines and chemical connections are maintained in a FFS condition to enable surface retrieval, if required, at field decommissioning	Implement Equipment strategy for flowlines and chemical connections with the objective to maintain flowlines in a fit for service condition to enable surface retrieval, if required, at field decommissioning	OIMS System 6-2 Facility Integrity Management System (FIMS), Program 06 (Subsea) Equipment Strategy with the objective to maintain flowlines and chemical connections in a fit-for-service (FFS) condition to enable surface retrieval, if required, at field decommissioning including a 10 year ROV visual inspection	The maintenance workorder management system shows equipment has been maintained in accordance with the equipment strategy for flowlines and chemical connections defined under FIMS Program 06 (Subsea).	Central Fields Asset Manager
						The maintenance workorder management system shows a 10 year ROV visual inspection has been undertaken	Central Fields Asset Manager

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
21	Physical presence – interference with commercial fishing	Disruption to commercial fishing	All relevant marine users will be notified of activities prior to operations	Stakeholder notification	All relevant stakeholders will be notified of activities approximately 4 weeks and 1 week prior to operations commencing	Stakeholder consultation records database confirm that pre-start notices were sent to all relevant stakeholders	Offshore Risk, Environment & Regulatory Supervisor
				Ongoing consultation with fishing and shipping groups.	Consultation with marine users to minimise disruption.	MODU log of events will record interactions with commercial fishing.	Offshore Risk, Environment & Regulatory Supervisor
						Stakeholder consultation records show that relevant commercial fishers have been informed of activities and their concerns addressed	
						SMS alerts issued to SETFIA fishing contacts to raise the awareness of the project activities, including when and where they are taking place	
				Vessel Crew and Navigational Equipment	SEMS 5.5.1.5 Vessels will meet the crew competency, navigation equipment, watchkeeping and radar requirements of the AMSA Marine Order Part 3 and Part 30	Training and competency records indicate that vessels meet the crew competency, navigation equipment, and radar requirements of the AMSA Marine Orders	
				Navigational Equipment	SEMS 5.5.1.5 Navigational Aids (communication, AIS, Message 21 coding, AtoN) will meet AMSA expectations, and in accordance with IMO Resolution MSC.347 (91)	Stakeholder consultation records indicate that navigational aids onboard MODU and support vessels meet AMSA expectations for safe operations near major shipping route	MODU OIM/Vessel Master
				Standby/guard vessel and AHTs	SEMS 5.5.1.5 Standby/guard vessel and AHTs monitor vessel movements near and within the 2 NM Buffer zone around the MODU, and will intervene when a third party vessel approachs	Records confirm that a Guard vessel is on standby at all time during P&A operations and actively patrols the 2 NM buffer zone around the MODU	

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					the 2 NM Buffer zone		
				Pre-start notifications	SEMS 5.5.1.5 The AHS will be notified no less than four working weeks before operations commence to enable Notices to Mariners to be published	Stakeholder consultation records confirm a Notice to Mariners was provided to the AHS at least four weeks before operations commenced	Operations Superintendent
					SEMS 5.5.1.5 AMSA's JRCC will be notified 24–48 hours before operations commence to enable AMSA to distribute an AUSCOAST warning	Stakeholder consultation records confirm that information to distribute an AUSCOAST warning was provided to the JRCC	
					SEMS 5.5.1.5 AHT will conduct an All Ships "Securite" VHF radio call on Safety Channels prior to the commencement and at regular periods throughout mooring and unmooring phase.	Vessel GMDSS Radio Logbooks record details of radio transmissions from vessel.	Vessel Master
					Relevant Stakeholders will be notified of activities approximately one month and again one week prior to commencement	Stakeholder consultation records confirm that information was distributed to relevant stakeholders in required timeframes.	Operations Superintendent
				Petroleum Safety Zone (PSZ)	SEMS 5.5.1.5 Establishment of 500 m PSZ around operational facilities in accordance with section 616 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006.	Stakeholder consultation records show that a petroleum safety zone is established at least one month before start of field activities, and confirmed by a notice published in the Gazette as provided for under section 616 of the Offshore Petroleum and Greenhouse Gas Storage	Operations Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
						Act 2006.	
				Subsea infrastructure removal	As part of the plug and abandonment, the electrical and hydraulic connections, subsea trees, completion guidebases, wellheads and temporary guidebases will be removed from the seabed	Records confirm removal of the electrical and hydraulic connections, subsea trees, completion guidebases, wellheads and temporary guidebases.	
			Stakeholders will be made aware of any remaining wellheads	Stakeholder consultation	Relevant stakeholders will be notified of the location of any wellheads that were unable to be retrieved	Stakeholder consultation database will show that notification has been given if any wellheads remain in situ	Offshore Risk, Environment & Regulatory Supervisor
22	Interference with commercial shipping	Disruption to commercial shipping	No unplanned or negative interactions with commercial shipping	Vessel Crew and Navigational Equipment	SEMS 5.5.1.5 Vessels will meet the crew competency, navigation equipment, watchkeeping and radar requirements of the AMSA Marine Order Part 3 and Part 30	Records indicate that vessels meet the crew competency, navigation equipment, and radar requirements of the AMSA Marine Orders	Offshore Risk, Environment & Regulatory Supervisor
				Navigational Equipment	SEMS 5.5.1.5 Navigational Aids (communication, AIS, Message 21 coding, AtoN) in accordance with safety case commitments for safe operations near TSS, as agreed with AMSA (Section 3.4.1), and in accordance with IMO Resolution MSC.347 (91)	Records indicate that navigational aids onboard MODU and support vessels are in accordance with safety case commitments for safe operations near TSS, as agreed with AMSA (Section 2.4.11) and in accordance with IMO Resolution MSC.347 (91)	MODU OIM/Vessel Master
				Standby/guard vessel and AHTs	SEMS 5.5.1.5 Standby/guard vessel and AHTs monitor vessel movements near and within the 2 NM Buffer zone around the MODU, and will intervene when a third party vessel approachs the 2 NM Buffer zon	Records confirm that a Guard vessel is on standby at all time during P&A operations and actively patrols the 2 NM buffer zone around the MODU	
				Temporary Fairway and 2NM buffer zone	SEMS 5.5.1.5 Establishment of temporary fairways and 2 NM buffer zone around operational area to divert commercial shipping away from	Records indicate that AMSA/AHS has established temporary fairways and buffer zones at least 3 months	Operations Superintendentr

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					P&A activities	before start of field activities	
				Pre-start notifications	SEMS 5.5.1.5 The AHS will be notified no less than four working weeks before operations commence to enable Notices to Mariners to be published	Email records confirm a Notice to Mariners was provided to the AHS at least four weeks before operations commenced	Operations Superintendent
					SEMS 5.5.1.5 AMSA's JRCC will be notified 24–48 hours before operations commence to enable AMSA to distribute an AUSCOAST warning	Email records confirm that information to distribute an AUSCOAST warning was provided to the JRCC	
					SEMS 5.5.1.5 Relevant Stakeholders will be notified of activities approximately one month and again one week prior to commencement	Stakeholder records confirm that information was distributed to relevant stakeholders in required timeframes.	
					SEMS 5.5.1.5 AHT will conduct an All Ships "Securite" VHF radio call on Safety Channels prior to the commencement and at regular periods thoughout mooring and unmooring phase.	Vessel GMDSS Radio Logbooks record details of radio transmissions from vessel.	Vessel Master
				Petroleum Safety Zone (PSZ)	SEMS 5.5.1.5 Establishment of 500 m PSZ around operational facilities in accordance with section 616 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006.	Records show that a petroleum safety zone is established at least one month before start of field activities, and confirmed by a notice published in the Gazette as provided for under section 616 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006.	Operations Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
				Adherence to Vessel Collision Avoidance Procedure	MODU Vessel Collision Avoidance Procedure	Incident records will show that no vessel collisions have occurred	MODU OIM
23	Physical presence of MODU – anchors, wellheads and subsea equipment	Damage, physical impact and disturbance to seabed	Limit extent of seabed disturbance during anchoring and P&A activities.	Mooring analysis	Mooring analysis will be undertaken before anchoring. Anchor slipping / tension monitoring will be undertaken as per ISO 1990 1-7:2013 while the MODU is anchored.	Mooring records confirm anchor slipping / tension was monitored while the MODU was anchored.	MODU OIM
				Post-abandonment ROV survey	Post-campaign ROV survey around the wellhead area will record the condition of the seabed at the completion of the program to ensure that no retrievable dropped objects or subsea equipment, intended for removal remain on the seabed.	Post-campaign survey around the wellhead area confirms that equipment has been recovered on completion of well activities	MODU OIM
				Retrieval of anchors and anchor chains, electrical and hydraulic connections, subsea tree, completion guidebase, wellhead and temporary guidebase on completion of P&A activities	Retrieval of anchors and anchor chains, electrical and hydraulic connections, subsea tree, completion guidebase, wellhead and temporary guidebase on completion of P&A activities	Records confirm that anchors and anchor chains, electrical and hydraulic connections, subsea tree, completion guidebase, wellhead and temporary guidebase have been removed on completion of P&A activities	Drilling Superintendent
24	Physical Presence – NORM	Exposure to radiation from NORM	Prevent exposure to radiation from recovered infrastructure containing NORM	Measure NORM from recovered infrastructure and handle and package for transport accordingly	Blackback P&A NORM Management Plan	NORM Survey Sheet complies with the requirements of the Blackback P&A NORM Management Plan	Radiation Safety Officer
					Measurement of both the gamma ray radiation and alpha/beta radiation component is conducted on both external and accessible internal surfaces of recovered infrastructure. conducted by Radiation Safety Officer	NORM Survey Sheet confirms measurement of gamma ray and alpha/beta radiation is conducted on both external and accessible internal surfaces of recovered infrastructure and signed by	Drilling Supervisor/OIM

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
						Radiation Safety Officer	
			Prevent marine organisms from ongoing exposure to radiation from NORM	Install plugs in disconnected ends of the flowlines within 12 months of the completion of the BKA P&A activity	Plugs will be installed in accordance with manufacturer's specifications. This will be completed within the committed timeframe of 12 months.	Regulatory Deadlines Database will show that 12 month deadline for installing plugs on flowlines has been met	Central Fields Asset Manager
25	Operation and maintenance of MODU & support vessels	Incidental discharge of dropped objects to the marine environment, causing impact on the marine environment	Prevent dropped objects to marine environment	Approved lifting procedures	The MODU and supply vessels will apply approved lifting procedures	Lift plan is in place for vessel unloading. Lift plan is in place for critical lifts on rig deck.	Deck Supervisor/ Crane Operator
				Tying down of deck material	All materials on deck will be adequately secured to avoid loss overboard during storm, swell or heavy wind conditions	Rig walkarounds confirm that deck loads are adequately secured.	MODU OIM/Vessel Master
				Approved vessel maintenance procedures	Prevent overboard discharge of paint, coating and grit, hazardous liquid spills by undertaking all maintenance in accordance with approved vessel maintenance procedures	Records show routine completion of maintenance in accordance with preventative maintenance system	MODU OIM/Vessel Master
				Prevent accidental release of waste to marine environment	Prevent accidental release of vessel waste by implementing vessel/MODU waste management procedures (including use of containment barriers where appropriate) and by storing hydrocarbons and hazardous liquids within secondary containment or purpose-built bulk tanks aboard the MODU	Records show personnel have completed induction which includes waste management processes. Rig walkarounds confirm that waste management procedures are being followed	MODU OIM/Vessel Master
				Use of approved lifting procedures for ROV lifts from seabed	Approved lifting procedures specific to retrieval of equipment from seabed by ROV.	Lifting procedure is in place for retrieving items from seabed with ROV	MODU OIM/ Deck Supervisor/ Crane Operator
				Remove dropped objects at completion of P&A	ROV inspection of the seafloor around the well post campaign to confirm that no unplanned equipment has been abandoned on the seabed	Records confirm that a post-campaign ROV survey around the well was completed and that any identified dropped	MODU OIM/Vessel Master

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					and if so that they are removed where practicable.	objects are removed where practicable	
						Incident records will show that no dropped object incidents occurred	MODU OIM/Drilling Superintendent
26	Vessel Movements – Collision Risk	Collision risk with commercial /recreational fishing or shipping activities near Gippsland Basin Traffic Separation Scheme.	No release of diesel or other chemicals to the marine environment as a result from a vessel collision.	Project vessel Crew and Navigational Equipment	Project vessels will meet the crew competency, navigation equipment, watchkeeping and radar requirements of the AMSA Marine Order Part 3 and Part 30	Records indicate that project vessels meet the crew competency, navigation equipment, and radar requirements of the AMSA Marine Orders	MODU OIM/Vessel Master
				MODU Station keeping and Mooring system	MODU Station keeping (SCE-14) and Mooring system (SCE-28) procedures are implemented	Daily reports confirm that station keeping and mooring systems have maintained planned locations	
				Standby/guard vessel and AHTs	Standby/guard vessel and AHTs monitor vessel movements near and within the 2 NM Buffer zone around the MODU, and will intervene when a third party vessel approaches the 2 NM Buffer zone	Daily report confirms that a guard vessel is on standby at all times during P&A operations and actively patrols the 2 NM buffer zone around the MODU	
				Adherence to MODU Vessel Collision Avoidance Procedure	MODU Vessel Collision Avoidance Procedure	Incident records will show that no vessel collisions have occurred	
				Use of attending Support Vessel that are maintained to standard	Attending Support Vessel Systems are maintained and tested in accordance with PMS	PMS records confirm that Attending Support Vessel Systems are maintained and tested in accordance with PMS	Vessel Master
				Navigational Equipment	Navigational Aids (communication, AIS, Message 21 coding, AtoN) will meet AMSA expectations (Section 2.4.11), and in accordance with IMO Resolution MSC.347 (91)	Pre-mobilisation inspection confirms that navigational aids meet AMSA expectations	Contract Manager
						Daily report confirms that navigational aids onboard MODU and support vessels are operational	Vessel master /MODU OIM

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
				Temporary Fairway and 2NM buffer zone	Establishment of temporary fairways and 2 NM buffer zone around operational area to divert commercial shipping away from P&A activities	Records indicate that AMSA/AHS has established temporary fairways and buffer zones at least 3 months before start of field activities	Operations Superintendent
				Pre-start notifications	The AHS will be notified no less than four working weeks before operations commence to enable Notices to Mariners to be published	Stakeholder consultation log confirms a Notice to Mariners was provided to the AHS at least four weeks before operations commenced	
					AMSA's JRCC will be notified 24–48 hours before operations commence to enable AMSA to distribute an AUSCOAST warning	Stakeholder consultation log confirms that information to distribute an AUSCOAST warning was provided to the JRCC	
					Relevant Stakeholders will be notified of activities approximately one month and again one week prior to commencement	Stakeholder consultation log confirms that information was distributed to relevant stakeholders in required timeframes.	
				Petroleum Safety Zone (PSZ)	Establishment of 500 m PSZ around operational facilities in accordance with section 616 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006.	Records show that a petroleum safety zone is established at least one month before start of field activities, and confirmed by a notice published in the Gazette as provided for under section 616 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006.	Operations superintendent
					Any vessel that enters the PSZ will be required to complete a checklist, before requesting MODU permission to enter the PSZ. All PSZ entries are logged.	MODU bridge log confirms authorised entries into PSZ.	Vessel master /MODU OIM
					The MODU AIS system will register an unauthorised entry into the PSZ, and will also register on AHT/guard vessel radar, which will intercept any	Support vessels have access to Unidentified Approaching Vessel Plan. MODU log book confirms any	Vessel master /MODU OIM

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					unauthorised vessels breaching PSZ, in accordance with Unidentified Approaching Vessel Plan. Any such incidences are logged in MODU log book.	unauthorised PSZ entries	
			Minimise the impact on the environment as a result from a LOC	Emergency Response Preparedness	Emergency response capability will be maintained in accordance with EP, OPEP and related documentation.	Outcomes of internal audits and exercises demonstrate preparedness.	Operations superintendent
				SOPEP (or equivalent)	Emergency response activities will be implemented in accordance with the vessel SOPEP	Records confirm that emergency response activities have been implemented in accordance with the vessel SOPEP	MODU OIM/Vessel Master
				OPEP	Under the OPGGS(E) Regulations, the petroleum activity must have an accepted Oil Pollution Emergency Plan (OPEP) in place before the activity commences. In the event of a LOWC, the OPEP will be implemented.	An approved OPEP is in place before the start of field activities.	Operations superintendent
						Records confirm that emergency response activities have been implemented in accordance with the OPEP	Offshore Risk, Environment & Regulatory Supervisor
					The OPEP shall be tested in accordance with the OPGGS (E) Regulations.	Records indicate tests undertaken in accordance with the exercises according to the schedule given in the approved EP (Section 7.7).	Emergency Management Team (EMT) Incident Controller (IC)
					Esso shall maintain a full time emergency response capability for the duration of the P&A activities	IMT roster. Training records current in relation to oil spill response.	IMT
					In the event that initiation criteria for MES activities are triggered, MES shall be undertaken within the timeframes specified in the OPEP and OSMP. MES activities shall continue until termination criteria are met.	Pre-drill oil spill response audit confirms that minimum performance standards are achievable. Pre-mobilisation audit and ongoing audits confirm that measures identified in Section 10: Emergency Response Planning are met for the	IMT

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
						duration of the campaign. In the event of an incident, Daily logs of response activities prepared by IMT show that minimum time frames for response are met.	
				OSMP	Operational and scientific monitoring will be implemented in accordance with the OSMP	Records confirm that operational and scientific monitoring have been implemented in accordance with the OSMP	Emergency Management Team (EMT) Incident Controller (IC)
27	Bulk transfer from vessel to MODU via hose	Unplanned release of diesel or other chemicals to the marine environment during bulk transfer may cause localised short term impact on water quality.	No unplanned release of diesel or other chemicals into the marine environment during bulk transfer.	Bulk fluid transfer procedures	MODU has bulk fluid transfer procedures in place before commencing operations. The process will include: • MODU to vessel communication protocols • Transfer hose pressure testing • Continuous visual monitoring • Tank volume monitoring • Secondary containment (bunding) around hose connections, air breathers etc.	Pre-mobilisation inspection confirms that approved bunkering procedures ("Fuel Oil and Drilling / Completion Fluid Transfers from Dynamically Positioned Supply Boats Procedure") are in place	Contract manager
						Records confirm that approved bunkering procedures are implemented	MODU OIM
				Hoses and connections	Transfer hoses shall comprise sufficient floating devices and self-sealing weak-link couplings in the mid-section of the hose string, in accordance with GOMO 0611- 1401[4].	Pre-mobilisation inspection confirms records demonstrate transfer hoses meet GOMO 0611-1401 requirements	MODU OIM
				Diamond Planned Maintenance System (PMS)	Prevent transfer spills by maintaining bulk fluid transfer hoses, in accordance with the MODU maintenance system	Pre-mobilisation inspection confirms PMS records show bulk fluid transfer hoses have been maintained in accordance with the MODU	Contract manager

[4] *Guidelines for Offshore Marine Operations. Revision: 0611-1401. 06/11/2013.* www.g-omo.info/wp-content/uploads/2016/06/201311-GOMOfinal.pdf.

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
						maintenance system	
						Records show routine completion of maintenance in accordance with manufacturer specifications or preventative maintenance system	MODU OIM
			Mitigate impact on the environment from a spill during bulk transfer.	Emergency Response Preparedness	Emergency response capability will be maintained in accordance with EP, OPEP and related documentation.	Outcomes of internal audits and exercises demonstrate preparedness.	Operations superintendent
				SOPEP (or equivalent)	An approved vessel emergency response plan is in place, in accordance with Regulation 37 of MARPOL Annex I to mitigate against spills	Records confirm that an approved vessel emergency response plan is in place	MODU OIM/Vessel Master
						Records confirm oil spill training exercises were undertaken in accordance with the MODU Operator's emergency response exercise program	
				OPEP	Under the OPGGS(E) Regulations, the petroleum activity must have an accepted Oil Pollution Emergency Plan (OPEP) in place before the activity commences. In the event of a LOWC, the OPEP will be implemented.	An approved OPEP is in place before the start of field activities.	Operations superintendent
						Records confirm that emergency response activities have been implemented in accordance with the OPEP	Offshore Risk, Environment & Regulatory Supervisor
					The OPEP shall be tested in accordance with the OPGGS (E) Regulations.	Records indicate tests undertaken in accordance with the exercises according to the schedule given in the approved EP (Section 7.7).	Drilling Manager
					Esso shall maintain a full time emergency response capability for the duration of the P&A activities	IMT roster. Training records current in relation to oil spill response.	IMT
					In the event that initiation criteria for MES activities are triggered, MES	Pre-drill oil spill response audit confirms that minimum	IMT

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					shall be undertaken within the timeframes. MES activities shall continue until termination criteria are met.	performance standards are achievable. Pre-mobilisation audit and ongoing audits confirm that measures identified in Section 6: Emergency Response Planning are met for the duration of the campaign. In the event of an incident, Daily logs of response activities prepared by IMT show that minimum time frames for response are met.	
				OSMP	Operational and scientific monitoring will be implemented in accordance with the OSMP	Records confirm that operational and scientific monitoring have been implemented in accordance with the OSMP	Emergency Management Team (EMT) Incident Controller (IC)
28	Foam deluge system	Release of foam into the marine environment may have toxic impacts.	No release of fire-fighting foam to the marine environment.	No testing of foam deluge system resulting in release of foam to the marine environment.	No release of fire fighting foam to the marine environment.	Daily report to confirm no release of fire fighting foam to the marine environment.	MODU OIM/Vessel Master
29	Chemical and oils storage and handling	Unplanned release of chemicals or oils into the marine environment.	No unplanned release of oils or non-approved chemicals into the marine environment.	Bulk fluid transfer	MODU has bulk fluid transfer procedures in place before commencing operations. The process will include: • MODU to vessel communication protocols • Continuous visual monitoring • All lifting is undertaken in accordance with approved lifting procedures	Pre-mobilisation inspection confirms that approved bunkering procedures - as per SEMS requirements – are in place	Contract manager
						Records confirm that approved bunkering and lifting procedures are implemented	MODU OIM
				Oil and chemical store bunds are appropriately maintained.	Approved MODU and vessel procedures for handling and storage of chemicals is followed	Inspections confirm hydrocarbons and hazardous liquids are stored within secondary containment or	MODU OIM/Vessel Master

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					• Oil and chemical store bunds are maintained in accordance with the equipment strategy, which defines criticality of the equipment, and the corrective and preventative maintenance program. • For stores, as a minimum this requires that oil and chemical stores are located within a deck bund, and water-soluble chemicals not approved for discharge are stored in a bund that is isolated from drain/pile. • The corrective and preventative maintenance program is loaded into a computer-based maintenance system • Storage of waste oils and chemicals is in accordance with approved waste management procedure.	purpose built bulk tanks	
						Records show routine completion of maintenance in accordance with manufacturer specifications or preventative maintenance system	Drilling Superintendent
				Planned Maintenance System	Prevent transfer spills by maintaining lifting equipment, slings and containers in accordance with the MODU maintenance system	Pre-mobilisation inspection confirms PMS records show bulk fluid transfer hoses have been maintained in accordance with the MODU maintenance system	Contract manager
						Records show routine completion of maintenance in accordance with manufacturer specifications or preventative maintenance system	MODU OIM
			Mitigate impact on the environment from a spill during bulk transfer.	Emergency Response Preparedness	Emergency response capability will be maintained in accordance with EP, OPEP and related documentation (per OIMS System 10-2 Emergency Preparedness and Response)..	Outcomes of internal audits and exercises demonstrate preparedness.	Operations superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
				SOPEP (or equivalent)	An approved vessel emergency response plan is in place, in accordance with Regulation 37 of MARPOL Annex I to mitigate against spills	Records confirm that an approved vessel emergency response plan is in place	MODU OIM/Vessel Master
						Records confirm oil spill training exercises were undertaken in accordance with the MODU Operator's emergency response exercise program	
				OPEP	Under the OPGGS(E) Regulations, the petroleum activity must have an accepted Oil Pollution Emergency Plan (OPEP) in place before the activity commences. In the event of a LOWC, the OPEP will be implemented.	An approved OPEP is in place before the start of field activities.	Operations superintendent
						Records confirm that emergency response activities have been implemented in accordance with the OPEP	Offshore Risk, Environment & Regulatory Supervisor
					The OPEP shall be tested in accordance with the OPGGS (E) Regulations.	Records indicate tests undertaken in accordance with the exercises according to the schedule given in the approved EP.	Operations superintendent
					Esso shall maintain a full time emergency response capability for the duration of the P&A activities	IMT roster. Training records current in relation to oil spill response.	IMT
					In the event that initiation criteria for MES activities are triggered, MES shall be undertaken within the timeframes specified. MES activities shall continue until termination criteria are met.	Pre-drill oil spill response audit confirms that minimum performance standards are achievable. Pre-mobilisation audit and ongoing audits confirm that measures identified in Section 6 Emergency Response Planning are met for the duration of the campaign. In the event of an incident, Daily logs of response	IMT

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
						activities prepared by IMT show that minimum time frames for response are met.	
				OSMP	Operational and scientific monitoring will be implemented in accordance with the OSMP	Records confirm that operational and scientific monitoring have been implemented in accordance with the OSMP	Emergency Management Team (EMT) Incident Controller (IC)
30	Accidental Release – Loss of well integrity	Unplanned loss of containment of reservoir fluids.	No release of condensate or gas to the marine environment as a result from a well blow-out.	Well Design	Abandonment procedures consider well design, drilling fluid selection, and formation pressures to ensure that there are two barriers in the well at any time during abandonment operations. Well procedures signed off at appropriate level of management.	Well-specific procedure has been signed off by the Drilling Manager. Supplementary drilling procedures signed by Drilling Superintendent. Changes to the approved procedures are managed by MOC.	Operations Superintendent
				Esso approved drilling operations procedures in place	Abandonment procedures consider well design, drilling fluid selection, and formation pressures to ensure that there are two barriers in the well at any time during abandonment operations.	Approved procedures are available on site and distributed to Esso and Diamond rig leadership.	Operations Superintendent
						Daily reports confirm that these procedures are followed	
				Evaluation of reservoir properties	Risk profiling, well design, and construction are peer reviewed and approved by management. Each well is subject to this process and requires that a well program is completed.	Well program is reviewed and endorsed by drilling and business line management.	Engineering Manager
				Well Operations Management Plan (WOMP)	Under Part 5 of the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011, NOPSEMA is required to accept a WOMP to enable well activities to be undertaken. The WOMP details well barriers and the integrity testing that will be in place for the program. The BAP WOMP describes Esso's	A NOPSEMA approved WOMP is in place before the start of abandonment activities	Engineering Manager

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					minimum requirements for well barriers during operations. Specifically, it requires: • Minimum of two independent tested barriers • Barrier integrity is verified upon installation and at periodic intervals • Suspension of operations if barrier fails resulting in fewer than two independent barriers remaining in place. API Standard 53 is an industry-developed standard that describes the recommended blowout equipment required to be implemented for an abandonment program.		
				Diamond Planned Maintenance System for BOP	PMS ensures that BOP and control systems are maintained, to enable reliable performance.	Records show routine completion of maintenance in accordance with preventative maintenance system (PMS)	Diamond Operations Manager
				BOP testing	BOP is tested before deployment on each well	Records show that BOP has successfully passed BOP test prior to deployment of the BOP and subsequent tests as per WOMP	
				Training & competency	Competencies of Esso Drilling Supervisors is tracked and training plans are established to ensure closure of any overdue refresher training as soon as practicable.	Training records shows that Esso drilling supervisors have the required competencies and there is a plan in place to address any RC gaps.	Operatrions Superintendent
			Minimise the impact on the environment as a result from a LOC	Emergency Response Preparedness	Emergency response capability will be maintained in accordance with EP, OPEP and related documentation (per OIMS System 10-2 Emergency Preparedness and Response).	Outcomes of internal audits and exercises demonstrate preparedness.	Operatrions Superintendent
				OPEP	Under the OPGGS(E) Regulations, the petroleum activity must have an accepted Oil Pollution Emergency	An approved OPEP is in place before the start of field activities.	Operatrions Superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
					Plan (OPEP) in place before the activity commences. In the event of a LOWC, the OPEP will be implemented.	Records confirm that emergency response activities have been implemented in accordance with the OPEP	Offshore Risk, Environment & Regulatory Supervisor
					The OPEP shall be tested in accordance with the OPGGS (E) Regulations.	Records indicate tests undertaken in accordance with the schedule given in the approved EP.	Operatrions Superintendent
					Esso shall maintain a full time emergency response capability for the duration of the P&A campaign.	IMT roster. Training records current in relation to oil spill response.	IMT
					In the event that initiation criteria for MES activities are triggered, MES shall be undertaken within the timeframes specified. • MES activities shall continue until termination criteria are met.	Pre-abandonment oil spill response audit confirms that minimum performance standards are achievable. Pre-mobilisation audit and ongoing audits confirm that measures identified in Section 6: Emergency Response Planning are met for the duration of the campaign. In the event of an incident, Daily logs of response activities prepared by IMT show that minimum time frames for response are met.	IMT
					The IMT shall be capable of mobilising to the Melbourne Office within two hours of notification Key personnel in the IMT shall have adequate expertise in their designated role.	IMT contact phone numbers checked. In the event of an emergency, records show that the IMT convened within 2 hours.	IMT
						Records show that key personnel in the IMT have adequate experience in their	IMT

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
						role.	
				OSMP	Operational and scientific monitoring will be implemented in accordance with the OSMP	Records confirm that operational and scientific monitoring have been implemented in accordance with the OSMP	Emergency Management Team (EMT) Incident Controller (IC)
				Relief well	Well Relief Plan (blowout contingency plan) prepared that includes the location and well path design as well as dynamic kill modelling. In the event, relief well drilled within timeframes defined in the EP (Source Control). Defined in Australia Drill Team Tier II/III Emergency Response Plan..	Relief well surface location is selected, well path developed and dynamic kill modelling completed prior to commencement of P&A activities. Tier II/III emergency response plan is in place, detailing preparation and drilling of a relief well. Status and location of suitable relief well rigs is confirmed within 30 days of first well spudding. APPEA Mutual Assistance Agreement in place. Records show that relief well was drilled as soon as reasonably practicable but within timeframes defined in Section 6.5: Source Control.	Operatrions Superintendent
				Capping Stack	A source control methodology as per WOMP is in place that meets the expectations defined in Section 6.5 of the EP (Source Control). Defined in Australia Drill Team Tier II/III Emergency Response Plan..	Records show that capping stack Interface with BOP and wellhead has been completed prior to first well spudding. Plume modelling of gas release has been completed prior to first well spudding.	

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
						SFRT agreement in place. Tier II/III emergency response plan is in place, detailing call-off and deployment of the capping stack. Status and location of suitable capping stack installation vessels confirmed within 30 days of first well spudding. Capping stack was installed as soon as reasonably practicable but within timeframes defined in Section 6.5: Source Control.	
					Contract with well control specialist (WWC/OSRL) for the duration of the P&A campaign	Records show that a contract is in place with well control specialists for the duration of the P&A campaign	
31	Mooring failure/ Emergency Disconnect	Unplanned loss of containment of kill weight brine	No release of kill weight brine to the marine environment as a result of mooring failure/Emergency Disconnect	Mooring analysis.	Mooring analysis will be undertaken before anchoring, as required by API RP 2SK Design and Analysis of Station keeping Systems for Floating Structures	Mooring analysis report shows mooring analysis was completed before anchoring commenced and records indicate mooring/anchoring undertaken as per the mooring analysis report.	MODU OIM
				Tension monitoring and station keeping	Anchor slipping / tension monitoring will be undertaken as per ISO 1990 1-7:2013 while the MODU is anchored.	Mooring records confirm anchor slipping / tension was monitored while the MODU was anchored.	MODU OIM

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
			Minimise the impact on the environment as a of mooring failure/Emergency Disconnect	Low toxicity chemicals used. Assess and confirm fluids planned for discharge are approved in accordance with Esso Chemical Selection procedure.	Only CHARM gold / silver or OCNS E / D rated chemicals or equivalent are approved for use where discharge may occur.	List of approved chemicals for discharge available to the onsite drilling supervisor.	Drilling Supervisor
						Any changes in approved chemicals approved in accordance with Esso chemical selection procedure.	
32	Monitor and Evaluate	LOWC emergency event may include Monitor and Evaluate	Esso maintains capability to implement operational monitoring in a Level 2 or 3 spill event.	Agreements/pre-qualifications	Esso maintains the following agreements (or contractor pre-qualifications) to maintain operational response capabilities: • AMOSC membership (Aerial Observers, RPS-APASA Contract). • AMSA MoU. • Aviation support (prequalification assessment) • Marine support services	Contracts/ memberships/ Memorandum of Understanding (MoU) and pre-qualification records are current.	IMT
				Oil Spill Tracking Buoys	Oil spill tracking buoy is available at heliport as well as instructions for deployment.	Records confirm that tracking buoy is available at heliport	Operations superintendent
			As requested by the relevant CA, Esso implements operational monitoring to inform spill response (Level 2 or 3 spill only).	Oil Spill Tracking Buoy Deployment	Oil spill tracking buoy is launched in the event of a Level 2/3 spill as soon as practicable but within 2 hours of the spill.	Incident management records verify that tracking buoy is deployed within suitable timeframe in the event of a Level 2 spill.	IMT Leader
				Response – Observations from aircraft / vessels	Operational monitoring is initiated during daylight hours within 24 hrs for aircraft observation and 24 hrs for additional vessel. Observation to be undertaken in accordance with OSMP O1 (Oil Spill Surveillance).	Spill response log notes that aircraft are deployed within 24 hours of spill (or nearest daylight hours immediately post 24 hours). Completed Aerial Observation Logs (as per OSMP O1)	Oil Spill Incident Controller (or delegate)

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
						emailed to IMT.	
				Oil Spill Trajectory Modelling	RPS-APASA provides OSTM results within four hours of spill notification in accordance with OSMP O1 (Oil Spill Surveillance).	Incident records verify operational monitoring timeframes met.	Oil Spill Incident Controller (or delegate)
				Response – Oil Spill Vector Calculation	Manual vector calculations identify spill impact areas utilising oil spill tracking buoy information within 1 hr of spill incident notification.	Spill response log verifies manual trajectory calculation is provided within 1 hr of spill notification.	Oil Spill Incident Controller (or delegate)
			As requested by the relevant CA, Esso implements scientific monitoring to inform spill response (Level 2 or 3 spill only).	Scientific Monitoring capabilities	Scientific monitoring is executed in accordance with the modules laid out in OSMP implementation strategy	Records confirm that performance of scientific monitoring is accordance with the modules laid out in OSMP implementation strategy.	Oil Spill Incident Controller (or delegate)
	Source Control	LOWC emergency event may include drilling a relief well and deploying a capping stack	Esso maintains capability to implement its Blackback Blowout Contingency Plan (part of WOMP)	Well Response Resources	Esso 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; • APPEA Mutual Assistance Agreement	Contracts/ agreements demonstrate preparedness.	Operations superintendent
					Esso conducts a source control desktop exercise before start of P&A activities.	Facilitated by third party with report issued in 30 days.	Operations superintendent

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
			Implement Blackback Blowout Contingency Plan	Level 2 Response	Inspection class ROV is mobilised to the field within 7 days of callout to identify possible causes of the wellhead leak.	Incident log verifies field mobilisation within this timeframe.	IMT Leader
					If considered suitable option, work-class ROV, subsea tooling and subsea engineer mobilised to site within 7 days to initiate repairs to wellhead valving (as required).	Incident log verifies field mobilisation within this timeframe.	IMT Leader
				Level 3 Response	Well control specialists are mobilised to site within 1-2 days to assist with the diagnosis of the well problem and develop remedial action options.	Contract call-out notice date and report from Well Control Specialist company verifies timeframe.	IMT Leader
					Capping stack: If considered a suitable option, capping equipment and deployment vessel is mobilised to the field within 23 days of well incident and well capping undertaken in accordance with the Capping Plan within 38 days of the equipment arriving in the field.	Contract call-out notice date and report from capping company verifies timeframe	IMT Leader
					Relief Well: Relief well installation will be in accordance with the relief well plan and is expected within 88 days of well incident occurring	Contract call-out notice date and report from MODU company verifies timeframe	IMT Leader
	Oiled Wildlife Response	LOWC emergency event may include Oiled Wildlife Response	Esso maintains capability to support oiled wildlife management in a Level 2 or 3 spill event.	Oiled Wildlife response capabilities	Esso maintains the following agreements to maintain OWR response capabilities: • AMOSC membership (equipment, personnel). • Waste management contract. • Vessel Contract; • Vessel of Opportunity listing	Contracts/memberships verify currency of membership.	IMT

RA	Activity	Hazard/Aspect	Performance Outcomes	Controls	Performance Standards	Measurement Criteria	Responsible Person
			Esso provides resources to support oiled wildlife response strategies as directed by DELWP.	Notifications	DELWP is notified as soon as possible after the sighting of oiled wildlife has occurred.	Incident management records verify that verbal and/or written notification was provided to DELWP as soon as possible after the sighting was noted.	Oil Spill Incident Controller
				OWR kits availability	AMOSC OWR kits are deployed to site within timeframes as directed by DELWP.	Incident records verify oiled wildlife response kits are deployed to site as directed by DELWP.	Oil Spill Incident Controller
				OWR resourcing	Esso meets DELWP resourcing needs throughout the response, meeting IAP performance outcomes.	Incident log verifies resources requested by DELWP met required IAP outcomes for oiled wildlife response.	Oil Spill Incident Controller
			Wildlife is only approached or handled by DELWP trained oiled wildlife responders.	Wildlife interaction inductions	Esso personnel are inducted into wildlife interaction restrictions.	Incident records verify no interaction by Esso personnel and wildlife.	Oil Spill Incident Controller

6 Emergency Response Planning

6.1 Oil Spill Planning Scenario Development

Sections 5.26 and 5.30 presents the oil spill risk assessment for Blackback P&A campaign. For the purpose of response planning, three representative pollution scenario, one from each response level, were selected for further analysis (Table 6-1).

Table 6-1 Credible spill scenarios identified response planning

Spill Scenario	Max. Spill Volume	Duration	Oil Type	Level
Spill during MODU refuelling (e.g. fuel line/coupling failure, leaks from hoses etc.)	5 m^3	1 Hr	MDO (Diesel)	1
Vessel collision resulting in fuel tank rupture and release of diesel	280 m^3	6 Hrs	MDO (Diesel)	2
Release of light crude from Loss of Well Control	3 days @15,200 bbl/day (2,416m^3/day) + 85 days @1,600 bbl/day (254 m^3/day)	88 days	Light Crude	3

The Loss of Well Control (LOWC) represents the worst-case discharge scenario (WCDS) and is used to demonstrate that all reasonable practicable measures to reduce oil pollution risk will be implemented and the adopted oil pollution response control measures and response arrangement detailed in the OPEP will be effective in reducing impacts and risks to ALARP.

6.2 Response Strategy Options

Spill response strategies for each scenario were evaluated. Results are summarised Table 6-2 and Table 6-3, for MDO and Blackback light crude, respectively. As both MDO and Blackback light crude are highly volatile and neither of the spills are predicted to hit shoreline at the lowest thresholds, except for the ANZECC reference value for entrained hydrocarbons, the primary response strategies for both oil types and all scenarios are limited to:

- Source Control,
- Natural Recovery, and
- Monitoring, Evaluation and Surveillance (MES).

Table 6-2 Response technique evaluation for a Marine Diesel Oil spill

Response Option*	Benefits	Effectiveness on MDO spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of oil to the marine environment.	**Yes**	✓
Natural Recovery	Non-intrusive so no impact to the environment.	MDO degrades rapidly in the open ocean. Natural recovery is therefore a viable option.	**Yes**	✓
Monitor, Evaluate and Surveillance	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Monitoring, Evaluation and Surveillance used to observe the natural break-up and dissipation of MDO spill without the need for active intervention.	**Yes**	✓
Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit	Dispersant application is not recommended for MDO as it spreads rapidly to a thin layer. Dispersant droplets are known to penetrate through the thin oil layer and cause 'herding' of the oil. This creates areas of clear water but is not successful dispersion (see The International Tanker Owners Pollution Federation [ITOPF] Technical Information Paper No. 4: The Use of	**Not viable**	x

Response Option*	Benefits	Effectiveness on MDO spill	Viable Response?	Net Benefit?
	to sea-surface /air breathing animals.	Chemical Dispersants to Treat Oil Spills). Application of dispersant can contribute to water quality degradation through chemical application without removing surface oil. Considered not to add sufficient benefits.		
Contain & Recover	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	MDO spreads rapidly to a thickness of less than 10 µm. Containment is ineffective at these thicknesses.	**Not viable**	-
Protect & Deflect	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g., current, waves) limit application	The field is sufficiently far from shore that coastline impact is not predicted.	**Not required**	-
In-situ burning	In-situ burning (burning oil in place) can quickly eliminate large quantities of spilled oil.	MDO spreads rapidly to a thickness of less than 10 µm. Containment is ineffective at these thicknesses.	**Not viable**	-
Oiled wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-spill captive management.	Given limited size and rapid spreading of the spill, OWR is unlikely to be required. OWR may be implemented if required. To be assessed on case-by-case basis.	**Not required**	-
Shoreline Clean-up	Last line of defence to remove oil from the marine environment.	The field is sufficiently far from shore that coastline impact is not predicted.	**Not required**	-

* *At ANZECC Reference threshold for entrained hydrocarbons (Environmental Monitoring ZPI), there is the potential for shoreline impact at below NOEC Concentrations. However, these concentrations are too low for any controls, except MES, natural recovery and source control to be effective.*

Table 6-3 Response technique evaluation for Loss of Well Control scenario

Response Option*	Benefits	Effectiveness on Blackback Light Crude Spill	Viable Response?	Net Benefit?
Source Control	Limit flow of hydrocarbons to environment.	Only viable option to stop flow of oil to the marine environment.	**Yes**	✓
Natural Recovery	Non-intrusive so no impact to the environment.	Blackback light crude weathers rapidly in the open ocean. Natural recovery is therefore a viable option.	**Yes**	✓
Monitor, Evaluate and Surveillance	Although surveillance is not an active intervention to treat or remove oil pollution, it is critical to effective response both in the initial stages of an incident and during ongoing response operations.	Monitoring, Evaluation and Surveillance used to observe the natural break-up and dissipation of Blackback light crude spill without the need for active intervention.	**Yes**	✓
Surface Dispersant Application	Dispersants act by allowing hydrocarbons to be mixed into the upper layers of the water column, which accelerates the biodegradation process. Removes oil from the water surface, protecting leeward shorelines and providing benefit to sea-surface /air breathing animals.	Blackback light crude is highly volatile and will be removed from the sea surface by evaporation. Dispersant is ineffective on Group 1 oils due to the very low viscosity and high volatility. Moreover, Blackback is too far offshore for a worst-case spill to pose a threat to the coastline. Application of dispersant can contribute to water quality degradation through chemical application, without removing surface oil. Considered not to add sufficient benefits.	**Not viable**	x
Subsea Dispersant Application	Applies dispersant directly to the source, allowing less dispersant to be used. Prevents liquid hydrocarbons from reaching the	Modelling shows that only a limited quantity will make it to the surface, without any intervention, with most either entrained or dissolved into the	**Not viable**	-

Response Option*	Benefits	Effectiveness on Blackback Light Crude Spill	Viable Response?	Net Benefit?
	surface, reducing VOCs at the surface.	water column (Section 5.30.3; APASA 2018b) Additionally, due to the distance from shore and low risk of shoreline impact, disadvantages outweigh benefits.		
Contain & Recover	Booms and skimmers to contain surface oil where there is a potential threat to environmental sensitivities. Relies on calm sea conditions, thicknesses >10µm to collect and adequate deployment timeframes.	Blackback crude oil is removed rapidly from the surface through evaporation. Suitable thickness for recovery will be present for only a very short period, making contain and recovery option ineffective. In Bass Strait sea conditions likely to be suitable for containment and recovery operations only 50% of the time.	**Not viable**	-
Protect & Deflect	Booms and skimmers deployed to protect environmental sensitivities. Environmental conditions (e.g., current, waves) limit application	The Blackback field is sufficiently far from shore that coastline impact is not expected.	**Not required**	-
In-situ burning	In-situ burning (burning oil in place) can quickly eliminate large quantities of spilled oil.	Blackback light crude is removed rapidly from the surface through evaporation. Suitable thickness for burning will be present for a very short period, making contain and recovery option ineffective. In Bass Strait sea, conditions likely to be suitable only 50% of the time.	**Not viable**	-
Oiled wildlife Response (OWR)	Consists of capture, cleaning and rehabilitation of oiled wildlife. May include hazing or pre-spill captive management.	Given limited size and rapid spreading of the spill, OWR is unlikely to be required. OWR may be implemented if required. To be assessed on case-by-case basis.	**Unlikely to be required**	-
Shoreline Clean-up	Last line of defence to remove oil from the marine environment.	The Blackback field is sufficiently far from shore that coastline impact is not expected.	**Not required**	-

* *At ANZECC Reference threshold for entrained hydrocarbons (Environmental Monitoring ZPI), there is the potential for shoreline impact at below NOEC Concentrations. However, these concentrations are too low for any controls, except MES, natural recovery and source control to be effective.*

6.3 Tactical Response Planning

Anticipated response for the three scenarios are presented in Table 6-4, Table 6-5 and Table 6-6 respectively. The following sections analyses each response strategy in more detail with the objectives of:

(1) ensuring sufficient resources are available to meet the needs of the response;

(2) evaluating effectiveness of each response strategy and level of performance required;

(3) developing environmental performance standards;

(4) exploring options to improve the effectiveness and/or determine the need for any further resources.

Table 6-4 Tactical response for Level 1 spill scenario

Spill Location:	**Blackback**
Duration of spill:	1 hour
Spill description:	Bunkering spill
Volume of oil discharged	<5 m^3
Oil Type:	MDO
Activity	**Anticipated response actions**
Incident management	Incident Command and Response team is established under the leadership of the Incident Commander (IC) (Section 6.3)

	Notifications are made to onshore headquarters and external agencies, in conformity with the OPEP.
Surveillance and assessment	A crew transfer helicopter is mobilised and a trained observer makes an initial overflight.

Table 6-5 Tactical response for Level 2 spill scenario

Spill Location:	**Blackback**
Duration of spill:	12 hours
Spill description:	Vessel spill
Volume of oil discharged	280 m^3
Oil Type:	MDO
Activity	**Anticipated response actions**
Source control	Source control is initiated in accordance with the vessel operating procedures.
Incident management	Incident Command and Response team is established under the leadership of the Vessel Master. Notifications are made to onshore headquarters and external agencies in conformity with the vessel SOPEP and Blackback P&A OPEP. A supporting incident management team is established at Esso's onshore headquarters to aid coordination of response and handle media enquiries.
Surveillance and assessment	**As per OPEP:** **Day 1** • A crew transfer helicopter is released from evacuation duties and a trained observer liaises with the pilot to undertake surveillance activities. • A tracking buoy is deployed either by a vessel or helicopter • Weather forecast is obtained from the Bureau of Meteorology • Desktop trajectory modelling is undertaken • A proprietary oil spill trajectory model is run to provide prediction of slick movement under prevailing and forecast weather conditions • Water and oil sampling is undertaken in accordance with OSMP **Day 2** A schedule of ongoing twice-daily overflights is agreed. After two days that the spill is no longer visible then aerial surveillance is stood down.

Table 6-6 Tactical response for Level 3 spill scenario

Spill Location:	**Blackback**
Duration of spill:	• 38 days based on VICSS installation • 70 days based on HLV mobilisation of Relief well MODU • 88 days based on wet tow of Relief well MODU Note: spill modelling based on estimated preliminary durations (Section 5.30): • 88 days for drilling of relief well • 38 days for capping stack installation;
Spill description:	Blowout
Volume of oil discharged	2,417 m^3/day for 3 days, then 245 m^3/day for 85 days • 16,154 m^3 before capping stack installation (38 days of release) • 28,874 m^3, based on relief well alone (88 days release)
Oil Type:	Group I (non-persistent)
Activity	Anticipated response actions
Source control	All operations are shut down and a Well Engineer called in for assistance within 6 hours. Well control consultants from WWC are mobilised and expected on site at the onshore emergency control centre within 24 hours.

Spill Location:	Blackback
Evacuation and fire hazard control	Non-essential personnel are evacuated to the mainland. During the first few hours of the spill, the Site Safety Officer verifies that all sources of ignition are shut down or removed from the area. A shipping exclusion zone of 5 km is established and broadcast.
Well control plan	**Day 1: Well control plan is activated** The well control plan is activated, including implementation of well capping, backed up by a relief well drilling plan. **Day 7: SFRT mobilised to site** It is estimated that it will take 7 days to mobilise the SFRT from Perth to site and 7 days for small scale debris clearing and 30 days to mobilise the capping device for vertical installation from Singapore to site, with the high potential to shut in the uncontrolled well within 38 days. **Day 23: VICSS on-site** The Vertical Installation Capping Stack System (VICSS) is on site and being deployed. **Day 38: Well successfully capped** The capping device is functional and at this point no further oil would be spilled. Oil spill response operations continue until the relief well is drilled. **Day 35: Relief well rig on-site (HLV scenario)** It will take approximately 35 days to mobilise relief well MODU to site when using a HLV, or 51 days for a wet-tow. A further 35 days are estimated to complete the relief well and kill the blowout. **Day 70: Relief well successfully completed – effective well kill** Effective well kill is estimated to take 70 days for the HLV scenario) or 88 days for the wet-tow scenario. **Day 86: Time to install OICSS** Mobilisation of an offset capping stack system (OICSS) would require 56 days, and a further 30 days to cap the well, resulting in well shut in after 86 days. On this basis, use of an offset capping stack scenario is last resort, as well intervention is estimated to take less time.
Incident management	**Day 1** The Incident Management Team (IMT) is assembled at the onshore emergency control centre within 60 minutes of the initial report. Working to an Incident Command System (ICS), the team quickly establishes the key management team sections and undertakes initial procedures in conformity with guiding action checklists in the OPEP. An Incident Action Plan for the next operating period (the following day) is drafted by the end of the day. Notifications to external authorities are made as detailed in OPEP. **Day 2** Relevant authorities embed liaison officers within the IMT and technical support from AMOSC, WWC and OSRL are on site, fulfilling roles within the ICS sections. Corporate company support is en-route via a regional response team, with a view to establishing a sustainable IMT for the coming weeks. A media and public affairs team is established with staffing of 10 persons drawing on corporate support. A website providing incident data directly to the public is live. **Day 3** An ICS planning cycle is fully functional. The IMT is fully staffed, with future support identified to ensure ongoing sustainability. Offers are received from the broader industry to provide technical support personnel; these are held on file and relevant personnel put on alert for potential mobilization if needed. **Day 4** AMOSC and/or OSRL personnel are on site and integrated into the IMT, providing a variety of technical expertise and operational support. **Day 5 onwards** The IMT is regarded as a sustainable entity, with staff rotations in place to ensure all personnel receive an adequate number of rest days.
Surveillance and assessment	**Day 1**

Spill Location:	Blackback
	• A crew transfer helicopter is released from evacuation duties and a trained observer liaises with the pilot to undertake an overflight to undertake surveillance activities. • A tracking buoy is stored at the Longford Heliport and deployed within two hours either by a vessel of helicopter. • Weather forecast is obtained from the Bureau of Meteorology • Desktop trajectory modelling is undertaken • A proprietary oil spill trajectory model is run to provide prediction of slick movement under prevailing weather conditions. • Water and oil-sampling is undertaken in accordance with OSMP The authorities have been notified and an AMSA representative accepts an offer to join the overflight. A proprietary oil spill trajectory model is run to provide a prediction of slick movement under the prevailing weather. The BOM provides the latest weather forecasting. **Day 2** A schedule of ongoing twice-daily overflights is agreed, with company and authority representatives on all flights. The contracted aviation company has an adequate number of twin-engined helicopters available. Aerial observations identify oil pollution (Code 1 and Code 2) covering an area of around 20 km^2 containing an estimated 120 m3 of oil. The oil is thinly spread (sheen/rainbow appearance) and evaporating rapidly. **Days 5 and onwards** By agreement, AMSA mobilises fixed-wing dedicated pollution monitoring aircraft (with remote sensing capability). This aircraft provides primary aerial surveillance and pollution-targeting capacity for the remainder of the incident, supplemented by helicopters.
Dispersant	N/A (Table 6-3)
In-situ burning	N/A (Table 6-3)
Containment and recovery	N/A (Table 6-3)
Shoreline protection and clean-up	Not required (Table 6-3)
Wildlife response	Not required (Table 6-3)

6.3.1 Emergency Management and Response System (EMRS)

The chain of command, including roles and responsibilities of personnel undertaking source control during an emergency blowout response and how these personnel will interface with the incident management team detailed in the OPEP is summarised in the "*Emergency Preparedness and Response Bridging Document: Blackback P&A Campaign"*.

This document has been developed to ensure that emergency support responsibilities are defined and agreed between Esso Australia Pty Ltd (EAPL - Emergency Support Group and Incident Management Teams) and the Esso Australia & PNG Drill Team in support of Diamond Offshore General Company (DOGC, Ocean Monarch). The ExxonMobil Emergency Response Model (Figure 6-1) illustrates how tactical response escalates from a Level 1 to a Level 2 then Level 3 response, each level being absorbed into the next level during transition.

Esso's emergency management and response system is based on the simplified diagram in Figure 6-2. The response structure is designed to cater for any size emergency. The extent to which this structure is used in practice depends on the nature of the particular emergency that may arise. Guidelines are used to help classify the emergency and determine the extent to which the response structure is mobilised.

Esso's Emergency Support Group (ESG) structure is detailed in Figure 6-2. Esso's Incident Management Team (IMT) structure is based on Figure 6-3.

Support from EMDC and DOGC will be requested as necessary to provide advice to other IMT participants fulfilling their response roles.

Refer to "*Emergency Preparedness and Response Bridging Document: Blackback P&A Campaign*" for an overview of the DOGC / Ocean Monarch Emergency Response Framework (extract from DODI "*Australasian Region Emergency Response Manual*").

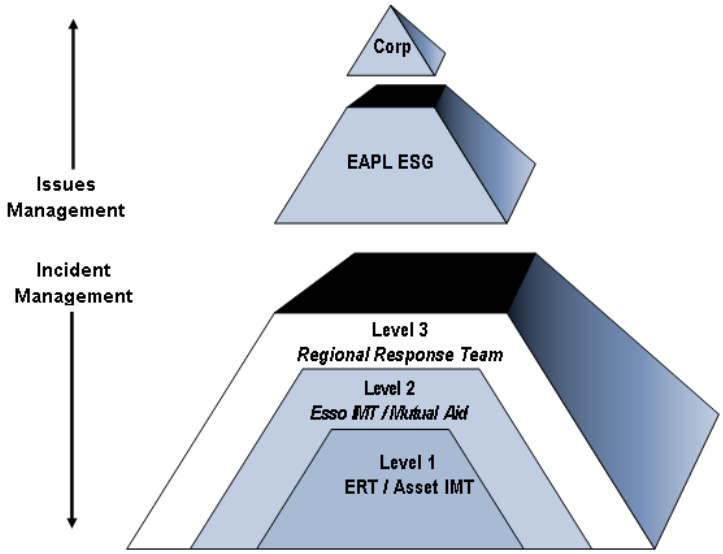


Figure 6-1 Esso emergency management and response system

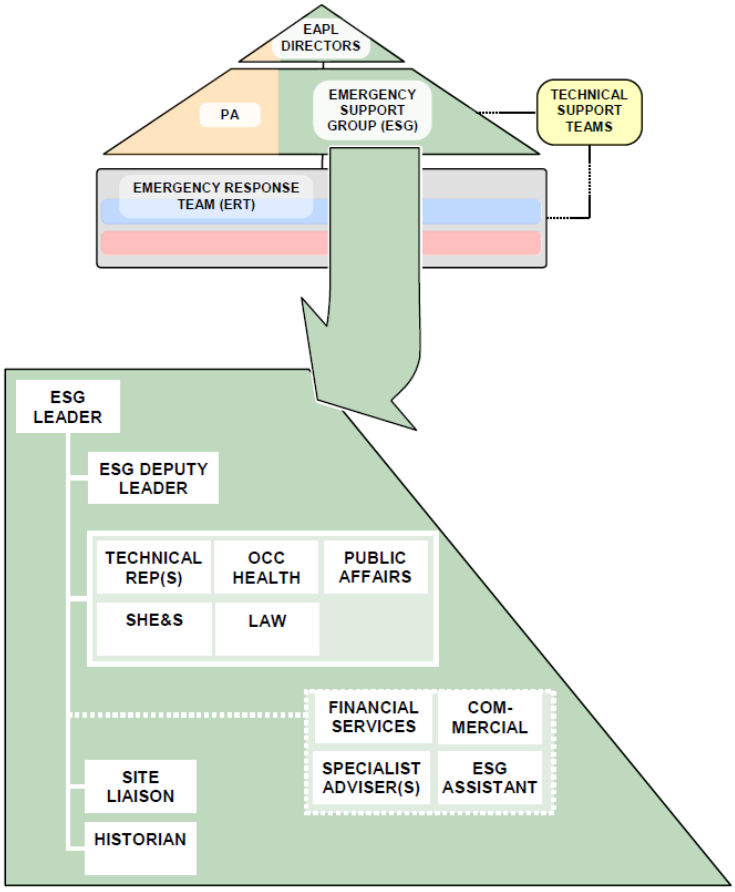


Figure 6-2 Organisation Chart – Esso Emergency Support Group (ESG) structure

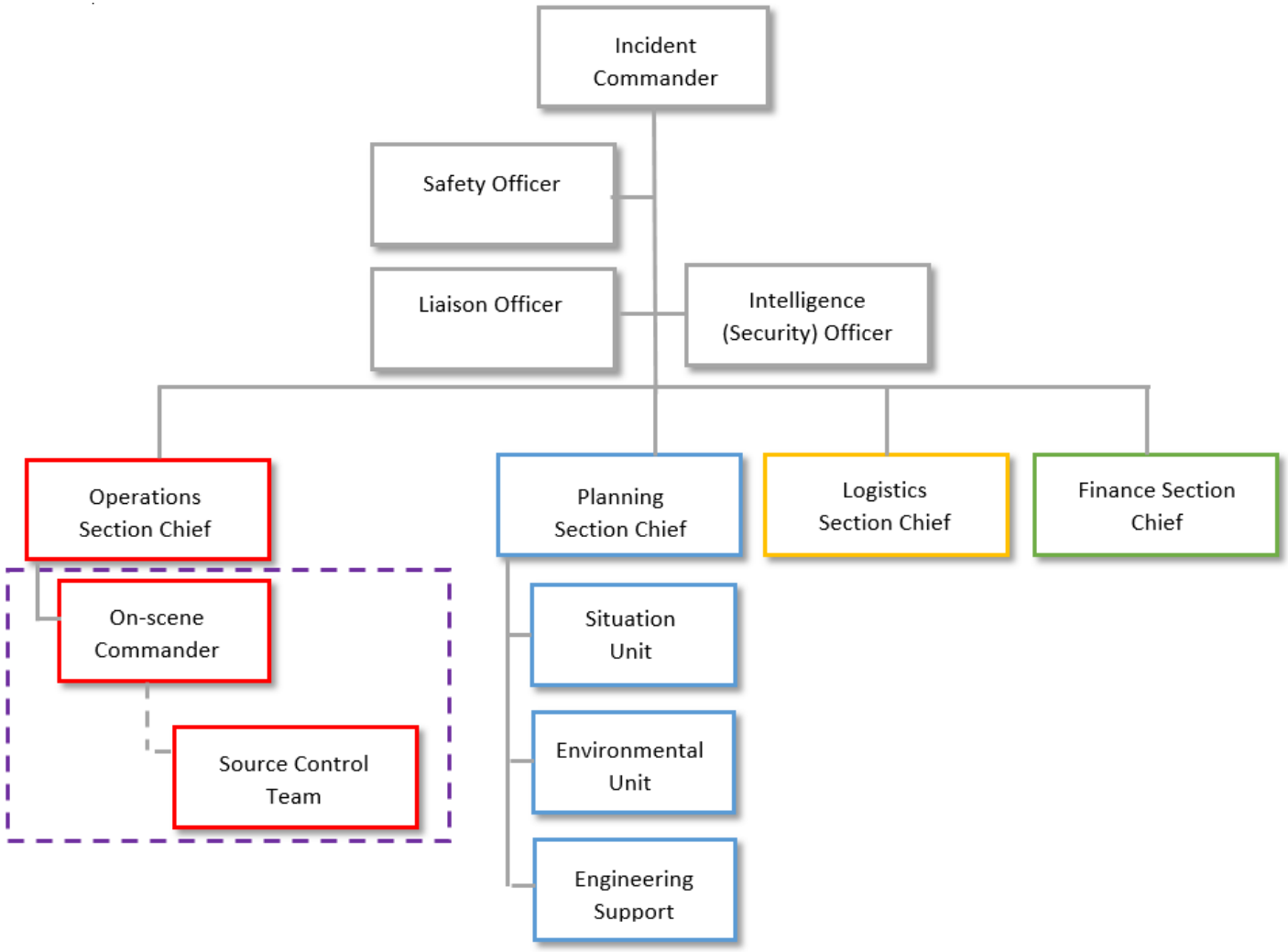


Figure 6-3 Organisation Chart – Esso Incident Management Team (IMT) structure

6.3.2 Incident Management Team (IMT)

The structure of the IMT (Figure 6-3) is based on the Incident Command System detailed in the Incident Management Handbook (The Response Group, 2015). The structure is consistent with the Australasian Inter-Service Incident Management System (AIIMS), which ensures that any interface between Commonwealth and State incident and emergency response organisations are aligned.

The structure of the team is scalable and flexible such that, if the incident dictates, not all roles need to be filled or one person can fill multiple roles. The role holders can also evolve over time. As the responsibility for the response moves from one organisation to another, a role may be replaced with a more suitable or more competent individual or the incident may be of such duration that shift change is required.

The IMT Leader (or Incident Commander (IC)), assisted by the IMT, is responsible for command, control and coordination of the response to incidents and for supporting the On-scene Commander (OC) in the tactical response to any incident. Responsibilities and checklists for IMT members are provided in the Incident Management Handbook (The Response Group, 2015).

The responsibilities highlighted by the purple box in Figure 6-3 will be undertaken by the Esso Australia & PNG Drill Team and Diamond Offshore personnel. The Source Control Group Supervisor will be a senior member of the Australian Drill Team whenever possible, with the on-scene roles being filled by MODU personnel (e.g. the MODU OIM would be the OC).

6.3.3 Source Control Branch (SCB)

Figure 6-4 outlines the organisation chart for the Source Control Branch (SCB), as further described in the ExxonMobil Incident Management Handbook (ExxonMobil 2015). The SCB reports to the IMT through communication between the IMT Operations Section and the SCB Director. The SCB consists of the following roles, assigned to specific source control tasks:

- SCB Director
- Well Intervention & Containment team
- Debris Removal team
- Subsea Dispersant team
- Relief Well team
- Flow Engineering team
- SSH&E and Risk Assessment Support
- Human Resources and legal support
- Logistics, Finance and Planning support

Additionally, the SCB is supported by SIMOPS and the On-Scene Commander.

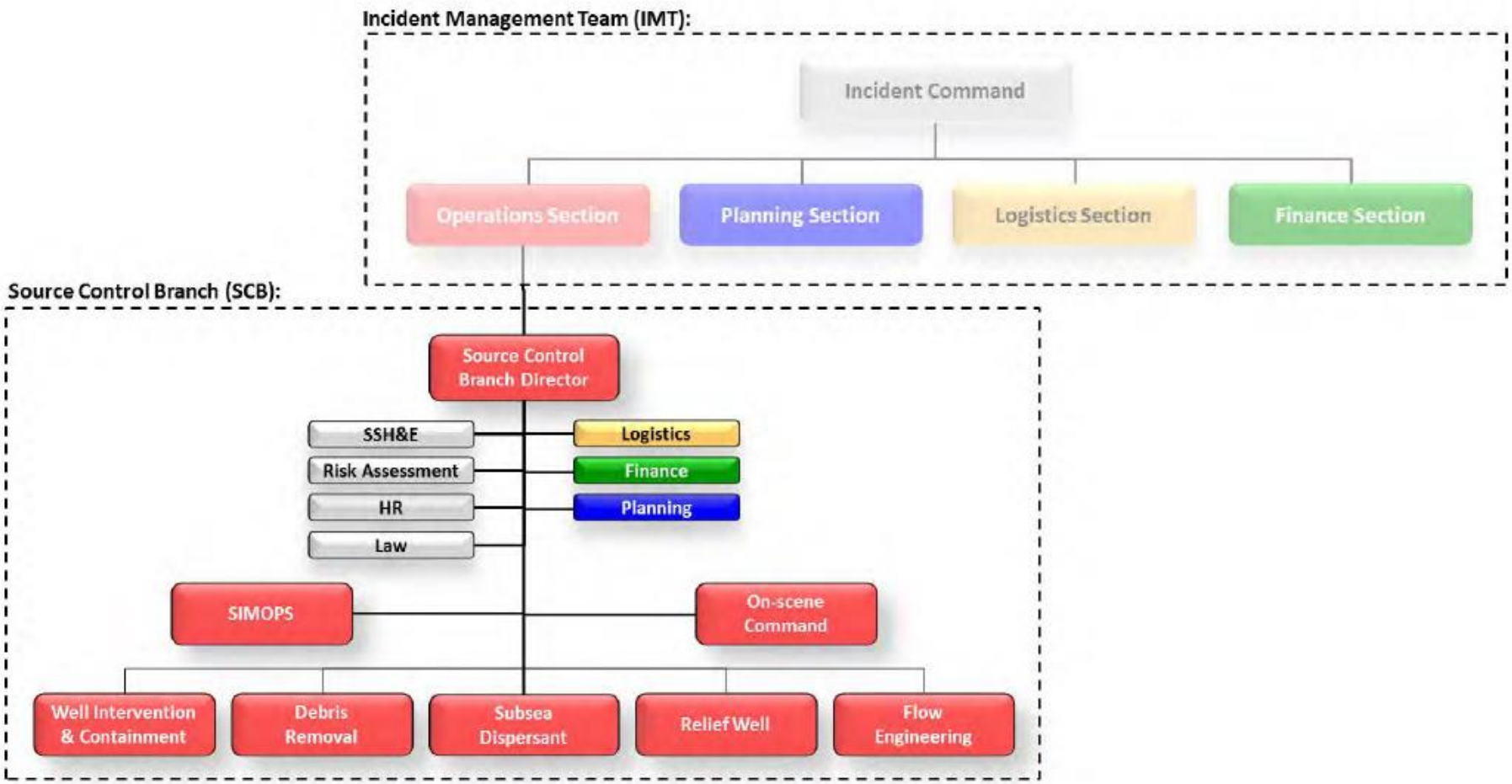


Figure 6-4 Organisation Chart – Esso Source Control Branch (SCB)

6.4 Monitoring, Evaluation and Surveillance (MES)

Monitoring and evaluating the oil spill is essential for maintaining situational awareness and assessing the environmental impact. This is fundamental to putting in place an effective oil spill response strategy. The key methods are:

- Aerial observation;
- Vessel-based observation;
- Computer-based tools:
    - Oil spill trajectory modelling;
    - Vector analysis (manual calculation); and
    - Automated Data Inquiry for Oil Spills (ADIOS) (a spill weathering model).
- Utilisation of satellite tracking drifter buoys;
- Remote sensing from aircraft;
- Remote sensing from satellite; and
- Water quality and oil sampling.

6.5 Source control

6.5.1 Overview

In order to regain control of a subsea well, Esso would first secure the safety of all personnel on board the rig and then begin a detailed evaluation of the incident. If available, the ROVs at site would be used to inspect the condition of the subsea tree, wellhead, BOP and other subsea well equipment. If applicable, attempts would be made to close the subsea tree or BOP through manual intervention using the ROV. Should this be unsuccessful, then the Source Control Plan would be activated. The well construction team and well control contractors would collectively assess the situation to determine the best course of action.

Source control tools available include:

- The Subsea First Response Toolkit (SFRT)
- Installation of capping stack (after the subsea tree is retrieved)
- Drilling a relief well

The impacts and risks associated with performing these activities are consistent with those already evaluated by this EP (Sections 5.26 and 5.30), and thus not discussed further.

The relief well offset from well blow-out incident will be based on observed release rates and prevailing weather conditions. Historic wind and current data (strength and direction), and estimated release rate indicates (extent of flammable gas cloud; WWC 2017) that an offset 500m SSE is a reasonable planning basis.

6.6 Operational and Scientific Monitoring Plan

In the event of a significant hydrocarbon release incident at the Blackback P&A operational area, a number of environmental monitoring studies will be implemented to inform spill response (Operational Monitoring) and to evaluate the potential environmental impacts to the marine environment (Scientific Monitoring). These are detailed in the Operational and Scientific Monitoring Plan (OSMP).

The potential impacts of MDO and light crude spills have been assessed in Section 5.26 & 5.30 of this EP, with management and response measures provided in the associated Oil Pollution Emergency Plans (OPEP; Appendix D). The content of the OSMP is aligned with the environmental sensitivities outlined in Section 3 of this Environment Plan.

A consolidated list of OSMP studies and references to each study's strategy and implementation plan are provided in Table 6-7.

Table 6-7 OSMP Studies and Monitoring Performance Objectives and reference to OSMP Sections for each study's strategy and implementation

Study ID	Study Name	OSMP Section	Implementation Plan
Operational (response phase) monitoring modules			
O1	Oil spill surveillance	3.1	O1
O2	Water and oil sampling	3.2	O2
O3	Shoreline assessment	3.3	O3
O4	Fauna observations	3.4	O4
O5	Air quality	3.5	O5
Scientific (recovery phase) monitoring modules			
S1	Ecotoxicity	4.1	S1
S2:	Hydrocarbon monitoring of intertidal sediments and water	4.2	S2
S3:	Hydrocarbons in offshore sediments	4.3	S3
S4	Fish and shellfish taint and toxicity for human consumption	4.4	S4
S5	Short-term impacts to oiled fauna and flora	4.5	S5
S6	Long-term impacts to commercial and recreational fisheries	4.6	S6
S7	Long-term impacts to fauna	4.7	S7
S8	Long-term impacts to subtidal and intertidal benthic habitat	4.8	S8
S9	Long-term impacts to coastal flora	4.9	S9
S10	Long-term impacts to Ramsar values	4.10	S10

Table 6-8 Sensitivities which may be to be monitored as part of the OSMP in the event of a Level 2 spill

Environmental Sensitivity	General Offshore	Shoreline impact	OSMP Monitoring Studies	Applicable OPEP response measure
General Offshore				
Plankton	Yes		O2: Water and oil sampling S1: Ecotoxicology	MES
Fish/	Yes		S1: Ecotoxicology S4: Fish and Shellfish Taint	MES
Cetaceans/ Seals/Turtles	Yes		O4: Fauna observations S7: Long-term impacts to fauna	MES
Sub-tidal Zone				
Sub-tidal rocky reefs		Yes	S3: Hydrocarbons in offshore sediments S8: Long-term impacts to subtidal and intertidal benthic habitat	MES
Intertidal Zone				
Sandy beach		Yes	O3: Shoreline assessment S2: Hydrocarbon monitoring of intertidal sediments and water	MES Shoreline Clean-up
Mixed sand beach / platform		Yes	O3: Shoreline assessment S2: Hydrocarbon monitoring of intertidal sediments and water	MES
Seagrass		Yes	O3: Shoreline assessment S8: Long-term impacts to subtidal and intertidal benthic habitat	MES
Kelp-dominated reefs		Yes	O2: Water and oil sampling S8: Long-term impacts to subtidal and intertidal benthic habitat	MES
Saltmarsh/wetlands		Yes	O2: Water and oil sampling O3: Shoreline assessment S8: Long-term impacts to subtidal and intertidal benthic habitat S9: Long-term impacts to coastal flora S10: Long-term impacts to Ramsar values	MES, P&D Protect & Deflect
Upper Shore				
Seabird/shorebird breeding, feeding and resting area		Yes	O2: Water and oil sampling O3: Shoreline assessment S8: Long-term impacts to subtidal and intertidal benthic habitat S5: Short-term impacts to oiled fauna and flora	MES, Oiled wildlife response
Seal Colonies/Haul-out		Yes	O4: Fauna observations S7: Long-term impacts to fauna	MES
Fishing				
Commercial and recreational fishing	Yes	Yes	S4: Fish and Shellfish Taint	MES

Note. Studies O1: Oil spill surveillance & O2: Water and oil sampling are considered to be general and therefore apply to all environmental sensitivities.

7 Implementation Strategy

The implementation strategy described in this section identifies systems, practices and procedures to be used to ensure that the environmental impacts and risks of the activity are reduced to As Low As Reasonably Practicable (ALARP) and acceptable levels, and that the environmental performance outcomes and standards in the EP are met.

7.1 Esso Operations Integrity Management System (OIMS)

Esso is committed to conducting business in a manner that is compatible with the environmental and economic needs of the communities in which it operates, and that protects the safety, security, and health of its employees, those involved with its operations, its customers, and the public. These commitments are documented in the Safety, Security, Health, Environmental, and Product Safety policies.

These policies are put into practice through a management system called the OIMS. Esso's OIMS Framework establishes common worldwide expectations for addressing risks inherent in the business. The term Operations Integrity (OI) is used by Esso to address all aspects of its business that can impact personnel and process safety, security, health and environmental performance.

The Blackback P&A campaign will operate in accordance with the proprietary ExxonMobil Operations Integrity Management System (OIMS). OIMS is adopted by all ExxonMobil affiliates worldwide.

7.2 Diamond Offshore Safety and Environmental Management System (SEMS)

This project is being implemented under the umbrella of the ExxonMobil Environmental Policy and OIMS which the drilling contractor, supply vessels and any other contractors, must abide by. The drilling contractor and supply vessels and contractors have in place formal, written systems, practices and procedures for management of HSE.

Through the Third Party Services Element of OIMS (Element 8), third party systems practices and procedures are reviewed and assessed for acceptability by Esso prior to commencement of operations. Third party servicers and systems are subject to regular audits throughout the program, at a minimum these are conducted annually as part of the critical contractor's evaluation program.

Diamond Offshore, as the nominated Facility Operator of the Ocean Monarch MODU, has in place a comprehensive Safety and Environmental Management System (SEMS) and Risk Management process.

Diamond Offshore ensures that all activities undertaken on the MODU are conducted and managed under the Ocean Monarch SEMS and all personnel including third party contractors are provided with induction training into the SEMS system prior to undertaking work on the Ocean Monarch.

Spill prevention controls include inspection/audit procedures that address housekeeping, leaks/spills, and storage areas, Marine Operations Procedures and Fuel Oil Transfer Procedures.

MODU operations are conducted within a framework of environmental awareness training, routine inspections, job safety analysis and incident reporting.

7.3 Blackback P&A Documents

The following documents have been developed for the Blackback P&A campaign and set the standards and requirements to be met for the P&A campaign by all parties (Esso, Diamond Offshore MODU, Support Vessels and Contractors):

- The Blackback P&A Environmental Plan (this document)
- The Blackback P&A Bridging Emergency Response Plan (ERP)
- The Blackback P&A Oil Pollution Emergency Plan (OPEP)
- The Blackback P&A Waste Management Plan (WMP)

The content of these documents is introduced as part of the induction process for personnel on-board the MODU and supply vessels, and copies are made available to crew members prior to the commencement of any work.

7.4 Training and Competency

Esso requires that all personnel be trained in accordance with their respective contractor- established training requirements as well as Esso contractually specified requirements.

The Diamond Offshore Human Resources Manager ensures that personnel assigned to HSE positions are adequately experienced and qualified for their roles.

Diamond have established the worldwide competency program, which is integrated with the company's personnel and payroll systems and provides system controls and documentation of completion. Audits of the competency program are conducted through the internal annual GEMS, regulator, customer and IADC accreditation audits. Each third party service provider is also required to maintain training files for their personnel. These records are verified as part of initial contract requirements and then audited at a minimum of annually for critical contractors.

7.5 Reporting and Inspections

The following table provides a summary of the external notifications and reporting arrangements.

Table 7-1 External Notification and Reporting Requirements

Notification	Timing	Reference/Comments
All relevant non-government stakeholders	At least 1 month and 1 week prior to planned activity commencement	All relevant stakeholders listed in the stakeholder register (email)
	Within 10 days of activity completion	
NOPSEMA	At least 10 days prior to activity	OPGGS(E) Reg 29 (submissions@nopsema.gov.au)
	Within 10 days of activity completion	
	At activity finalisation and obligation completion	OPGGS(E) Reg 25A
AHS - commencement date and duration	At least 4 weeks prior to activity	AHS issues a Notice to Mariners (datacentre@hydro.gov.au).
Transport Safety Victoria (TSV) - commencement date and duration.	At least 2 weeks prior to activity commencement.	TSV to issue Notice to Mariners (information@transportsafety.vic.gov.au).
AMSA	24-48 hrs before start of activity. Reconfirm on activity commencement	AMSA issues AusCoast Warnings for activity (rccaus@amsa.gov.au)
	On vessel demobilisation from field	
Provide cetacean observation data to the DoEE.	Within 3 months of activity completion	Upload information to: https://data.marinemammals.gov.au/csa

7.5.1 Monitoring and recording emissions and discharges

Table 7-2 provides a summary of the environmental risk monitoring requirements for the P&A activities. This should be considered along with the Performance Standards, Objectives and Criteria in Chapter

5. The MODU OIM and Esso Drilling Superintendent are responsible for ensuring the monitoring is undertaken as per the EP.

Table 7-2 Summary of environmental monitoring/recording and reporting requirements

Environmental Risk	Criteria to be Monitored	Frequency of Monitoring and Reporting
Hazardous waste disposal	Type and volume	Ongoing (EPR)
Diesel usage	Volume	Ongoing (EPR)
Oil spills	Type and volume	Each incident (IR)
Chemical spills	Type and volume	Each incident (IR)
Discharge of interface fluids	Volume and corresponding retort test analysis	Daily during campaign (EPR)
Discharges of cement	Volume of cement discharges	Daily during campaign (EPR)
Chemical Inventory	Type	Ongoing (EPR)
Fuel use (MODU, support vessels)	Volume	Ongoing (EPR)
Vessels entering safety zone	Per incident	Ongoing
Oily water (bilge) discharge	Discharge volume; oil in water concentration	Ongoing (EPR)
Waste to shore from MODU	Volume and type	Event/consignment (EPR)
Domestic waste discharge (Sewage/Food Scraps)	Discharge volumes; Compliance with MARPOL	Ongoing (EPR)
Incinerated waste (if present and used)	Volume, incineration temperature	Ongoing (EPR)
Ballast Water Discharges	Exchanged volume; distance from nearest land	Ongoing (EPR)
Sightings and Impacts to wildlife	Type	Ongoing (EPR/IR)

EPR: Environmental Performance Report
IR: Incident Report

7.5.2 Incident Notification and Reporting

The OPGGS(E) Regulations 2009 define "*Recordable Incidents*" and "*Reportable Incidents*", and also defines reporting requirements for each type of incident.

All environmental incidents and near misses are reported by Diamond Offshore and the supply vessels to Esso. Esso notifies and reports incidents to NOPSEMA in accordance with OPGGS(E) Regulations.

Incidents are managed internally by Esso in accordance with OIMS System 9-1 (Incident Management) to ensure valuable information and lessons learnt are available to improve operations and prevent the recurrence of similar incidents.

In addition to the OPGGS(E) Regulations 2009 requirements, unplanned releases of hydrocarbon liquid or non-approved chemicals exceeding 80 litres into the marine environment (while performing a petroleum activity) are to be reported to AMSA.

Other vessel incidents (while not performing a petroleum activity) must also be reported in accordance with the Navigation Act 2012 and other regulations.

In addition to the OPGGS(E) Regulations 2009 requirements, unplanned releases of hydrocarbon liquid or non-approved chemicals exceeding 80 litres into the marine environment (while performing a petroleum activity) are to be reported to AMSA.

Other vessel incidents (while not performing a petroleum activity) must also be reported in accordance with the Navigation Act 2012 and other regulations.

Table 7-3 Reporting to AMSA and other government agencies - marine pollution incidents/injuries

Petroleum Activity: Actual or potential unplanned releases of hydrocarbon liquid or non-approved chemicals exceeding 80 litres into the marine environment (while performing a petroleum activity). https://www.amsa.gov.au/contact-us/index.asp#report POLREP: https://amsa-forms.nogginoca.com/public/	• **Verbally at the first available opportunity** • **POLREP report within 3 days** (see OPEP) AMSA 24 Hour Emergency Contact Numbers 1800 641 792 (Maritime) 1800 815 257 (Aviation) or +612 6230 6811 (Maritime) +612 6230 6899 (Aviation)	Vessel Master outside 500m petroleum safety zone OIM within the 500m petroleum safety zone
Outside 500m petroleum Safety Zone: AMSA will be notified by the Vessel Master if any of the following incidents occur (while not performing a petroleum activity): • An oil pollution incident from a vessel has occurred in Commonwealth waters (Marine Notice 1/1996); • The vessel has sustained or caused an accident occasioning loss of life or serious injury; • The vessel has received damage or is defective affecting its seaworthiness; or • There is a serious danger to navigation resulting from a vessel (e.g. a sizable piece of equipment likely to float is lost overboard). https://www.amsa.gov.au/environment/regulations/marpol/reporting-pollution/index.asp	• **Verbally at the first available opportunity** • **POLREP report within 2 hours** AMSA 24 Hour Emergency Contact Numbers 1800 641 792 (Maritime) 1800 815 257 (Aviation) or +612 6230 6811 (Maritime) +612 6230 6899 (Aviation)	Vessel Master
Notify port and government agencies in the event of a Level 1 (Port Authority) or Level 2 (Port Authority & DEDJTR) vessel spill	• **Immediately** DEDJTR (Transport) - 0409 858 715 (24 hrs). semdincidentroom@transport.vic.gov.au NOPSEMA: 08 6461 7090. (Commonwealth waters) Port of Portland: (03) 5525 0900	Vessel Master
Notify DELWP in the event of oiled wildlife.	• **Immediately** 1300 134 444 (24 hrs).	Vessel Master/OIM
Notify DELWP of any incidents of injury or death to native fauna including whales and dolphins.	• **Immediately.** Whale & Dolphin Emergency Hotline: 1300 136 017. Seals, Penguins or Marine Turtles: 136 186 (Mon-Fri 8am to 6pm) or AGL Marine Response Unit: 0447 158 676.	Vessel Master/OIM

Notify the DoEE of any impacts to MNES, specifically injury to or death of EPBC Act-listed species.	• **Within 7 days** Phone 1800 110 395; Email: compliance@environment.gov.au	Vessel Master/OIM
Vessel strike with cetacean is reported to the DoEE. Upload information to: https://data.marinemammals.gov.au/report/shipstrike	• **Within 72 hours of incident.**	Vessel Master/OIM

7.5.3 Incident Investigation

Investigations into environmental incidents are conducted in accordance with Esso's incident investigation procedures and guidelines. Investigation teams may include Diamond Offshore or supply vessel representative(s) as agreed in consultation with the Diamond Offshore MODU Manager and the Esso Operations Superintendent; the team leader for investigations will be either an Esso investigator or Esso appointed objective third party. They are reported using the Esso reporting format.

Diamond Offshore will also undertake an investigation as per their operating procedures and safety case requirements.

7.5.4 Auditing and Inspections

Requirements for compliance with the EP under OPGGS(E) Regulation 14(3) are met through ongoing monitoring and reporting and auditing and inspections (outlined below).

Table 7-4 Summary of Assessments and Inspections

Inspection/Assessment	Party/Responsibility	Status/Plan
OIMS Risk Assessment	Esso Australia & PNG Drill Team, Diamond Offshore Manager and 3rd party contractor reps	Completed prior to start up. Corrective actions closed out prior to the start of operations.
Critical Contractor OIMS Evaluations	Esso QA/QC Coordinator	Completed on completion of P&A campaign.
Lifting Equipment Certification	3rd Party Inspection	Prior to start up, during P&A campaign as required.
Rig Inspection D-210	Esso Operations Superintendent	During P&A operations.
BOP/Well Control systems inspection	3rd Party Inspection by MODU Operator, in dialogue with Drilling Superintendent	Prior to initial running of BOP, as required thereafter.
Pre-mobilisation environmental inspection	Esso Operations Superintendent	Completed prior to start up. Corrective actions closed out prior to the start of operations.
Vessel and MODU inspections	Vessel/MODU Operator	Weekly walk-arounds, documented on inspection checklists. Basis for monthly recordable incident reports
Compliance Audit	Esso Offshore Risk, Environment and Regulatory Supervisor	During P&A operations. Summarised in the Environmental Performance Report to NOPSEMA

7.6 Environmental Performance Review

7.6.1 Daily Rig Calls

Daily rig calls are undertaken to keep all personnel involved up to date with the activities that are planned for the day and allows for input from the Management team to assist with work planning.

7.6.2 Toolbox Meetings

Toolbox meetings are conducted twice daily to plan for any events that are occurring during the shift. This allows for relevant permits and Work Risk assessments to be undertaken and to make sure that personnel completing the tasks understand all the safety and environmental risks associated.

Environmental matters will be included in daily toolbox talks as required for the specific task being risk assessed. Environmental issues will also be addressed in daily or weekly HSE meetings where all MODU / vessel crew will participate with the OIM, Vessel Master and Drilling Supervisor in discussing HSEC matters that have arisen during that day's or week's operations, and upcoming issues to consider. Outcomes will be documented in HSEC meeting minutes.

7.6.3 Monthly Meetings

Table 7-5 lists the environmental objectives that are monitored and stewarded throughout the program.

Table 7-5 Environmental Performance Indicators

Criteria Esso	Criteria Diamond Offshore	Expectations
Oil or Chemical Spills	Loss of Containment	None
Well Control incidents	Well control incidents	None
In country regulations	In country regulations	100% Compliance
Esso OIMS	Diamond Offshore HSE Management System (OM-SC-001-02)	100% Compliance
Key performance indicators		
• incident reports	Incidents reporting and investigation	None. All incidents reported to Esso as per Section 7.5.2
• Regulatory compliance	EP Compliance	100% Compliance
• Spill volume and quantity	Incidents reporting and investigation	None All spills reported to Esso as per Section 7.5.2
• Volume of waste disposal	Vessel Waste management	All waste quantities tracked and reported to Esso

7.7 Emergency and Oil Spill Preparedness and Response

7.7.1 Emergency Response Responsibilities

Responsibilities for the purposes of emergency response are outlined as follows:

- Diamond Offshore is the "Operator" of the Facility and has legislative responsibilities for all operations on the MODU, including response to emergencies, in accordance with MODU Emergency Procedures and the Blackback P&A OPEP.
- Esso's role in dealing with emergencies is to provide the necessary resources to support a Diamond Offshore emergency response. Esso's drilling team will operate from the company's Melbourne office. Additional management, technical and emergency response support will be provided from the Melbourne and Houston offices.

7.7.2 Oil Pollution Emergency Plan (OPEP) and Testing

Esso has a project OPEP that outline how spills will be managed (Chapter 6). For a Level 1 spill inside the 500m exclusion zone, the MODU SOPEP is the primary response plan. It is supported by the Blackback P&A OPEP. For Level 2 or 3 spills the Blackback P&A OPEP is the primary document and this will outline the resources and response strategies to be implemented depending on the size and

nature of the spill. It also outlines which the lead organisations and responders are and any notification requirements.

In all cases, Esso, as nominated operator under the OPGGS(E) Regulations, will retain control and responsibility for managing spill response.

In accordance with OPGGS(E) Regulation 14 (8C) and in accordance with OIMS System 10-2: Emergency Preparedness and Response, the OPEP will be tested:

- Prior to the commencement of a campaign.
- When there is a significant amendment to the OPEP.

The effectiveness of response arrangements will be measured by the performance standards of each exercise type. These exercises may be externally or internally facilitated.

7.8 Operational Control

7.8.1 Chemical Selection Procedure and Approval for Discharge

Any chemical that is planned to be discharged to the marine environment is selected based on their lowest toxicity. All drilling fluids meet OCNS Gold or non-CHARMable Category E (lowest toxicity). Where any of the chosen chemicals needs to be substituted, the lowest toxicity substitute is chosen, in accordance with Esso's chemical selection procedure (Workplace Substances Manual, Form WSM2). Any chemical that is the subject of a planned discharge to the marine environment must meet the requirements under the Esso chemical selection procedure.

7.8.2 Management of change

The objective of the MOC process is to ensure that additional risks are not introduced by changes that could increase the risk of harm to people, assets or the environment.

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, or
  - Authorised in the existing management plans, procedures, work instructions or maintenance plans.
- Proposed changes to activities, assets, equipment, processes or procedures that have the potential to impact on the environment or interface with the environmental receptor; and
- Changes to the requirements of an existing external approval (e.g. changes to conditions of environmental licences).

For any MOC with identified environmental impacts or risks, an impact/risk assessment will be undertaken to consider the impact of the proposed change on the environmental impacts/risks and the adopted control measures.

7.8.3 Review and update of the Environment Plan

In the event that a proposed change, including new stages or significant modifications identified under MOC, triggers the requirement for a revision under OPGGS Regulation 17 see below), the EP will be revised for re-submission to NOPSEMA.

Note all changes to the accepted EP will be traceable via ‘track-changes’ within the revision document and any changes made are fully justified. This process, including information around changes that trigger a formal revision, are documented.

In accordance with Regulation 17 of the OPGGS(E) Regulations 2009, a revision of the EP will be submitted to NOPSEMA where any significant new environmental impact or risk, or significant increase in an existing environmental impact or risk, has been identified, not provided for in the EP.

8 Stakeholder Consultation

Esso has undertaken consultation with all relevant stakeholders potentially affected by the Baldfish Drilling and Blackback P&A campaigns.

The principles of stakeholder engagement are to:

- Provide meaningful information in a format and language that is readily understandable and tailored to the needs of the target stakeholder group(s).
- Provide information in advance of consultation activities and decision-making.
- Disseminate information in ways and locations that make it easy for stakeholders to access it.
- Respect local timeframes and decision making processes.
- Establish two-way dialogue that gives both sides the opportunity to exchange views and information, to listen, and to have their issues heard and addressed.
- Adopt processes free of intimidation or coercion.
- Develop clear mechanisms for responding to people's concerns, suggestions, and grievances.
- Incorporate feedback into program design, and report back to stakeholders.
- Demonstrate that stakeholders have been consulted in accordance with the requirements of the OPGGS(E) Regulations 2009

8.1 Identification of Relevant Stakeholders

Esso identified the stakeholders for the Blackback P&A campaign from the stakeholder database set up to manage base business and project consultation. A total of 86 relevant stakeholders were identified, listed in Table 8-1. Esso classified these stakeholders into three categories for this EP:

- **Primary stakeholders** are those expected to provide direct advice or collaborate on plans and who may be impacted by the project;
- **Secondary stakeholders** are those with functions, interests or activities in the Operational ZPI that could be potentially affected by the activities to be carried out under the environment plan; and
- **Tertiary stakeholders** are other persons and organisations who may have an interest in the activities but are unlikely to be affected, or unknown stakeholders with whom Esso extended an opportunity to self-identify as having an interest in activities by way of a public consultation forum in Lakes Entrance, which was promoted through various newspaper advertisements.

Table 8-1 Stakeholders identified as relevant for the Blackback P&A activity

ID No.	Stakeholder Name
Primary Stakeholders	
	Department or agency of the Commonwealth to which the activities to be carried out under the EP may be relevant
02 125 04 09 109	• Australian Maritime Safety Authority (AMSA) • Australian Hydrographic Service (AHS) • Australian Fisheries Management Authority (AFMA) • Department of Environment and Energy (DoEE) – Parks Australia • DoEE
	Department or agency of a State (Victoria) to which the activities to be carried out under the EP may be relevant
39 43 44 46 47	• State Emergency Service • Department of Economic Development, Jobs, Transport and Resources (DEDJTR) (Transport) • Department of Primary Industries (Marine and Estuarine Fisheries) • Department of Environment, Land, Water and Planning (DELWP) • VicPlan Operations Group (VPOG)
	Department of the responsible State Minister (Victoria)
45	• DEDJTR Earth Resources Regulation
	Persons or organisations whose functions, interests or activities may be affected by the activities to be carried out under the EP

ID No.	Stakeholder Name
	Responders
01	• Australian Marine Oil Spill Centre (AMOSC)
03	• Asia Pacific Applied Science Associates (RPS APASA)
23	• Security Services
25	• Oil Response Company of Australia (ORCA)
55	• Wildlife Victoria
62	• Roads and Maritime Services, NSW
104	• Department of Defence (DoD)
42	• Maritime Safety Victoria
	Fishing Associations
17	• Lakes Entrance Fishermens' Co-operative Society Limited (LEFCOL)
33	• Seafood Industry Victoria (SIV)
37	• South East Trawl Fishing Industry Association (SETFIA)
Secondary Stakeholders	
	Department or agency of the Commonwealth to which the activities to be carried out under the EP may be relevant
103	• Director of National Parks (DoEE)
99	• Department of Agriculture and Water Resources (DAWR)
105	• Department of Foreign Affairs & Trade (DFAT)
85	• National Offshore Petroleum Titles Administrator (NOPTA)
	Department or agency of the State (Victoria) to which the activities to be carried out under the EP may be relevant
8	• Country Fire Authority
13	• Environment Protection Authority, Victoria (EPA Vic)
15	• Gippsland Ports
27	• Parks Victoria
29	• Phillip Island Nature Park
90	• Water Police
101	• Victorian Fisheries Authority
	Persons or organisations whose functions, interests or activities may be affected by the activities to be carried out under the EP
	Oil & Gas Industry Operators in Bass Strait
7	• BHP Billiton Petroleum
24	• Seven Group Holdings (Formerly Nexus)
26	• Origin Energy
34	• Cooper Energy (Formerly Santos)
57	• ROC Oil Limited
58	• Oil Basins Limited
61	• Carnarvon Hibiscus Pty Ltd
87	• Bass Oil Company Limited
100	• CarbonNet
122	• 3D Oil
	Fishing Associations
18	• Lakes Entrance Scallop Fishing Industry Association
40	• Sustainable Shark Fishing Association
51	• Victorian Recreational Fishing (VRFish)
52	• Victorian Scallop Industry Association
71	• Victorian Fishery Association Resource Management
76	• Commonwealth Fisheries Association (CFA)
77	• Southern Shark Industry Alliance
41	• Tasmanian Seafood Industry Council
120	• Tuna Australia Limited
121	• Australian southern Bluefin Tuna Industry Association
123	• Panama II Octopus fishing vessel
124	• Victoria Game Fishing Club
	Ports
14	• Geelong Ports
28	• Port of Hastings
Tertiary Stakeholders	
	Department or agency of the State (Victoria/Tasmania) to which the activities to be carried out under the EP may be relevant
10	• East Gippsland Catchment Management Authority
63	• Department of Primary Industries, Parks, Water and Environment (DPIPWE)
64	• Tasmanian Parks and Wildlife Service
	ersons or organisations whose functions, interests or activities may be affected by the activities to be carried out under the EP
	Responders
109	• Life Saving Victoria

ID No.	Stakeholder Name
84	• Port Phillip Sea Pilots
119	• Border Protection Command
	Fishing Associations
70	• Victorian Bays and Inlets Fisheries Associations
74	• Warrnambool Professional Fishermen's Association
66	• Apollo Bay Fishermen's Co-op
73	• Victorian Rock Lobster Association
79	• Eastern Victorian Sea Urchin Divers Association & Eastern Zone Abalone Industry Association
82	• East Gippsland Estuarine Fishermen's Association
83	• Corner Inlet Fisheries Habitat Association
	Ports
30	• Port Franklin Fisherman's Association
32	• Victorian Ports Corporation
115	• Port of Portland
112	• Victorian Regional Channels Authority
	Councils/Shires/Boards
11	• East Gippsland Shire Council
20	• Wellington Shire Council
38	• South Gippsland Shire Council
93	• Mornington Peninsula Shire
108	• Central Coastal Board
	Other person or organisation that the titleholder considers relevant
107	• Boating Industry Association of Victoria
111	• Yachting Victoria
116	• Gippsland Times
81	• Australian Oceanographic Services
88	• Alistair Mailer
117	• Lakes Post
118	• Australian Communications and Media Authority

8.2 Mechanisms for Consultation

A number of mechanisms to communicate with stakeholders have been used to ensure stakeholders can make an informed assessment of the possible consequences of the activity on their functions, interests or activities.

The following mechanisms were used to communicate with stakeholders:

- written communications:
- one-on-one discussions via telephone and in-person.
- public consultation session in Lakes Entrance (17 November 2017):
- Esso community news webpage

8.2.1 Written communications

Early in October 2017, an email update was sent to Esso's Public and Government Affairs existing offshore stakeholder database, informing them about upcoming activities in the Gippsland Basin and reason Esso was seeking to consult with the stakeholders. A three-page fact sheet (*Esso Offshore Projects*) was attached. Additionally, it included an invitation to attend the public consultation session in November 2017, or arrange an alternative meeting time at their convenience.

Personal invitations for the Lakes Entrance consultation forum went out to relevant stakeholders in October 2017.In addition to the letter drop and fact sheet, the Lakes Entrance consultation forum was promoted through a series of announcements in a local newspaper (Gippsland Times: "*Back in the hunt for Gippsland gas",* 26 September 2017), with ongoing communications in fishing trade magazines (SETFIA, LEFCOL).

Following the email and consultation session some stakeholders indicated they had received adequate information, had no comments, and would like to be 'considered consulted'. A greater number indicated a general interest in being 'kept in the loop' without any specific comments or queries about the planned activity.

In December 2017 a revised fact sheet was sent to all relevant stakeholders further informing them of upcoming Esso projects involving drilling activities with the Ocean Monarch at VIC/P70 (Baldfish).

A two page article on Esso's Offshore Projects, including the Blackback P&A campaign, was circulated in the May 2018 issue of PROFISH (SIV quarterly newsletter) and no contacts or requests for additional information specific to the Blackback P&A activities were received.

In August 2018 an Esso Offshore Projects fact sheet providing high level details about projects including the Blackback P&A campaign, regulatory requirements and stakeholder consultation was again distributed to all relevant stakeholders.

8.2.2 One-on-one discussions via telephone and in-person

Depending on the stakeholders' preference, telephone and in-person discussions were held to clarify and discuss the EP and OPEP.

8.2.3 Public consultation session in Lakes Entrance

The public consultation session was held in Lakes Entrance on 17 November 2017 and was intended to consult about the VIC/P70 Baldfish drilling project, as documented in its Environment Plan and supporting OPEP, and provide an opportunity for both known stakeholders and unknown stakeholders to learn more about Esso's offshore operations. Invitations were announced widely, followed up by individual follow-up invitations by telephone in the week before the public consultation session.

The session was well attended, with 32 stakeholders confirmed, from a wide range of backgrounds, of which 27 attended on the day. Key stakeholders with particular relevance to the Blackback P&A location included Seafood Industry Victoria and LEFCOL. Esso was represented by the Offshore Operations Manager, the Offshore Risk, Environmental & Regulatory Supervisor, Public and Government Affairs and the Project SSHE Coordinator. A brief overview of planned activities was presented by the Esso Offshore Operations Manager. This was followed by a Q&A session and one-on-one conversations.

A series of informative posters were also presented at the session, which visitors were invited to read and discuss with Esso personnel. In addition, the flyer with information on the Bass Strait campaigns was available for visitors to take away.

No major concerns were raised with regards to upcoming Bass Strait campaigns. Areas discussed included the proximity to shipping lanes and how this would be managed and the removal of the subsea equipment (i.e. obstruction / snagging hazard). Further details summarised below.

Tourist Information: introduced the project and EAPL operations, minor issues raised included a request for additional information sheets and posters that they could provide to interested members of the public, introduced to the Esso P&GA Representative.

LEFCOL: informal talk about the various projects and what impact there could be on the local fishermen. Removal of the subsea facilities reduces the number of snagging hazards present in the area which is considered a positive aspect. No major concerns raised.

8.2.4 Webpage

In August 2017, Esso updated its offshore webpage with information about the acquisition of permit VIC/P70 and the hunt for new gas ("*Back in the hunt for Gippsland gas*", Richard Owen, Lead Country Manager, 3 August 2017).

Esso also created a portal of information used throughout the consultation period (Esso community news webpage https://www.exxonmobil.com.au/en-au/community/local-outreach/esso-community-news), which included:

- Downloadable PDF of the fact sheet ("*Esso Offshore Projects*") on planned activities in Gippsland Basin, which included an announcement about the upcoming consultation session (Oct. 2017).
- Information about Esso plans to extend field life of Gippsland basin:
    - "Back in the hunt for Gippsland gas" (Aug. 2017);
    - "Key gas fields nearing the end but news not all bad" (Oct. 2017);
    - "East coast gas supply Q&As"

- The webpage also features a clear "*contact us*" link for interested parties to email Esso.

An "Offshore Projects" page was created in November 2017, to provide ongoing updates on Esso offshore activities (http://www.exxonmobil.com.au/en-au/energy/natural-gas/natural-gas-operations/offshore-projects). This was updated in August 2018 with:

- Downloadable PDF of the most recent '*Offshore Projects Fact Sheet'* (Aug. 2018)
- Information about Esso's planned program of offshore work including the Blackback P&A campaign using the Ocean Monarch MODU.

8.3 Consultation Outcomes

Much of the interaction with stakeholders during the consultative process was administrative in nature, rather than feedback about the Environment Plan. Common reasons for providing feedback throughout the process were to:

- Re-direct Esso's communication to another position in the organization;
- Advise Esso the stakeholder would like to be kept updated about Esso's offshore operations;
- Notification they had received the information and considered themselves consulted.

A small number of stakeholders have either asked clarifying questions about, or provided comment on the Blackback P&A campaign. These questions and Esso's assessments and responses are su,,arised in the following table.

Table 8-2 Summary of Key Issues, Merits and Measures Adopted

Issue	Raised by	Merit and Measures Adopted
Interference with commercial shipping and potential risk of collision	AMSA	This issue had already been identified by Esso as one of the key safety and environmental concerns with the proposed drilling locations and the proximity to the Bass Strait Traffic Separation Scheme. Esso have worked with AMSA to identify temporary fairways that could be established to re-route marine traffic and these have been adopted (Section 5.22.2.1). In addition 2 NM buffer zones will be established to provide the rig and support vessels protection, in addition to the temporary Petroleum Safety Zones. AMSA also provided input in the necessary navigation aids and confirmed that the tools in place exceed AMSA's expectations. Notices to mariners have been issued and Esso has consulted with key ports and 3rd parties as recommended by AMSA – no further issues or objections have been raised. PSZ to be established around the Blackback wells In October 2018 AMSA reviewed further details on the Blackback campaign provided by Esso and confirmed that they were content with the plans for the Blackback P&A activities.
Presence of subsea infrastructure as snagging hazard	LEFCOL, SETFIA	Temporary PSZ to be gazetted at Blackback for the duration of the P&A campaign. Discussion was had around whether or not the fishermen fish in the shipping lanes and it was concluded that given the proximity to the shelf drop off they probably do. The removal of the Blackback subsea facility is considered a positive aspect.

A detailed summary of the consultation that has taken place (names and contact details deleted for privacy of information) is included in Appendix 1.

8.4 Ongoing Consultation

Esso will continue to consult with stakeholders on an ongoing basis. This will consist of:

- Maintaining the database of relevant stakeholders potentially affected by offshore production operations and records of consultation for each stakeholder.
- Follow up with stakeholders after the EP is accepted by NOPSEMA, to thank them for their involvement, update them of the outcome, notify them of next steps going forward, and make available to them the Environment Plan summary.
- Provide an update to stakeholders at the end of the campaign, which will contain an update about the P&A campaign, including information such as environmental performance data.
- Providing any new relevant information through the dedicated website content at https://www.exxonmobil.com.au/en-au/energy/natural-gas/natural-gas-operations/offshore-projects.
- An Esso offshore operations community information session to be held in Lakes Entrance on 5th December 2018.

9 References used in the Environment Plan

ABARES (Australian Bureau of Agricultural and Resource Economics). 2016a. Fishery Status Reports 2016. Department of Agriculture, Fisheries and Forestry. A WWW publication accessed in September 2017 at http://www.agriculture.gov.au/abares/publications/publications

ABARES 2016b. Fisheries status reports 2016. Chapter 2: Bass Strait Central Zone Scallop Fishery. L. Georgeson, R. Green and S. Nicol. A WWW publication accessed in September 2017 at http://www.agriculture.gov.au/abares/publications/publications.

ABARES 2016c. Fisheries status reports 2016. Chapter 8: Southern and Eastern Scalefish and Shark Fishery. N Marton and R Green. A WWW publication accessed in September 2017 at http://www.agriculture.gov.au/abares/publications/publications.

ABARES 2017. Fishery Status Reports 2016. Department of Agriculture, Fisheries and Forestry. A WWW publication accessed in October 2017 at http://www.agriculture.gov.au/abares/publications/publications.

ABARES 2018. Fishery Status Reports. Chapter 7: Small Pelagic Fishery. A Moore and D Mobsby. Accessed in July 2018 at http://www.agriculture.gov.au/abares/research-topics/fisheries/fishery-status/small-pelagic

ABC, 2018. Red handfish 'needle in a haystack' population found at second Tasmanian location. www.abc.net.au/news/2018-01-24/rare-red-handfish--population-found/9358794. Published 24 January 2018.

AFMA (Australian Fisheries Management Authority) 2010. Commonwealth Trawl Sector. Commonwealth Trawl Sector. A WWW publication accessed in September 2017 at http://www.afma.gov.au/wp-content/uploads/2010/07/fs_trawl.pdf.

AFMA 2014a. Small Pelagic Fishery Management Arrangements Booklet 2013-2014. A WWW publication accessed in September 2017. http://www.afma.gov.au/wp-content/uploads/2014/11/Small-Pelagic-Fishery-management-arrangements-booklet-2014-15.pdf.

AFMA 2014b. Re-opening of a commercial fishery for orange roughy (*Hoplostethus atlanticus*) in Australia. Accessed in September 2017 at http://www.afma.gov.au/wp-content/uploads/2014/03/Orange-roughy-Handout.pdf.

AFMA 2014c. Orange Roughy (*Hoplostethus atlanticus*) stock rebuilding strategy. Accessed in September 2017 at http://www.afma.gov.au/sustainability-environment/protected-species-management-strategies/.

AFMA 2014d. School Shark (*Galeorhinus galeus*) Stock Rebuilding Strategy-Revised 2015. A WWW publication accessed in September 2017 at http://www.afma.gov.au/wp-content/uploads/2014/12/School-Shark-Rebuilding-Strategy.pdf.

AFMA 2016. Southern and Eastern Scalefish and Shark Fishery 2016 Management Arrangements Booklet. Accessed in September 2017 at http://www.afma.gov.au/wp-content/uploads/2016/04/SESSF-Management-Arrangements-Booklet-2016.pdf.

AFMA 2017a. Commonwealth fisheries annual catch data. Accessed in September 2017 at http://www.afma.gov.au/resources/catch-data/.

AFMA 2017b. Petroleum industry consultation with the commercial fishing industry. Accessed in September 2017 at http://www.afma.gov.au/sustainability-environment/petroleum-industry-consultation/.

AFMA 2017c. Bass Strait Central Zone Scallop Fishery Management Arrangements Booklet (July 2017). Accessed September 2017 at http://www.afma.gov.au/wp-content/uploads/2017/07/BSCZSF-Management-Arrangements-Booklet-2017-final.pdf.

AFMA 2017d. Catch data Commonwealth Fisheries around Block VIC/P70 for 2010 to 2016. Dataset made available through AFMA, 10 November 2017.

Agriculture Victorina 2017. Victorian Emergency Animal Welfare Plan (Revision 1) A WWW publication accessed in September 2017 at http://agriculture.vic.gov.au/__data/assets/pdf_file/0003/365088/Victorian-Animal-Emergency-Welfare-Plan_updated.pdf.

Aichinger Dias LA, J Litz, L Garrison, A Martinez, K Barry and T Speakman 2017. Exposure of cetaceans to petroleum products following the Deepwater Horizon oil spill in the Gulf of Mexico. Endang. Species Res. 33: 119–125.

Ainsaar, M., Ruzzene, M., and Abbinga, E. 2007. Gippsland sustainable tourism: Project summary report. Urban Enterprise Pty Ltd.

Allen, S., H. Marsh and A. Hodgson, 2004. Occurrence and Conservation of the Dugong (Sirenia: Dugongidae) in New South Wales. Proceedings of the Linnean Society of New South Wales. 125:211-216.

AMSA 2012. NatPlan to Combat the Pollution of the Sea by Oil and other Noxious and Hazardous Substances, Interim Technical Guideline for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities, July 2012, Australian Government.

AMSA 2015a. Technical guidelines for preparing contingency plans for marine and coastal facilities, 1-63. https://www.amsa.gov.au/forms-and-publications/Publications/AMSA413.pdf.

AMSA 2015b. National plan. Response, assessment and Termination of cleaning for Oil contaminated foreshores. Guidance Reference: NP-GUI-025. Endorsed by the NPSCC November 2015. A WWW publication accessed in September 2017 at https://www.amsa.gov.au/marine-environment/national-plan-maritime-environmental-emergencies/index-supporting-documents.

AMSA 2017a. Automatic Identification System (AIS). A WWW publication accessed in September 2017 at https://www.amsa.gov.au/navigation/services/ais/.AMSA 2017b. Vessel Traffic Data - Historic Vessel Tracking Request. A WWW publication accessed in September 2017 at https://www.operations.amsa.gov.au/Spatial/.

AMSA 2017c. The International Convention for the Prevention of Pollution from Ships (MARPOL). A WWW publication accessed in September 2017 at https://www.amsa.gov.au/environment/regulations/marpol/.

ANZECC (Australian and New Zealand Environment and Conservation Council) 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1: The Guidelines (Chapters 1-7). Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New ZealandApache 2008. Gippsland Basin 2008 Drilling Environment Plan: Public Summary February 2008.

APASA, 2018a Baldfish & Hairtail Exploration Gippsland Basin Oil Spill Modelling Study. Prepared for Esso Australia Pty Ltd by RPS Asia-Pacific Applied Science Associates. Report No. MAQ0611J, February 2018.

APASA, 2018b Blackback Oil Spill Modelling. Prepared for Esso Australia Pty Ltd by RPS Asia-Pacific Applied Science Associates. Report No. MAQ0714J, August 2018.

APPEA, 2002. Guidelines for Naturally occurring radioactive materials. http://analizebasilicata.altervista.org/blog/wp-content/uploads/2016/10/en_norm_APPEA-GUIDELINES-FOR-NORM-australia-2.pdf

Arnould, J. P. Y. and Kirkwood, R. 2008. Habitat selection by female Australian fur seals (*Arctocephalus pusillus doriferus*). Aquatic Conservation: Marine and Freshwater Ecosystems. 17: S53–S67.

ARPANSA, 2008 Management of Naturally occurring radioactive material (NORM), Radiation protection Series Publication No. 15 https://www.arpansa.gov.au/sites/g/files/net3086/f/legacy/pubs/rps/rps15.pdf

AQIS. 2011. Australian Ballast Water Management Requirements. Version 5. Australian Quarantine Inspection Service, Department of Agriculture, Fisheries and Forestry. Canberra.

Australian Museum, 2014. Animal Species: Manta Ray, *Manta birostris.* Accessed July 2018 at https://australianmuseum.net.au/manta-ray-manta-birostris

Azis P, Al-Tisan I, Daili M, Green T, Dalvi A and Javeed M 2003. Chlorophyll and plankton of the Gulf coastal waters of Saudi Arabia bordering a desalination plant Desalination, 154 (2003), pp. 291–302.

Azwell, TMS, MJ Blum, A Hare, S Joye, S Kubendran, A Laleian, G Lane, DJ Meffert, EB Overton, J Thomas & LE White 2011. The Macondo Blowout Environmental Report - Deepwater Horizon Study Group Environmental Report – January 2011.

Balch, A. H., and M. W. Lee, eds., 1984, Vertical seismic profiling—technique, applications, and case histories: Boston, MA, IHRDC, 488 p.

Badruzzaman, A. 2011. Radioactive sources: their importance, challenges and opportunities. A WWW publication accessed in September 2017 at https://www.epmag.com/radioactive-sources-their-importance-challenges-and-opportunities-658506.

Bannister, J. L., Kemper, C. M., and Warneke, R. M. 1996. The Action Plan for Australian Cetaceans. Department of Environment and Water Resources (DEW). Canberra. Accessed online in September 2017 at https://www.environment.gov.au/system/files/resources/2711a6fd-dbf3-4aad-b79b-14ef6ba2687d/files/whaleplan.pdf.

Batten SD, Allen RJS and Wotton COM, 1998, The effects of the Sea Empress Oil Spill on the Plankton of the Southern Irish Sea. Marine Pollution Bulletin 36(10): 764-774.

Baumgartner, D. J., W. E. Frick, P. J. W. Roberts, and C. A. Bodeen. 1992. Dilution Models for Effluent Discharges. Standards and Applied Science Division, Office of Science and Technology; Oceans and Coastal Protection Division, Office of Wetlands, Oceans, and Watersheds; Pacific Ecosystems Branch, ERL-N, 2111 S. E. Marine Science Drive, Newport, Oregon 97365-5260, U. S. Environmental Protection Agency.

Bax, N. J., and Williams, A. 2001. Seabed habitat on the south-eastern Australian continental shelf: context, vulnerability and monitoring. Marine and Freshwater Research 52: 491–512.

Bejarano AC, JK. Farr, P Jenne, V Chu, and A Hielscher 2016. The chemical aquatic fate and effects database (CAFE), a tool that supports assessments of chemical spills in aquatic environments. Env Tox Chem 35(6): 1576–1586.

Bejaranoa AC, Gardiner WW, Barron MG, Word JQ, 2017, Relative sensitivity of Arctic species to physically and chemically dispersed oil determined from three hydrocarbon measures of aquatic toxicity. Mar Poll Bull 122:316-322.

BirdLife International. 2012. Light pollution has a negative impact on many seabirds including several globally threatened species. Available online at: http://www.birdlife.org/datazone/sowb/casestudy/488.

Black KP, Brand GW, Grynberg H, Gwyther D, Hammond LS, Mourtikas S, Richardson BJ and Wardrop JA 1994. Production facilities. In: Environmental implications of offshore oil and gas development in Australia – the findings of an independent scientific review. Swan, J.M., Neff, J.M. and Young, P.C. (eds) Australian Petroleum Exploration Association. Sydney. pp 209–407.

Black, K., Rosenberg, M., Hatton, D., Colman, R., Symmonds, G., Simons, R, Pattiaratchi, C., and Nielsen, P. 1991. Hydrodynamic and sediment dynamic measurements in eastern Bass Strait. Volume 2. Sea bed description and sediment size analysis. Working paper No. 21, Victorian Institute of Marine Sciences.

BOM (Bureau of Meteorology) 2017. Climate Averages. A WWW database accessed in September 2017 at http://www.bom.gov.au/climate/.

Boon, P.I., Allen, T., Brook, J., Carr, G., Frood, D., Hoye, J., Harty, C., McMahon, A., Mathews, S., Rosengren, N., Sinclair, S., White, M. and Yugovoc, J. 2011. Mangroves and coastal saltmarsh of Victoria: distribution, condition, threats and management. Report to Department of Sustainability and Environment by Institute for Sustainability and Innovation, Victoria University, Melbourne. 513pp.

BP 2013. Shah Deniz 2 Project. Environmental & Socio-Economic Impact Assessment. BP Development Pty Ltd.

Brandsma, M. G., Smith, J.P., O'Reilly, J.E., Ayers, R.C. and Holmquist, A.L. 1992 Modeling Offshore Discharges of Produced Water in Produced Water. Edited by J. P. Ray and F. R. Englehardt, Plenum Press, New York, pp. 59-71.

Brady, B., Morris, L. and Ball, D, 2002. Oil Spill Dispersants and Temperate Marine Environments. A Literature Review to Support Development of Dispersant Use Protocols for Victoria. Marine and Freshwater Resources Institute Report No. 51. September 2002.

Bruce, B.D., Bradford, R., Daley, R., Green, M., Phillips, K., 2002. Targeted review of biological and ecological information from fisheries research in the South Ease Marine Region. December. Prepared for the National Oceans Office.

Brothers *et al*., 2001. Tasmania's Offshore Islands: seabirds and other natural features. Tasmanian Museum and Art Gallery. Hobart.

Bruinzeel, LW, van Belle, J and Davids, L 2009. The Impact of Conventional Illumination of Offshore Operational areas in the North Sea on Migratory Bird Populations. Presented at the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic meeting of the Working Group on the Environmental Impact of Human Activities. November 2009.

Burton, GA, Batley, G.E., Chapman, P.M., Forbes, V.E., Schlekat, C.E., Smith, E.P., den Besten, P.J., Bailer, J., Reynoldson, T., Green, A.S., Dwyer, R.L., Berti, W.R. 2002. A weight-of-evidence framework for assessing ecosystem impairment: improving certainty in the decision-making process. Human Ecology and Risk Assessment. 8: 1675-1696.

Burns K, Slee D, Lloyd J, Hanlon M, Skepper C & Mitsopoulos G 2011. Monitoring plan for the montara well release, Timor Sea monitoring study S3 "Assessement of fish for the presence of oil". WA Department of Fisheries.

Cambridge ML and Kuo J 1979. Two new species of seagrasses from Australia, *Posidonia sinuosa* and *P. angustifolia* (Posidoniaceae). Aquatic Botany, 6: 307-328.

Cardno, 2017. Metocean Criteria for Drilling-Blackback, Bass Strait. Report 59918018. Prepared for ExxonMobil by Cardno (NSW/ACT), St Leonards NSW, October 2017.

Cato, DH, Bell, M.J., 1992. Ultrasonic ambient noise in Australian shallow waters at frequencies up to 200 kHz. Defence Science and Technology Organisation,Sydney.

Cato, DH, Tavener, S., 1997. Ambient sea noise dependence on local, regional and geostrophic wind speeds: implications for forecasting noise. Applied Acoustics 51, 317–338.

CEFAS (Centre for Environment, Fisheries and Aquaculture Science) 2017. Offshore Chemical Notification Scheme. Accessed in September 2017 at https://www.cefas.co.uk/cefas-data-hub/offshore-chemical-notification-scheme/.

Clarke RH 2010. The Status of Seabirds and Shorebirds at Ashmore Reef, Cartier Island and Browse Island. Monitoring Program for the Montara Well Release. Pre-impact Assessment and First Post-Impact Field Survey. Prepared on behalf of PTTEP Australasia and the Department of the Environment, Water, Heritage and the Arts by the Australian Centre for Biodiversity, Monash University. Melbourne.

Coffey 2010. Snapper platform seabed survey- January 2010. Report CR 946_13_v3. Prepared for Esso Australia Pty Ltd by Coffey Environments Pty Ltd, Perth, Australia.

Coleman, N. 1988 Monitoring of scallop spatfall and growth rates at Lakes Entrance, September 1987 to May 1988.

Conolly, R. 1968. Submarine canyons of the continental margin, East Bass Strait (Australia). Mar. Geol. 6, 449–461.

CNR (Victorina Department of Conservation and Natural Resources; now Department of Natural Resources and Environment), 2003. Map 4 Resource Uses, Marine and Coastal Special Investigations. Land Conservation Council, Victoria.

Cogger HG 2000. The Status of Marine Reptiles in New South Wales. A Report prepared for the New South Wales. National Parks and Wildlife Service by. Dr Harold G. Cogger.

Cortin, T. 2010. Can fire fighting foams be environmentally friendly? Fire and Rescue November 2010: 29

C&R Consulting 2009. Impacts of plastic debris on Australian marine wildlife. Report by C&R Consulting for The Department of the Environment, Water, Heritage and the Arts19th June 2009. Available online: http://www.environment.gov.au/marine/publications/impacts-plastic-debris-australian-marine-wildlife.

CSIRO 2014. Orange Roughy (*Hoplostethus atlanticus*) Eastern Zone stock assessment incorporating data up to 2014. Accessed in September 2017 at http://www.afma.gov.au/wp-content/uploads/2014/03/SESSF-CSIRO-Orange-Roughy-Eastern-Assessment-Final-2014.pdf.

DAFF (Department of Agriculture, Fisheries and Forestry) 2009. The National Biofouling Management Guidance for the Petroleum Production and Exploration Industry. A WWW document downloaded from http://www.marinepests.gov.au/marine_pests/publications/Pages/petroleum-exportation.aspx.

DAFF. 2017. Marine Pests Interactive Map. A WWW database accessed in April 2017 at http://www.marinepests.gov.au/Pages/marinepest-map.aspx

DAWR (Department of Agriculture and Water Resources) 2015. Ballast Water. A WWW database accessed at http://www.agriculture.gov.au/biosecurity/avm/vessels/quarantine-concerns/ballast.. Department of Agriculture and Water Resources. Canberra.

DAWR 2017. Australian Ballast Water Management Requirements, Version 7. Accessed in January 2018 at http://www.agriculture.gov.au/biosecurity/avm/vessels/ballast/australian-ballast-water-management-requirements.

Davis HK, CF Moffat, NJ Shepherd (2002). Experimental Tainting of Marine Fish by Three Chemically Dispersed Petroleum Products, with Comparisons to the Braer Oil Spill. Spill Science & Technology Bulletin, Vol. 7, Nos. 5–6, pp. 257–278, 2002.

Davies J.M., Bedborough D.M., Blackman R.A.A., Addy J.M., Appelbee J.F., Grogan W.C., Parker J.G. and Whitehead A. 1989. The Environmental Effect of Oil-based Mud Drilling in the North Sea. In:Drilling Wastes. Edited by Engelhardt F.R., Ray J.P. and Gillam A.H. Elsevier Applied Science, London.

DEDJTR (Victoria Department of Economic Development, Jobs, Transport and Resources) 2017. Victorian Emergency Animal Welfare Plan (Revision 1) A WWW publication accessed in September 2017 at http://agriculture.vic.gov.au/__data/assets/pdf_file/0003/365088/Victorian-Animal-Emergency-Welfare-Plan_updated.pdf.

De Guise S, Levin M, Gebhard E, Jasperse L, Burdett Hart L, Smith CR, Venn-Watson S, Townsend F, Wells R, Balmer B, Zolman E, Rowles T, Schwacke L 2017. Changes in immune functions in bottlenose dolphins in the northern Gulf of Mexico associated with the Deepwater Horizon oil spill. Endang. Species Res. 33:291-303.

DEH (Department of the Environment and Heritage), 2005. Humpback Whale Recovery Plan 2005 - 2010. [Online]. (Now Department of the Environment and Energy (DoEE). Canberra, Commonwealth of Australia. Available from: http://155.187.2.69/biodiversity/threatened/publications/recovery/m-novaeangliae/index.html.

DEH 2006. A Guide to the Integrated Marine and Coastal Regionalisation of Australia IMCRA Version 4.0. Department of the Environment and Heritage, Canberra, Australia.

De Leo FC, Smith CR, Rowden AA, Bowden DA, Clark MR. 2010. Submarine canyons: hotspots of benthic biomass and productivity in the deep sea. Proceedings of the Royal Society B: Biological Sciences. 2010: 277(1695):2783-2792. doi:10.1098/rspb.2010.0462.

DELWP (Victoria Department of Environment, Land, Water and Planning), 1998. Commercial Fishing Methods in Victoria. John Tomkin. Note Number: FN0105 A WWW publication accessed in September 2017 at http://pandora.nla.gov.au/pan/59217/20060524-0000/FN0105.pdf.

DELWP. 2017a. Victorian biodiversity atlas. A WWW database accessed at https://vba.dse.vic.gov.au/vba/#/.

DELWP 2017b. Wildlife emergencies. A WWW publication accessed in September 2017 at https://www.wildlife.vic.gov.au/wildlife-emergencies/wildlife-emergencies.

DEWHA, 2010a. Approved Conservation Advice for *Tyto novaehollandiae castanops* (Tasmanian Masked Owl). Accessed July 2018 at http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=67051

DEWHA, 2010b. National Recovery Plan for Norfolk Island. Accessed July 2018 at http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-norfolk-island

DEWHA, 2010c. Approved Conservation Advice for *Ceyx azureus diemenensis* (Tasmanian Azure Kingfisher). Accessed July 2018 at http://www.environment.gov.au/biodiversity/threatened/species/pubs/25977-conservation-advice.pdf

Diamond Offshore 2015. Diamond Offshore - GEMS Customer Portal, [Online] Available at: https://gemscustomer.dodi.com/SitePages/Home.aspx.

Diamond Offshore 2017. Diamond Offshore Safety Case Ocean Monarch Mobile Offshore Drilling Unit Portal, [Online] Available at: www.HSECase.com.

DMP (WA Department of Mines and Petroleum), 2013. Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline. Available online at http://www.dmp.wa.gov.au/Documents/Environment/ENV-PEB-165.pdf.

DNV 2011. Shipping and Offshore Activity Data for Australian Ports and Waters. Prepared by DET NORSKE VERITAS for Australian Maritime Safety Authority, December 2011. Available online at https://www.amsa.gov.au/forms-and-publications/environment/publications/Other-Reports/documents/DNVApp1.pdf.

DOD (Department of Defence) 2017. Aqueous Film Forming Foams (AFFF)/PFAS Information Sheet. http://www.defence.gov.au/whs/_Master/docs/programs/Aqueous%20Film%20Forming%20Foams.pdf.

DoE, 2012a. Approved Conservation Advice for Epinephelus daemelii (black cod). Accessed July 2018 at http://environment.gov.au/biodiversity/threatened/species/pubs/68449-conservation-advice.pdf

DoE, 2012b. Approved Conservation Advice for *Thymichthys politus* (red handfish). Accessed July 2018 at http://www.environment.gov.au/biodiversity/threatened/species/pubs/83756-conservation-advice.pdf

DoE, 2015a. Conservation Advice *Pterodroma Mollis* soft-plumaged petrel. Accessed July 2018 at http://www.environment.gov.au/biodiversity/threatened/species/pubs/1036-conservation-advice-01102015.pdf

DoE, 2015b. Conservation Advice *Grantiella picta* painted honeyeater. Accessed July 2018 at http://environment.gov.au/biodiversity/threatened/species/pubs/470-conservation-advice.pdf

DoE, 2016a. Conservation Advice *Charadrius leschenaultia* Greater sand plover. Accessed July 2018 at http://www.environment.gov.au/biodiversity/threatened/species/pubs/877-conservation-advice-05052016.pdf

DoE, 2016b. Conservation Advice *Charadrius mongolus* Lesser sand plover. Accessed July 2018 at http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=879

DoECC, 2006. Gould's Petrel (*Pterodroma leucoptera leucoptera*) Recovery Plan

DoECC, 2007. National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia*)

DoEE (Department of Environment and Energy) 2000. EPBC Regulations (Part 8: Interacting with cetaceans and whale watching). Version SR 2000 No. 181 of 17 October 2016 (F2016C00914). Administered by: Environment and Energy. Accessed in September 2017 at http://www.environment.gov.au/epbc/about.

DoEE 2008. EPBC Act Policy Statement 2.1 - Interaction between offshore seismic exploration and whales: Industry guidelines. http://www.environment.gov.au/resource/epbc-act-policy-statement-21-interaction-between-offshore-seismic-exploration-and-whales

DoEE 2014. National Conservation Atlas. Accessed March 2018 at http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf.

DoEE 2015a. South-east marine region profile. Accessed in September 2017 at http://www.environment.gov.au/system/files/resources/7a110303-f9c7-44e4-b337-00cb2e4b9fbf/files/south-east-marine-region-profile.pdf.

DoEE. 2015b. Conservation Management Plan for the Blue Whale, 2015-2025 — A Recovery Plan under the Environmental Protection and Biodiversity Conservation Act 1999. Department of the Environment. Commonwealth of Australia. Accessed March 2018 at http://www.environment.gov.au/biodiversity/threatened/publications/recovery/blue-whale-conservation-management-plan.

DoEE 2015c. Conservation Values Atlas. Accessed online at http://www.environment.gov.au/topics/marine/marine-bioregional-plans/conservation-values-atlas.

DoEE, 2015d. Wildlife conservation plan for migratory shorebirds

DoEE, 2016. National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia*).

DoEE, 2017a. South east Commonwealth Marine Reserves Network. Accessed at http://environment.gov.au/topics/marine/marine-reserves/south-east

DoEE, 2017b. Flinders Commonwealth Marine Reserve. Accessed in September 2017 at http://www.environment.gov.au/topics/marine/marine-reserves/south-east/flinders.

DoEE 2017c. Shipwrecks Database. A WWW publication accessed in September 2017 at http://www.environment.gov.au/topics/heritage/historic-shipwrecks/australian-national-shipwreck-database.

DoEE 2017d. Loggerhead turtle. A WWW publication accessed in September 2017 at http://www.environment.gov.au/coasts/species/turtles/loggerhead.html.

DoEE 2017e. Leatherback turtle. A WWW publication accessed in September 2017 at http://www.environment.gov.au/coasts/species/turtles/leatherback.html.

DoEE 2017f. Green turtle. A WWW publication accessed in September 2017 at http://www.environment.gov.au/marine/marine-species/marine-turtles/green.

DoEE 2017g. Hawksbill turtle (*Eretmochelys imbricata*). Accessed in September 2017 at http://www.environment.gov.au/marine/marine-species/marine-turtles/hawksbill.

DoEE 2017h. Hooded plover. A WWW publication accessed in September 2017 at http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66726.

DoEE 2017i. Fairy tern. A WWW publication accessed in September 2017 at http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82950.

DoEE 2017j. Species Profile and Threats (SPRAT) Database - EPBC Act List of Threatened Fauna. Accessed in September 2017 at http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl.

DoEE 2017k. Species Profile and Threats (SPRAT) Database - *Eubalaena australis* — Southern Right Whale. Accessed in September 2017 at http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=40.

DoEE 2017l. Australian Whale Sanctuary. Accessed in September 2017 at http://www.environment.gov.au/marine/marine-species/cetaceans/australian-whale-sanctuary.

DoEE 2017m. Species Profile and Threats Database (SPRAT), *Eudyptula minor* — Little Penguin Accessed in September 2017 at http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1085http://www.environment.gov.au/marine/marine-species/marine-turtles/hawksbill.

DoEE 2017n. East Gippsland Commonwealth Marine Reserve. Accessed in September 2017 at http://www.environment.gov.au/topics/marine/marine-reserves/south-east/east-gippsland.

DoEE 2017o. Australian National Guidelines for Whale and Dolphin Watching 2017. Accessed in November 2017 at http://www.environment.gov.au/marine/publications/australian-national-guidelines-whale-and-dolphin-watching-2017.

DoEE 2017p. Commonwealth Marine Reserves. A WWW publication accessed September 2017 at http://www.environment.gov.au/topics/marine/marine-reserves.

DoEE 2017q. Freycinet Commonwealth Marine Reserve. Accessed in September 2017 at. http://www.environment.gov.au/topics/marine/marine-reserves/south-east/freycinet.

DoEE, 2017r. Australian Wetlands Database – Ramsar wetlands, Corner Inlet. A WWW publication accessed in September 2017 at http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=13.

DoEE, 2017s. Australian Wetlands Database – Ramsar wetlands, Gippsland Lakes. A WWW publication accessed in September 2017 at http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=21.

DoEE, 2017t. Littoral rainforests and coastal vine thickets of eastern Australia. Accessed in September 2017 at http://www.environment.gov.au/epbc/publications/littoral-rainforest.

DoEE, 2017u. Beagle Commonwealth Marine Reserve. Accessed in September 2017 at http://www.environment.gov.au/topics/marine/marine-reserves/south-east/beagle.

DoEE, 2017x. Australian Wetlands Database – Ramsar wetlands, Logan Lagoon. A WWW publication accessed in September 2017 at http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=4.

DoEE, 2017y. Australian Wetlands Database – Ramsar wetlands, East Coast Cape Barren Island Lagoons. A WWW publication accessed in September 2017 at http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=8.

DoEE 2018a. EPBC Act Protected Matters Report for the CBA PRP operational area. Department of Environment. June 2018.

DoEE 2018b. EPBC Act Protected Matters Report for the CBA PRP Operational ZPI. Department of Environment. June 2018.

DoEE, 2018c EPBC Protected Matters Report for the CBA PRP Environmental Monitoring ZPI. Department of Environment. June 2018.

DoEE. 2018d. *Balaenoptera borealis* — Sei Whale. Species Profile and Threats Database. Department of the Environment and Energy. Accessed March 2018 at http://www.environment.gov.au/sprat

DoEE. 2018e. *Balaenoptera physalus* — Fin Whale. Species Profile and Threats Database. Department of the Environment and Energy. Accessed March 2018 at http://www.environment.gov.au/sprat.

DoEE. 2018f. *Caperea marginata* — Pygmy Right Whale. Species Profile and Threats Database. Department of the Environment and Energy. Accessed March 2018 at http://www.environment.gov.au/sprat.

DoEE 2018g Species Profile and Threats Database. *Lathamus discolor* — Swift Parrot. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=744.

DoEE 2018h. Species Profile and Threats Database. *Limosa lapponica menzbieri* — Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri). http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=86432.

DoEE, 2018i. *Manta birostris* – Giant Manta Ray Species Profile and Threats Database accessed in July 2018 at http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=84995

DoEE 2018j. Species Profile and Threats Database. Natator depressus. AWWWpublication accessed in July 2018 at http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59257

DEECW 2010 Seabed habitat mapping of the continental shelf of NSW. A WWW publication accessed in July 2018 at http://www.ozcoasts.gov.au/geom_geol/nsw/NSWContinentalShelfSeabedMapping.pdf

DOF (WA Department of Fisheries) 2009. A Review: Biosecurity Risks Posed by Vessels and Mitigation Options. Fisheries Occasional Publication No. 55. Department of Fisheries. Government of Western Australia.

DOF 2015. Vessel Check User Guide - Biofouling Risk Assessment Tool for Commercial / Non-Trading / Petroleum / Commercial Fishing Vessel for International and Interstate Movements

Dolman S, Williams-Grey V, Asmutis-Silvia R & Isaac S. 2006. Vessel collisions and cetaceans: What happens when they don't miss the boat. A WDCS Science Report. 25 p.

DPI, 2017. Our fisheries. A WWW publication accessed in September 2017 at http://www.dpi.nsw.gov.au/fisheries/commercial/fisheries.

DPI, 2018. Batemans Marine Park. Accessed July 2018 at https://www.dpi.nsw.gov.au/fishing/marine-protected-areas/marine-parks/batemans-marine-park

DPIPWE (Department of Primary Industries, Parks, Water and Environment, Tasmania), 2000. Small Bass Strait Island Reserves Draft Management Plan October 2000.

DPIWE, 2006. Forty-spotted Pardalope Recovery Plan 2006 – 2010. Accessed July 2018 at http://www.environment.gov.au/system/files/resources/cea2c00a-1f06-4f1c-afff-786c55285db8/files/p-quadraginatus.pdf

DPIWE, 2010. Threatened Tasmanian Eagles recovery plan. Accessed July 2018 at http://www.environment.gov.au/system/files/resources/65561423-e15b-45f6-84e9-ad7f5f237d79/files/tasmanian-wedge-tailed.pdf

DPIWE 2011. Islands of the Hogan Group - Bass Strait. Biodiversity & Oil Spill Response Survey. A WWW publication accessed in September 2017 at http://dpipwe.tas.gov.au/Documents/Oil-Spill-Response-Survey.pdf.

DPIWE 2017a. Marine Reserves. A WWW publication accessed in September 2017 at http://dpipwe.tas.gov.au/sea-fishing-aquaculture/recreational-fishing/area-restrictions/marine-reserves.

DPIPWE, 2017b. Commercial Fishing. A WWW publication accessed in September 2017 at http://dpipwe.tas.gov.au/sea-fishing-aquaculture/commercial-fishing.

DSE, 2008. National Recovery Plan for the Australian Grayling *Prototroctes maraena*. Accessed July 2018 at https://environment.gov.au/system/files/resources/184f9f43-1f10-441d-a918-5df406b2cd2c/files/australian-grayling.pdf

DSE (Victorian Department of Sustainability and Environment) 2009. Wildlife Emergencies Factsheet No 4: Wildlife Impacted by Marine Pollution. A WWW publication accessed in September 2017 at http://www.dse.vic.gov.au/__data/assets/pdf_file/0019/103591/6.4_Oiled_Wildlife_Emergencies_Fact_Sheet v1.pdf.

DSEWPAC (Department of Sustainability, Environment, Water, Population and Communities) 2010 Gippsland Lakes Ramsar site Ecological Character Description. Accessed at http://www.environment.gov.au/water/wetlands/publications/gippsland-lakes-ramsar-site-ecd

DSEWPAC 2011a Corner Inlet Ramsar site Ecological Character Description. Accessed at http://environment.gov.au/water/wetlands/publications/corner-inlet-ramsar-site-ecological-character-description

DSEWPAC 2011b. National recovery plan for threatened albatrosses and giant petrels 2011-2016. Accessed in March 2018 at https://www.environment.gov.au/.../albatrosses-and-giant-petrels-recovery-plan.pdf.

DSEWPAC 2012. Conservation Management Plan for the Southern Right Whale. A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999

DSEWPAC 2013. Recovery Plan for the White Shark (*Carcharodon carcharias*)

Duarte CM 1991. Seagrass depth limits. Aquatic Botany Vol 40(4): 363-377.

Dunham R.J. 1962. Classification of carbonate rocks according to depositional texture. In: Classification of Carbonate Rocks (Ed. W.E. Ham), Am. Assoc. Pet. Geol. Mem., 1, 108–121.

EA (Environment Australia) 2002. Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) in Australia. Available from DoEE website: http://www.environment.gov.au/coasts/publications/grey-nurse-plan/index.html.

EA 2003. Recovery Plan for Marine Turtles in Australia. Prepared by the Marine Species Section, Approvals and Wildlife Division, Environment Australia in consultation with the Marine Turtle Recovery Team. July 2003. www.environment.sa.gov.au/files/sharedassets/public/plants_and_animals/fauna_recovery_plans/pa-rec-marineturtles.pdf.

Ecos Consulting (Aust) Pty Ltd, 2001. National Oceans Office South East Regional Marine Plan – Impacts of Petroleum.

Edgar, G. J. 1997. Australian Marine Life: The plants and animals of temperate waters. Reed New Holland, Sydney, Australia.

Edgar, G. J. 2001. Australian Marine Habitats in Temperate Waters. Reed New Holland, Sydney, Australia.

EMSA, 2016 http://www.emsa.europa.eu/news-a-press-centre/external-news/item/2925-the-management-of-ship-generated-waste-on-board-ships.html.

Environ International (Environ), 2016. Assessment of POP Criteria for Specific Short-Chain Perfluorinated Alkyl Substances https://fluorocouncil.com/wp-content/uploads/2017/03/ENVIRON-Assessment-of-POP-Criteria-Resources-1.pdf

EPA 2017a. The Victorian Environment Protection (Ships' Ballast Water) Regulations 2017 (S.R. No. 28/2017). http://www.epa.vic.gov.au/your-environment/water/ballast-water.

EPA 2017b Protocol for Environmental Management: Domestic Ballast Water Management in Victorian Waters. http://www.epa.vic.gov.au/our-work/publications/publication/2017/march/949-7.

EPR. 1993. Blackback discharge study. Memorandum to Esso Australia Ltd 1993. Exxon Production Research.

Esso Australia Ltd. 1990. 1989 Metocean Design Criteria for Bass Strait fixed platforms. Vols. 1 - 4.

Esso 2015. Incident Management Handbook – Proces, Organisation and Language for Incident Response Management. Developeed by The Response Group, Texas, USA for ExxonMobil.

Etter, RJ, Grassle, JF, 1992. Patterns of species diversity in the deep sea as a function of sediment particle size diversity. Nature 360, 576-578.

Etkins, D.S., 1997. The impacts of oil spills on marine mammals. OSIR Report – Special Report. OSIR Baker Hughes INTEQ.

Exon, NF, Hill, PJ, Keene, JB, Smith, SM, 1999. The “SOJOURN 7” Swath-Mapping Cruise of R.V. Melville off eastern Tasmania and in the Gippsland Basin. AGSO Record 1999/7 Record 1999/7, pp. 1–50.

Exxon Mobil 2012. Environmental Aspects Guide. Effective - January 1, 2012.

Fauquier DA, Litz J, Sanchez S, Colegrove K, Schwacke LH, Hart L, Saliki J, Smith C, Goldstein T, Bowen-Stevens S, McFee W, Fougeres E, Mase-Guthrie B, Stratton E, Ewing R, Venn-Watson S, Carmichael RH, Clemons-Chevis C, Hatchett W, Shannon D, Shippee S, Smith S, Staggs L, Tumlin MC, Wingers NL, Rowles TK 2017. Evaluation of morbillivirus exposure in cetaceans from the northern Gulf of Mexico 2010−2014. Endang. Species Res. 33:211-220.

Felder DL, Thoma BP, Schmidt WE, Sauvage T, Self-Krayesky SL, Christoserdov A, Bracken-Grissom HD and Fredericq S. 2014. Seaweeds and Decapod Crustaceans on Gulf Deep Banks after the Macondo Oil Spill. Bioscience 64: 808–819.

FFFC (Fire Fighting Foam Coalition), 2017. Fact Sheet on AFFF Fire-fighting Agents https://docs.wixstatic.com/ugd/331cad_fa5766eb867b4a5080330ce96db195fa.pdf

French DP, Schuttenberg, H.Z., and Isaji, T., 1999. Probabilities of oil exceeding thresholds of concern: example from an evaluation for the Florida power and light. In: proceedings: AMOP 99 Technical Seminar, June 2nd–4th 1999, Calgary, Alberta, Canada, pp. 243-260.

French-McCay DP, 2002. Development and application of an oil toxicity and exposure model, OilToxEx. Environmental Toxicology and Chemistry 21, 2080-2094.

French McCay D, 2003. Development and application of damage assessment modelling: Example assessment for the North Cape oil spill. Mar Pollut Bull 47:341–359.French McCay, D.P., 2004. Oil Spill Impact Modeling: Development and Validation. Environmental Toxicology and Chemistry 23, 2441–2456.

French McCay, D.P., 2004. Oil Spill Impact Modeling: Development and Validation. Environmental Toxicology and Chemistry 23, 2441–2456.

French-McCay, D 2016. Potential Effects Thresholds for Oil Spill Risk Assessments. By: Deborah French McCay, RPS-ASA, USA. Proceedings of the Thirty-ninth AMOP Technical Seminar, Environment and Climate Change Canada, Ottawa, ON pp. 285-303, 2016.

Fugro. 1995. Blackback Project Site Survey and Pipeline Route Investigation Survey Report. Project HY11760 (Prepared for Esso) February 1995.

Fugro. 1996. Blackback Project Subsea Site Investigation along Route 'A'. Project HY11760 (Prepared for Esso) June 1996.

Fukuyama, AK, G Shigenaka, and GR VanBlaricom. 1998. Oil spill impacts and the biological basis for response guidance: an applied synthesis of research on three subarctic intertidal communities. NOAA Technical Memorandum NOS ORCA 125. Seattle: Hazardous Materials Response and Assessment Division, National Oceanic and Atmospheric Administration. 73 pp.

Gage, JD, Lamount, PA, Tyler, PA, 1995. Deep-sea macrobenthic communities at contrasting sites off Portugal, preliminary results: I – Introduction and diversity comparisons. Internationale Revue Gesamten Hydrobiologie 80, 235-250.

Gagnon MM and Rawson C 2011. Montara Well Release, Monitoring Study S4A – Assessment of Effects on Timor Sea Fish. Curtin University, Perth, Australia.

GEMS. 2005. Nexus Petroleum. Oil Spill Risk Assessment Longtom-3 Bass Strait VIC. Global Environmental Modelling System.

Geoscience Australia, 2017. Australian Marine Spatial Information System. Accessed in September 2017 at http://www.ga.gov.au/scientific-topics/marine/jurisdiction/amsis.

Gibbs CF, Arnott GH, Longmore AR and Marchant JW, 1991. Nutrient and plankton distribution near a shelf break front in the region of the Bass Strait cascade. Australian Journal of Marine and Freshwater Research 42(2) 201 – 217.

Gill, P. C., 2002. A blue whale (*Balaenoptera musculus*) feeding ground in a southern Australian coastal upwelling zone. Journal of Cetacean Research and Management 4:179–184.

Gill, P.C., and Morrice, M.G., 2003. Blue Whale research in the Bonney Upwelling, South-east Australia - current information. Deakin University, School of Ecology and Environment, Technical paper 2001/1. November 2003.

Godfrey JS, Jones ISF,Maxwell JGH, Scott BD, 1980. On the winter cascade from Bass Strait into the Tasman Sea. Australian Journal of Marine and Freshwater Research 31, 275–286.

Gonzalez, AM, 1996. A laboratory-formulated sediment incorporating synthetic acid volatile sulfide. Environmental Toxicology and Chemistry, 15: 2209-2220.

Gros J, CM. Reddy, RK. Nelson, SA. Socolofsky, and JS Arey 2016. Simulating Gas−Liquid−Water Partitioning and Fluid Properties of Petroleum under Pressure: Implications for Deep-Sea Blowouts. Env Sci Technol. 50:7397-7408.

Hardage BA, 1985, Vertical seismic profiling, Part A— principles, 2nd ed.: Oxford, U., K., Pergamon Press, 509 p.

Harris, M.P. and Norman, F.I. 1981. Distribution and status of coastal colonies of seabirds in Victoria. Memoires of the Museum of Victoria. 42: 89–106.

Hartley JP 1996. Environmental monitoring of offshore oil and gas drilling discharges – A caution on the use of barium as a tracer. Mar. Pollut. Bull. 32:727-733.

Heislers S and Parry GD 2007. Species diversity and composition of benthic infaunal communities found in Marine National Parks along the outer Victorian coast. Parks Victoria Technical Paper Series No. 53. Fisheries Victoria, Department of Primary Industries, Queenscliff.

Henry, WC, Hyden, AM, Williams, SL, 2000. Innovations in subsea development and operation. APPEA J. 40, 439–449.

Heyward A, Moore C, Radford B and Colquhoun J. 2010. Monitoring Program for the Montara Well Release Timor Sea: Final Report on the Nature of Barracouta and Vulcan Shoals. Prepared by the Australian Institute of Marine Science for PTTEP Australasia (Ashmore Cartier) Pty Ltd.

Hirst, A. and Bott, N.J. 2016. Marine pests in the Gippsland Lakes: Existing threats and future monitoring. RMIT Centre for Environmental Sustainability and Remediation. Melbourne.

Hohn AA, Thomas L, Carmichael RH, Litz J, Clemons-Chevis C, Shippee SF, Sinclair C, Smith S, Speakman TR, Tumlin MC, Zolman ES 2017. Assigning stranded bottlenose dolphins to source stocks using stable isotope ratios following the Deepwater Horizon oil spill. Endang. Species Res. 33:235-252.

Holdgate, GR, Wallace, MW, Gallagher, SJ, Smith, AJ,Keene, JB, Moore, D, Shafik, S, 2003. Plio-Pleistocene tectonics and eustasy in the Gippsland Basin, southeast Australia: evidence from magnetic imagery andmarine geological data. Aust. J. Earth Sci. 50, 403–426.

Hook S, Batley G, Holloway M, Irving P & Ross A 2016. Oil Spill Monitoring Handbook. CSIRO Publishing.

Hornsby FE, McDonald TL, Balmer BC, Speakman TR, Mullin KD, Rosel PE, Wells RS, Telander AC, Marcy PW, Schwacke LH 2017. Using salinity to identify common bottlenose dolphin habitat in Barataria Bay, Louisiana, USA. Endang. Species Res. 33:181-192.

Hylland, K, and Eriksen, D, 2013. Naturally occurring radioactive material (NORM) in North Sea produced water: environmental consequences.

https://www.norskoljeoggass.no/contentassets/17d9e80725554841a0f8c12d75ec86bf/radioactivity-produced-water.pdf

IMCA. 2016. Marine Inspection for Small Workboats. A WWW document downloaded from www.imca-int.com/marine. International Marine Contractors Association. IMCA M 189 Rev 3, June 2016.

IMO 2011 Guidelines for the control and Management of Ships biofouling to minimise the transfer of invasive aquatic species. ANNEX 26 Resolution MEPC.207(62).

IPIECA (International Petroleum Industry Conservation Association), 1995. Biological Impacts of Oil Pollution: Rocky Shores, International Petroleum Industry Environmental Conservation Association, No. 7.

IPIECA (International Petroleum Industry Conservation Association), 2004. A guide to Oiled Wildlife Response Planning, International Petroleum Industry Conservation Association, no. 13.

ITOPF (International Tank Owners Pollution Federation), 2011. Effects of Oil Pollution on the Marine Environment. Technical Information Paper. Technical paper No. 13. The International Tank Owners Pollution Federation Limited.

IMO (International Maritime Organization) 1974, Convention for the Safety of Life at Sea (SOLAS), as amended, London.

IMO 2011. IMO guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (RESOLUTION MEPC.207(62). Adopted on 15 July 2011. http://www.imo.org/en/OurWork/Environment/Biofouling/Pages/default.aspx.

IMO. 2015. GESAMP Composite List of Hazard Profiles 2015. A WWW publication accessed at http://www.imo.org/en/OurWork/Environment/PollutionPrevention/ChemicalPollution/Documents/GESAMP%20CompList%202015.pdf.

Incardona JP, LD Gardner, TL Linbo, TL Brown, AJ Esbaugh, EM Mager, JD Stieglitz, BL French, JS Labenia, CA Laetz, M Tagal, CA Sloan, A Elizur, DD Benetti, M Grosell,. BA Block and NL Scholz 2014. Deepwater Horizon crude oil impacts the developing hearts of large predatory pelagic fish. PNAS 111(15): E1510-E1518. https://doi.org/10.1073/pnas.1320950111.

Jenssen, BM 1996. An overview of exposure to, and effects of, petroleum oil and organochlorine pollution in grey seals (Halichoerus grypus). Sci Total Environ. 1996 Jul 16;186(1-2):109-18.

Jewett, S.C., T.A. Dean, R.O. Smith, & A. Blanchard. 1999. The Exxon Valdez oil spill: impacts and recovery of the soft-bottom benthic community in and adjacent to eelgrass beds. Marine Ecology Progress Series 185:59-83.

Jones, I.S.F., 1980. Tidal and wind-driven currents in Bass Strait. Australian Journal of Marine and Freshwater Research 31: 109–117.

Jones, R. and Allen, J., 1979. A stratified archaeological site on great Glennie Island, Bass Strait. Australian Archaeology 9: 2–11.

Jones H. A. & Davies P.J. 1983. Superficial sediments of the Tasmanian continental shelf and part of Bass Strait. Bureau of Mineral Resources Bulletin 218.

Kellar NM, Speakman TR, Smith CR, Lane SM, Balmer BC, Trego ML, Catelani KN, Robbins MN, Allen CD, Wells RS, Zolman ES, Rowles TK, Schwacke LH 2017. Low reproductive success rates of common bottlenose dolphins Tursiops truncatus in the northern Gulf of Mexico following the Deepwater Horizon disaster (2010−2015). Endang. Species Res. 33:143-158.

Kirkwood, R., Pemberton, D., Gales, R., Hoskins, A.J., Mitchell, T., Shaughnessy, P.D. and Arnould, J.P.Y., 2010. Continued population recovery by Australian fur seals. Marine and Freshwater Research. 61:695-701.

Kroops, W, Jak, R. G., Van der Veen, D.P.C., 2004. Use of dispersants in oil spill response to minimize environmental damage to birds and aquatic organisms. Interspill 2004. Presentation no. 429

Klimey, AP and Anderson SD, 1996. Residency patterns of white sharks at the South Farrallone Islands, California. In Great White Sharks: The biology of *Carcharodon cacharias*. A.P. Klimey & D.G. Ainley (Eds).pp 365-373. Academic Press, New York.

Kloser RJ, Williams A, and Butler A 2001. Assessment of acoustic mapping of seabed habitats: marine biological and resource surveys South-East Region. Cooperative Program, Report 2 to the National Oceans Office. 332 pp.

Kuiter, RH 2000. Coastal Fishes of South-eastern Australia. GA Pty Ltd., Sydney Land Conservation Council (LCC). 1993. Marine and coastal special investigation descriptive report. Victorian Government, Melbourne

Laist DW, Knowlton AR, Mead JG, Collet AS & Podesta M 2001. Collisions between Ships and Whales. Marine Mammal Science, Vol. 17, Issue 1, pp 35-75.

Land Conservation Council (LCC). 1993. Marine and Coastal Development Report (special investigation) June 1993.

Langford TEL 1990. Ecological effects of thermal discharges, xi, 468p. Elsevier.

Larcombe, J and Begg, G 2008, Fishery status reports 2007: Status of fish stocks managed by the Australian Government, Bureau of Rural Sciences, Canberra.

Lawson and Treloar Pty Ltd. (1990). "Bass Strait Metocean Data, Kingfish B, Wave, Current and Wind Data". Unpublished report prepared for Esso Australia Limited. Lawson and Treloar Pty Ltd report REP1182, issued October 1987 and revised March 1990.

Lawson and Treloar Pty Ltd. (1991). "Bass Strait Metocean Data, Marlin 500mm Gas Pipeline Stability Criteria". Unpublished report prepared for Esso Australia Limited. Lawson and Treloar Report No. R1331, issued October 1990 and revised March 1991 and July 1991.

Lawson and Treloar Pty Ltd. (1994). "Blackback Oceanographic Study". Unpublished report prepared for Esso Australia Limited. Lawson and Treloar Pty Ltd report R1487, February 1994.

Lawson and Treloar, (1996). “Blackback Oceanographic Measurement Program”. Unpublished report prepared by Lawson and Treloar Pty Ltd for Esso Australia Limited, Report #J1449/R1665.

Lawson and Treloar, (1998). “Prediction of Bass Strait Cascade Currents”. Unpublished report prepared by Lawson and Treloar Pty Ltd for Esso Australia Limited, Report # Rm1030/J5146.

Lawson and Treloar, (1999a). “First Generation Platforms, Data for Riser Analysis”. Unpublished report prepared by Lawson and Treloar Pty Ltd for Esso Australia Limited, Report # Rm1039/J5158.

Lawson and Treloar, (1999b). “Oceanographic Measurements during Blackback Drilling and Completion”. Unpublished report prepared by Lawson and Treloar Pty Ltd for Esso Australia Limited, Report # Rm1039/J5158.

Lawson and Treloar, (2000). “Water Temperature in Bass Strait”. Unpublished report prepared by Lawson and Treloar Pty Ltd for Esso Australia Limited, Report # Rm1055/J5170.

Leftrade Ltd. 2013. Types of fishing. A www publication accessed at Lakes Entrance Fishermen's Co-Op website: http://www.leftrade.com.au/operations/types-of-fishing.html.

Lighthouses of Australia, 2018. www.lighthouses.org.au/lights/index.asp

Loehr L C, Beegle-Krause CJ, George K, McGee C D, Mearns AJ, Atkinson MJ 2006. The significance of dilution in evaluating possible impacts of wastewater discharges from large cruise ships. Marine Pollution Bulletin, Vol 52, pp 681–688.

Marshall, NG, 1988. A Santonian dinoflagellate assemblage from the Gippsland Basin, Southeastern Australia, Association of Australasian Palaeontologists. Memoir 5, 195–215.

McCauley, R., 1998. Radiated Underwater Noise Measured from the Drilling Rig Ocean General, Rig Tenders Pacific Ariki and Pacific Frontier, Fishing Vessel Reef Venture and Natural Sources in the Timor Sea, Northern Australia, report prepared for Shell Australia, Melbourne, July 1998.

McCauley R.D., C Jenner C., JL Bannister, DH Cato & AJ Duncan 2000. Blue whale calling in the Rottnest trench, Western Australia, and low frequency sea noise. In: Australian Acoustical Society Conference (pp. 1–6). Joondalup, Western Australia.

McCauley RD, R . Day, KM. Swadling, QP Fitzgibbon, RA Watson & JM Semmens 2017. Widely used marine seismic survey air gun operations negatively impact zooplankton. Nature Ecology & Evolution 1, 0195 (2017).

McDonald TL, Hornsby FE, Speakman TR, Zolman ES, Mullin KD, Sinclair C, Rosel PE, Thomas L, Schwacke LH 2017. Survival, density, and abundance of common bottlenose dolphins in Barataria Bay (USA) following the Deepwater Horizon oil spill. Endang. Species Res. 33:193-209.

McIntyre AD & Johnson R 1975. Effects of nutrient enrichment from sewage in the sea. In: ALH Gameson, ed. Discharge of sewage from sea outfalls. New York, Pergamon Press. pp. 131–141.

McKay MD, Morrison JD, Upton SC 1999. Evaluating prediction uncertainty in simulation models. Computer Physics Communications 117(1–2): 44-51.

Mitchell, JK, GR Holdgate, MW Wallace, SJ Gallagher (2007). Marine geology of the Quaternary Bass Canyon System, southeast Australia: A cool-water carbonate system. Marine Geology 237 (2007) 71–96.

Morrow, R. A., Jones, I. S. F., Smith, R. L. and Stabeno, P. J., 1990. Bass Strait forcing of coastal trapped waves: ACE revisited. Journal of Physical Oceanography 20: 1528–1538.

Munro P., Croce B., Moffit C., Brown N., McIntosh A., Hird S. and Stagg R. 1998. Solid-Phase Test for Comparison of Degradation Rates of Synthetic-Mud Base Fluids Used in the Off-Shore Drilling Industry. Environmental Toxicology and Chemistry 17(10): 1951-1959.

Myers, G 2008. Ultra-Deepwater Riserless Mud Circulation with Dual Gradient Drilling. Scientific Drilling, No. 6, July 2008.

National Oceans Office, 2002. Sea Country – an Indigenous perspective The South-east Regional Marine Plan Assessment Reports. Available online at http://www.environment.gov.au/system/files/resources/271c0bfc-34a2-4c6c-9b02-01204ebc0f43/files/indigenous.pdf

Neff, J.M. 2010. Fates and Effects of Water Based Drilling Muds and Cuttings in Cold-Water Environments. Prepared by Neff & Associates LLC for Shell Exploration and Production Company.

Neira, F.J., 2005. Summer and winter plankton fish assemblages around offshore oil and gas operational areas in south-eastern Australia .Estuarine, Coastal and Shelf Science. 2005, Vol.63(4), pp.589-604

NERA (National Energy Resources Australia) 2017a. Reference Case Project. Accessed online in November 2017 at https://referencecases.nopsema.gov.au/about-the-project/.

NERA 2017b. Environment Plan Reference Case – Planned discharge of sewage, putrescible waste and greey water. https://referencecases.nopsema.gov.au/assets/reference-case-project/2017-1001-Sewage-grey-water-and-putrescible-waste-discharges.pdf

Neuparth T, Costa FO & Costa MH 2002. Effects of temperature and salinity on life history of the marine amphipod *Gammarus locusta*. Implications for ecotoxicological testing. Ecotoxicology, 11, 61–73.

NNTT (National Native Title Tribunal), 2010. Native Title Determination Details - VCD2010/001 – Gunai-Kurnai People. A WWW publication accessed in September 2017 at http://www.nntt.gov.au/searchRegApps/NativeTitleClaims/Pages/Determination_details.aspx?NNTT_Fileno=VCD2010/001.

NOAA (U.S. Department of Commerce National Oceanic and Atmospheric Administration National Ocean Service Office of Response and Restoration, Emergency Response Division), 2002. Managing seafood safety after an oil spill. Seattle: Hazardous Materials Response Division, Office of Response and Restoration, National Oceanic and Atmospheric Administration. 72pp.

NOAA 2006. Special Monitoring of Applied Response Technologies (SMART). Accessed online at https://response.restoration.noaa.gov/sites/default/files/SMART_protocol.pdf.

NOAA, 2010a. Oil and sea turtles: biology planning and response. US Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Office of Response and Restoration, 116 pp.

NOAA, 2010b. Oil spills in coral reefs: planning and response considerations, US Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Office of Response and Restoration, 84 pp.

NOAA, 2010c Oil spills in mangroves: planning and response considerations. US Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Office of Response and Restoration, 71 pp.

NOAA 2010d. Characteristic Coastal Habitats - Choosing Spill Response Alternatives.

NOAA 2016. Technical Guidance for Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing. NOAA Technical Memorandum NMFS-OPR-55, July 2016 http://www.nmfs.noaa.gov/pr/acoustics/Acoustic%20Guidance%20Files/opr-55_acoustic_guidance_tech_memo.pdf.

NOO. 2002. Ecosystems - Nature's Diversity. The South-East Regional Marine Plan Assessment Reports. National Oceans Office. Hobart.

NOPTA 2018. Titleholders report - National Offshore Petroleum Titles Administrator. Accessed in May 2018 at www.nopta.gov.au/_documents/neats/titleholders-report-20180331.xlsx.

NOPSEMA 2013, Validation Guideline, N-04200-GL0525, Revision 13, April 2016. https://www.nopsema.gov.au/assets/Guidelines/A52424.pdf.

NOPSEMA, 2016. Environment plan content requirements. Guidance noteN04750-GN1344 Revision No 3 April 2016. Accessed in September 2017 at https://www.nopsema.gov.au/assets/Guidance-notes/A339814.pdf.

NOPSEMA 2016a, Validation Policy, N-04200-PL0286, Revision 9, June 2016 . https://www.nopsema.gov.au/assets/Policies/A15457-Validation-Rev-9.pdf.

NOPSEMA 2016b. Operational and Scientific Monitoring Programs – Information paper (N-04700-IP1349, Rev 2, March 2016) https://www.nopsema.gov.au/assets/Information-papers/A343826.pdf

NOPSEMA 2017a, Scope of Validation Matrix, N-04200-FM0325 (March 2017).. https://www.nopsema.gov.au/assets/Forms/A15410.pdf.

NOPSEMA 2017b. Reference case briefing, Perth, Melbourne, and Adelaide - August/September 2017. Accessed online in November 2017 at https://referencecases.nopsema.gov.au/about-the-project/ and https://www.nopsema.gov.au/assets/Presentations/A573288.pdf.

NOPSEMA, 2018.Oil pollution risk management – Guidance Note (N-04700-GN1488, Rev 2, February 2018) https://www.nopsema.gov.au/assets/Guidance-notes/A382148.pdf

Norse Decom, 2003. Naturally occurring radionuclides in the marine environment – an overview of current knowledge with emphasis on the North Sea area
https://www.forskningsradet.no/csstorage/vedlegg/radionuclides_marine_environment.pdf

NRC (National Research Council) 1989. Using oil spill dispersants on the sea. Washington DC National Academy Press. 335 p.

NSW Health 2017. Fact Sheet - PFOS and PFOA. Accessed online in November 2017 at http://www.health.nsw.gov.au/environment/factsheets/Pages/pfos.aspx.

NPWS (NSW National Parks and Wildlife Service), 2017a. Nadgee Nature Reserve. A WWW publication accessed at http://www.environment.nsw.gov.au/NationalParks/parkHome.aspx?id=N0458 in September 2017.

NPWS 2017b. Ben Boyd National Park. A WWW publication accessed at http://www.nationalparks.nsw.gov.au/visit-a-park/parks/ben-boyd-national-park in September 2017.

NPWS, 2018. Visit a park. Accessed July 2018 at https://www.nationalparks.nsw.gov.au/visit-a-park/parks

OECD 2002. Manual for investigation of HPV chemicals . Chapter 4: Initial assessment of data. 4.2. Guidance for the Initial Assessment of Aquatic Effects.

OGUK. 2014. Guidance on Risk Related Decision Making. Accessed in January 2018 at http://oilandgasuk.co.uk/product/guidance-on-risk-related-decision-making-issue-2-july-2014/.

O'Hara, T and Barmby, V. 2000. Victorian Marine Species of Conservation Concern: Molluscs, Echinoderms and Decapod Crustaceans. Department of Natural Resources and Environment.

Olsvik, P.A., Berntssen,M.H.G., Hylland,K., Eriksen,D., Holen,E., 2012. Low impact of exposure to environmentally relevant doses of 226 Rain Atlantic cod (*Gadus morhua*) embryonic cells. *J.Environ.Radioact*. 109, 84–93. Accessed in August 2018 at https://www.sciencedirect.com/science/article/pii/S0265931X12000495

OSPAR, 2004. Report on Discharges, Spills and Emissions from Offshore Oil and Gas Installations, OSPAR Commission, 2004.

OSPAR 2012. OSPAR Guidelines in support of Recommendation 2012/5 for a Risk-based Approach to the Management of Produced Water Discharges from Offshore Installations. Source: OSPAR 12/22/1, Annex 19 (OSPAR Agreement: 2012-7, updated by OIC 2014).

OSPAR, 2013. OSPAR List of Substances Used and Discharged Offshore which Are Considered to Pose Little or No Risk to the Environment (PLONOR) (OSPAR Agreement: 2013-06).

Pangerc et al 2016, Underwater sound measurement data during diamond wire cutting: First description of radiated noise T Pangerc, S Robinson, P Theobald, and L Galley, Acoustic Society of America. Accessed in October 2018 at https://asa.scitation.org/doi/pdf/10.1121/2.0000322?class=pdf

ParksVic, 1998. The Lakes National Park and Gippsland Lakes Coastal Park Management Plan. Accessed in September 2017 at http://trove.nla.gov.au/work/7878610?selectedversion=NBD13768438.

ParksVic 2003. Gippsland Lakes Ramsar Site Strategic Management Plan. Accessed in September 2017 at http://parkweb.vic.gov.au/__data/assets/pdf_file/0007/313279/gippsland-lakes-ramsar-site.pdf

ParksVic 2005. Corner Inlet Ramsar Site Strategic Management Plan. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/corner-inlet-marine-national-park

ParksVic 2006. Management Plan for Cape Howe Marine National Park. A WWW publication accessed on in September 2017 at http://parkweb.vic.gov.au/explore/parks/cape-howe-marine-national-park.

ParksVic, 2017a. Point Hicks Marine National Park. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/point-hicks-marine-national-park.

ParksVic, 2017b. Beware Reef Marine Sanctuary. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/beware-reef-marine-sanctuary.

ParksVic, 2017c. Ninety Mile Beach Marine National Park. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/ninety-mile-beach-marine-national-park.

ParksVic, 2017d. Nooramunga Marine and Coastal Park. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/nooramunga-marine-and-coastal-park.

ParksVic, 2017e. Corner Inlet Marine and Coastal Park. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/corner-inlet-marine-and-coastal-park.

ParksVic, 2017f. Corner Inlet Marine National Park. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/corner-inlet-marine-national-park.

ParksVic, 2017g. Wilsons Promontory Marine Park. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/wilsons-promontory-national-park.

ParksVic, 2017h. Croajingolong National Park. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/croajingolong-national-park.

ParksVic, 2017i. Cape Conran Coastal Park. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/cape-conran-coastal-park.

ParksVic, 2017j. Gippsland Lakes Coastal Park. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/gippsland-lakes-coastal-park.

ParksVic, 2017k. The Lakes National Park. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/the-lakes-national-park.

ParksVic, 2017l. Cape Howe Marine National Park. A WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/cape-howe-marine-national-park.

ParksVic, 2017m. Subtidal rocky reefs. WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/park-management/environment/ecosystems/marine/subtidal-rocky-reefs.

ParksVic, 2017n. The Lakes National Park. WWW publication accessed in September 2017 at http://parkweb.vic.gov.au/explore/parks/the-lakes-national-park/environment.

ParksVic. 2017o. Marine pests. A WWW database accessed at http://parkweb.vic.gov.au/park-management/environment/weeds-and-pests/marine-pests. Parks Victoria. Kew.

ParksVic. 2017p. Gabo island Lighthouse Reserve Visitor Guide. A WWW publications accessed in July 2018 at http://parkweb.vic.gov.au/explore/parks/gabo-island-lighthouse-reserve

ParksVic, 2018. National and State Parks. Accessed July 2018 at parkweb.vic.gov.au/explore/find-a-park/marine-protected-areas

Parry, G.D., Campbell, S.J. and Hobday, D.K. 1990. Marine resources off East Gippsland, southeastern Australia. Technical Report No. 72, Marine Science Laboratories, Queenscliff, Victoria, Australia.

Passlow, V, 1997. Slope sedimentation and shelf to basin transfer: a cool-water carbonate example from the Otway Margin, Southeast Australia. In: James, N.P.C., Jonathan, A.D. (Eds.), SEPM, vol. 56. SEPM, pp. 107–125.

Patil JG, Hayes KR, Gunasekera RM, Deagle BE, McEnnulty FR, Bax NJ, & Hewitt CL 2004a. Port of Hastings National Demonstration Project – Verification of the Type II error rate of the Ballast Water Decision Support System (DSS). Final report prepared for the EPA, www.marine.csiro.au/crimp.

Patil, J, Gunasekera R, McEnnulty F, Bax, N 2004b. Development of genetic probes for the rapid assessment of the impacts of marine invasive species on native biodiversity - *Maoricolpus roseus*. Final report for the Department of Environment and Heritage by CSIRO Marine Research, November 2004.

Peel D, Smith JN & Childerhouse S. (2016) Historical Data on Australian whale vessel strikes. IWC June 2016 (SC/66b/HIM/05 Rev1). https://www.nespmarine.edu.au/document/historical-data-australian-whale-vessel-strikes-international-whaling-commission-june-2016.

Pemberton, D. & Kirkwood, R.J. 1994. Pup production and distribution of the Australian fur seal, *Arctocephalus pusillus doriferus*, in Tasmania. Wildlife Research. 21:341-352.

Pizzey, G. 2003. The Field Guide to the Birds of Australia. HarperCollins, Pymble, NSW.

PTTEP. 2013. Montara Environmental Monitoring Program. Report of Research. A WWW publication accessed at: www.au.pttep.com/sustainable-development/environmentalmonitoring. PTTEP Australasia. Perth.

Rawson, C., Gagnon, M.M. and Williams, H. 2011. Montara Well Release Olfactory Analysis of Timor Sea Fish Fillets. Curtin University, Perth, Western Australia, November 2011.

Ralf B. Schäfer, Nadine Gerner, Ben J. Kefford, Jes J. Rasmussen, Mikhail A. Beketov,Dick de Zwart, Matthias Liess, and Peter C. von der Ohe 2013. How to Characterize Chemical Exposure to Predict Ecologic Effects on Aquatic Communities?, Environmental Science and Technology, Vol 47, pp 7996-8004.

Reddy, C. M., Arey, J. S., Seewald, J. S. *et al*. (2011). Composition and fate of gas and oil released to the water column during the Deepwater Horizon oil spill. Proceedings of the National Academy of Sciences. DOI 10.1073.

Reich KJ, López-Castro MC, Shaver DJ, Iseton C, Hart KM, Hooper MJ, Schmitt CJ 2017. δ13C and d15N in the endangered Kemp's ridley sea turtle Lepidochelys kempii after the Deepwater Horizon oil spill. Endang. Species Res. 33:281-289.

Reilly & York. (2001). Guidance on Sensory Testing and Monitoring of Seafood for Presence of Petroleum Taint Following an Oil Spill. Environmental Health Perspectives 119:1062-1069 (2011).

Rice DW 1998. Marine mammals of the world. Systematics and distribution. Special publication number 4. Kansas: Society for Marine Mammalogy.

Rochford, DJ 1975. The physical setting. In "Resources of the Sea" (Eds. MR Banks and TG Dix). Symposium Bicheno, Tasmania (Royal Society of Tasmania: Hobart).

Rodríguez A, Burgan G, Dann P, Jessop R, Negro JJ, Chiaradia A 2014. Fatal attraction of short-tailed shearwaters to artificial lights. PLoS One 9(10):e110114.

Rosel PE, Wilcox LA, Sinclair C, Speakman TR, Tumlin MC, Litz JA, Zolman ES 2017. Genetic assignment to stock of stranded common bottlenose dolphins in southeastern Louisiana after the Deepwater Horizon oil spill. Endang. Species Res. 33:221-234.

Rowe, G.T., Polloni, P.T., Haedrich, R.L., 1982. The deep-sea macrobenthos on the continental margin of the Northwest Atlantic Ocean. Deep-Sea Research 29, 257-278.

RPS 2009. Effects of a desalination plant discharge on the marine environment of Barrow Island. Prepared by RPS for Chevron Australia Pty Ltd.

RPS 2017. Appendix 1: ConocoPhillips Barossa Project Cooling Water Dispersion Modelling. Prepared by RPS for Conocophillips Australia. Report Number: MAQ0540J.000, 7 March 2017.

Rudd HJ & NA Hill 2001. Measures to Reduce Emissions of VOCs during Loading and Unloading of Ships in the EU. A report produced for the European Commission, Directorate General – Environment. AEAT/ENV/R/0469 Issue 2. August 2001. Accessed in January 2018 at ec.europa.eu/environment/air/pdf/vocloading.pdf.

Ryerson TB, KC Aikin, WM Angevine, EL Atlas, DR Blake, CA Brock, FC Fehsenfeld, RS Gao, JA de Gouw, DW Fahey, JS Holloway, DA Lack, RA Lueb, S Meinardi, AM Middlebrook, DM Murphy, JA Neuman, JB Nowak, DD Parrish, J Peischl, AE Perring, IB Pollack, AR Ravishankara, JM Roberts, JP Schwarz, R Spackman, H Stark, C Warneke and LA Watts 2011. Atmospheric emissions from the Deepwater Horizon spill constrain air–water partitioning, hydrocarbon fate, and leak rate. Geophys. Res. Lett. 38 L07803 http://onlinelibrary.wiley.com/doi/10.1029/2011GL046726/pdf.

Sabri Y., Ippolito S, Tardio J and Bhargava S 2012. Understanding mercury accumulation in MEG and its fate in the MEG regeneration process. A report for Esso by the Research Laboratory for Mercury Sensing and Abatement, Centre for Advanced Materials and Industrial Chemistry (AMIC), RMIT.

Saunders, D.L. and Tzaros, C.L. 2011. National Recovery Plan for the Swift Parrot *Lathamus discolor*, Birds Australia, Melbourne. http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-swift-parrot-lathamus-discolor

Sause BL. Gwyther D, Hanna PJ and O'Connor NA 1987. Evidence for winter – spring spawning of the scallop Pectan alba (Tate) in Port Phillip bay, Victoria, Australia, J. Mar. Freshwat. Res. 38: 329-337.

Schaanning MT, K Hylland, GØ Eriksen, TD Bergan, JS Gunnarson and J Skei. 1996. Interactions between eutrophication and contaminants II. Mobilization and bioaccumulation of Hg and Cd from marine sediments. Mar. Pollut. Bull. 33:71-79.

Scholten, M.C.Th., Kaag, N.H.B.M., Dokkum, H.P. van, Jak, R.G., Schobben, H.P.M., and Slob, W., 1996. Toxische effecten van olie in het aquatische milieu, TNO report TNO-MEP – R96/230, Den Helder, The Netherlands.

Scholz, D., Michael, J. Shigenaka, G. and Hoff, R., 1992. Biological resources, In: An introduction to coastal habitats and biological resources for oil spill response, Report HMRAD 92-4, NOAA Hazardous Materials Response and Assessment Division, Seattle.

Schlacher, T.A., Schlacher-Hoenlinger, M.A., Williams, A., Althaus, F., Hooper, J.N.A., Kloser, R., 2007. Richness and distribution of sponge megabenthos in continental margin canyons off southeastern Australia. Marine Ecology Progress Series 340, 73-88.

Schwacke LH, Thomas L, Wells RS, McFee WE, Hohn AA, Mullin KD, Zolman ES, Quigley BM, Rowles TK, Schwacke JH 2017. Quantifying injury to common bottlenose dolphins from the Deepwater Horizon oil spill using an age-, sex- and class-structured population model. Endang. Species Res. 33:265-279.

Shaughnessy PD 1999 The Action Plan for Australian Seals. Environment Australia. April 1999.

Shen W & Xing G 2017. Study on Vessel Sewage Treatment Technologies. AIP Conference Proceedings 1890, 040041 (2017).

Shepherd SA and Edgar GJ (2013). Ecology of Australian temperate reefs : the unique South. CSIRO Publishing.

Simmonds M, Dolman S. Weilgart L (eds.) 2004. Oceans of noise A Whale and Dolphin Conservation Society WDCS Science report. https://uk.whales.org/sites/default/files/oceans-of-noise.pdf.

Smit MGD, RK. Bechmann, AJ Hendriks, A Skadsheim, BK. Larsen, T Baussant, A Bamber and S Sanni, 2009. Relating biomarkers to whole-organism effects using species sensitivity distributions: a pilot study for marine species exposed to oil. Env Tox Chem 28(5):1104–1109.

Stevens, J.D., Pillans, R.D. and Salini, J., 2005. Conservation Assessment of *Glyphis* sp. A (Speartooth Shark), *Glyphis* sp. C (Northern River Shark), *Pristis microdon* (Freshwater Sawfish) and *Pristis zijsron* (Green Sawfish). [Online]. Hobart, Tasmania: CSIRO Marine Research. Available from: http://www.environment.gov.au/resource/conservation-assessment-glyphis-sp-speartooth-shark-glyphis-sp-c-northern-river-shark.

Stewart K, Crozier J, Gilmour P and Edmunds M (2007). Victorian Subtidal Reef Monitoring Program: The Reef Biota at Bunurong Marine National Park. Parks Victoria Technical Series No. 48. Parks Victoria, Melbourne.

Stivala, J. (2005) Statement of Management Arrangements for the Victorian Commercial Scallop (*Pecten fumatus*) Fishery. Fisheries Victoria, Department of Primary Industries.

Swan, J.M., Neff, J.M. and Young, P.C. (Eds.), 1994. Environmental Implications of Offshore Oil and Gas Development in Australia, The Findings of an Independent Scientific Review. Australian Petroleum Exploration Association (APEA), Energy Research and Development Corporation (ERDC), Australia.

Takeuchi, I., Miyoshi, N., *et al*. (2009). Biomagnification profiles of polycyclic aromatic hydrocarbons, alkylphenols and polychlorinated biphenyls in Tokyo Bay elucidated by d13C and d 15N isotope ratios as guides to trophic web structure. Mar Poll Bull 58:663-671.

Tas Parks, 2018. National Parks. Accessed July 2018 at http://www.parks.tas.gov.au/index.aspx?base=236

Thomas L, Booth CG, Rosel PE, Hohn A, Litz J, Schwacke LH 2017. Where were they from? Modelling the source stock of dolphins stranded after the Deepwater Horizon oil spill using genetic and stable isotope data. Endang. Species Res. 33:253-264.

TPWS (Tasmania Parks and Wildlife Service), 2017a. Kent Group Marine Reserve. A WWW publication accessed in September 2017 at http://www.parks.tas.gov.au/index.aspx?base=3110.

TPWS 2017b. Strzelecki National Park. A WWW publication accessed in September 2017 at http://www.parks.tas.gov.au/?base=3834.

TPWS 2017c. Mt William National Park. A WWW publication accessed in September 2017 at http://www.parks.tas.gov.au/index.aspx?base=3634.

TSSC (Threatened Species Scientific Committee), 2008. Commonwealth Conservation Advice on *Dermochelys coriacea*

TSSC, 2009. Commonwealth Listing Advice on *Galeorhinus galeus under EPBC Act 1999*. A WWW publication accessed in September 2017 at http://www.environment.gov.au/biodiversity/threatened/species/pubs/68453-listing-advice.pdf.

TSSC, 2015a. Approved Conservation Advice for *Balaenoptera borealis* (Sei whale).

TSSC, 2015b. Conservation Advice *Halobaena caerulea* (Blue petrel)

TSSC, 2015c. Approved Conservation Advice for *Balaenoptera physalus* (Fin whale)

TSSC, 2015d. Approved Conservation Advice for *Calidris ferruginea* (Curlew Sandpiper)

TSSC, 2015e. Approved Conservation Advice for *Megaptera novaeangliae* (Humpback whale)

TSSC, 2015f. Approved Conservation Advice for *Numenius madagascariensis* (Eastern Curlew)

TSSC, 2015g. Approved Conservation Advice for *Rhincodon typus* (Whale shark)

TSSC, 2016a. Approved Conservation Advice for *Calidris canutus* (Red knot)

TSSC, 2016b. Approved Conservation Advice for *Limosa lapponica baueri* (Bar-tailed godwit (Western Alaskan))

TSSC, 2016c, Conservation Advice for *Calidris tenuirostriss* (Great Knot)

Tomczak, M. Jr 1985. The Bass Strait water cascade during winter 1981. Continental Shelf Research 4, 255-278.

Tourism Victoria, 2017. Visit Melbourne. A WWW publication accessed in September 2017 at www.visitmelbourne.com/Regions/Gippsland.aspx.

TriSurv 2008. Dory-1 Site Survey. Prepared for Apache Energy Limited by Tri-Surv Pty Ltd Western Australia. Report No.: 8A270-RR-001-R0. August 2008.

URS, 2000. Blackback Seabed Monitoring Programme. Report prepared for Esso Australia Pty Ltd.

URS, 2001. Review of Environmental Impacts of Petroleum Exploration and Appraisal Activities in Commonwealth Waters. Report prepared for the Department of Science and Resources.

URS 2009. Ichthys Gas Field Development Project EIS Appendix 15: Review of Literature on Sound in the Ocean and Effects of Noise on Marine Fauna. Prepared for INPEX Browse, Ltd. Doc No. C036-AH-REP-0020, Rev 2. 27 July 2009.

UNEP (United Nations Environment Programme) 1985. GESAMP: Thermal discharges in the marine environment. UNEP Regional Seas Reports and Studies No. 45.

UNEP 1999. Seawater Cooling Overboard Discharge: Nature of Discharge - Phase I Final Rule and Technical Development Document of Uniform National Discharge Standards (UNDS). Published in April 1999. Reference number: EPA-842-R-99-001.

USEPA (United States Environmental Protection Agency). 2000. Environmental assessment of final effluent limitations guidelines and standards for synthetic-based drilling fluids and other non-aqueous drilling fluids in the oil and gas extraction point source category. United States Environmental Protection Agency, Washington.

US-EPA 2002. Cruise Ship Plume Tracking Survey Report. EPA842-R-02-001, September 2002.

VEAC (Victorian Environmental Assessment Council) 2014. Marine Investigation Final Report. A WWW publication accessed in September 2017 at https://www.parliament.vic.gov.au/file_uploads/VEAC_Marine_Investigation_Final_Report_int_Rq704ZkR.pdf.

Vetter, E.W., Dayton, P.K., 1998. Macrofaunal communities within and adjacent to a detritus-rich submarine canyon. Deep Sea Research II 45, 25-54.

Vetter, E.W., Dayton, P.K., 1999. Organic enrichment by macrophyte detritus, and abundance patterns of megafaunal populations in submarine canyons. Marine Ecology Progress Series 186, 137-148.

Vetter, E.W., Smith, C.R., De Leo, F.C., 2010. Hawaiian Hotspots: Enhanced Megafaunal Abundance and Diversity in Submarine Canyons on the Oceanic Islands of Hawaii. Marine Ecology 31, 183-199.

Victorian Heritage Council, 1999. Gabo Island Lightstation. A Victorian Heritage Database Report accessed on 11 July 2018 at http://vhd.heritagecouncil.vic.gov.au/places/2022/download-report

VFA (Victorian Fisheries Authority) 2017a. Abalone Disease. A WWW publication accessed in September 2017 at https://vfa.vic.gov.au/operational-policy/marine-pests-and-diseases/abalone-disease.

VFA 2017b. Victorian Fish Stock Status Report. A WWW publication accessed in September 2017 at https://vfa.vic.gov.au/operational-policy/publications-and-resources/status-of-victorian-fisheries.

Vikebø FB, P Rønningen, VS Lien, S Meier, M Reed, B Adlandsvik and T Kristiansen, 2014. Spatio-temporal overlap of oil spills and early life stages of fish International Council for the Exploration of the Sea (ICES) Journal of Marine Science 71(4): 970–981.

Visit NSW, 2017. South Coast. A WWW publication accessed in September 2017 at http://www.visitnsw.com/destinations/south-coast

Volkman, J. K., Miller, G. J., Revill, A. T. and Connell, D. W. (1994). Oil spills. In Environmental implications of offshore oil and gas development in Australia. Swan, J. M., Neff, J. M. and Young, P. C. (eds). Australian Petroleum Exploration Association, Sydney, pp. 509-695.

Walker DI and McComb AJ 1990. Salinity response of the seagrass *Amphibolis Antarctica* (Labill.) Sonder et Aschers: an experimental validation of field results. Aquat Bot. 36:359–366.

Walker, T. I., Taylor, B. L., and Hudon, R. J, 2001. Southern shark catch and effort 1970–2000. Report to Australian Fisheries Management Authority. July 2001. Marine and Freshwater Resources Institute.

Wallace BP, Brosnan T, McLamb D, Rowles T, Ruder E, Schroeder B, Schwacke L, Stacy B, Sullivan L, Takeshita R, Wehner D 2017. Overview: Effects of the Deepwater Horizon oil spill on protected marine species. Endang. Species Res. 33:1-7.

Walraven E. (1992). Rescue and Rehabilitation of Oiled Birds (Pub. Zoological Parks Board of NSW, Taronga Zoo Sydney).

Wan Y, Jin X, Hu J, Jin F. (2007). Trophic dilution of polycyclic aromatic hydrocarbons (PAHs) in a marine food web from Bohai Bay, North China. Environ Sci Technol 41:3109-3114

Warneke, R.M., 1995. Family Otariidae. In: Mammals of Victoria; distribution, ecology and conservation. pp 251-256.

WaterReuse Association (2011). Desalination Plant Intakes – Impingement and Entrainment Impacts and Solutions. White Paper March 2011, Revised June 2011. A WWW publication accessed in November 2017 at https://www3.epa.gov/region1/npdes/schillerstation/pdfs/AR-026.pdf.

Watson, GF, and Chaloupka, M. Y., 1982. Zooplankton of Bass Strait: Species composition, systematics and artificial key to species. Victorian Institute of Marine Science Technical Report No. 1. 1–128.

Watson JEM, Joseph LN. & Watson AWT 2009). A Rapid Assessment of the Impacts of the Montara Oil Leak on Birds, Cetaceans and Marine Reptiles. Prepared on behalf of the Department of the Environment, Water, Heritage and the Arts by the Spatial Ecology Laboratory, University of Queensland, Brisbane.

Weise, FK, Montevecchi WA, Davoren GK, Huettmanns F, Diamond AW and Linke J (2001. Seabirds at risk around offshore oil platforms in the North-west Atlantic. Mar Poll Bull 42(12): 1285-1290. www.opc.ca.gov/webmaster/_media_library/2016/01/Wiese-et-al-2001-offshore-lighting-and-seabirds.pdf.

Wells RS, Schwacke LH, Rowles TK, Balmer BC, Zolman E, Speakman T, Townsend FI, Tumlin MC, Barleycorn A, Wilkinson KA 2017. Ranging patterns of common bottlenose dolphins Tursiops truncatus in Barataria Bay, Louisiana, following the Deepwater Horizon oil spill. Endang. Species Res. 33:159-180.

Wildwell Control 2017. Gas dispersion and radiant heat study - Hairtail-1 Well. Document Number: 2017-296-001R-A. Report prepared by Willdwell Control for ExxonMobil. December 2017.

Wildwell Control 2018a. Capping Stack Interface Check Ocean Monarch. Report prepared by Willdwell Control Document No: WC-CS-ALL-INT. January 2018.

Wildwell Control 2018b. WellCONTAINED™ Subsea Containment Solutions. http://wildwell.com/wellcontained/.

Williams A, Bax NJ, Kloser RJ, Althaus F, Barker B and Keith G 2009. Australia's deep-water reserve network: implications of false homogeneity for classifying abiotic surrogates of biodiversity ICES J Mar Sci 66: 214–224.

Wilson MJ, S Frickel, D Nguyen, T Bui, S Echsner, BR Simon JL Howard, K Miller and JK Wickliffe, 2016, A Targeted Health Risk Assessment Following the Deepwater Horizon Oil Spill: Polycyclic Aromatic Hydrocarbon Exposure in Vietnamese-American Shrimp Consumers. Environmental Health Perspectives 123(2): 152-159. February 2015. http://dx.doi.org/10.1289/ehp.1408684.

Worley Parsons, 2013. Mercury Dispersion Modelling WTN & MLA and B Operational areas. Report prepared for Esso Kipper Mercury Removal Project – FEED.

Yakovis EL, AV. Artemieva, MV. Fokin, AV. Grishankov, NN. Shunatova 2005. Patches of barnacles and ascidians in soft bottoms: Associated motile fauna in relation to the surrounding assemblage. J Exp. Mar. Biol. Ecol 327(2):210-224.

Yender R. Michel J & C. Lord C. 2002. Managing Seafood Safety after an Oil Spill. Seattle: Hazardous Materials Response Division, Office of Response and Restoration, National Oceanic and Atmospheric Administration. 72 pp.

Ylitalo GM, MM Krahn, WW Dickhoff, JE Steina, CC Walker, CL Lassitterb, ES Garrett, LL. Desfosse, KM. Mitchell, BT. Noblec, S Wilson, NB Becke, RA. Benner, PN Koufopoulos and RW Dickey 2012. Federal seafood safety response to the Deepwater Horizon oil spill. Proceedings of the National Academy of Sciences of the USA (PNAS) 109(50): 20274–20279. December 2012.

Ylitalo GM, Collier TK, Anulacion BF, Juaire K, Boyer RH, da Silva DAM, Keene JL, Stacy BA 2017. Determining oil and dispersant exposure in sea turtles from the northern Gulf of Mexico resulting from the Deepwater Horizon oil spill. Endang. Species Res. 33:9-24.

Zieman, J.C.O., Phillips, R.C., Thayer, G., Thorhaug, A., 1984. The effects on seagrass ecosystems. Restoration of habitats impacted by Oil Spills. JB Cairns, AL Boston, Butterworth: 37

APPENDIX 1 Consultation Log Summary

Organisation: Australian Maritime Safety Authority **ID** 2

Contact Name: [redacted]

Position: Senior Advisor Nautical & Hydrographic

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1466	22-Jan-18	Email sent from [redacted] EAPL) to [redacted] and [redacted] (CSIRO): Thank you Paul, for a very interesting conversation on this matter. And also for providing [redacted] as a contact. I have also run this matter past [redacted], Esso Oil Spill Response Advisor [redacted]@exxonmobil.com) to seek his opinion on this matter and I also made contact with [redacted] of ASA [redacted]@asascience.com) on this matter. [redacted], I would very much like to hear your view on this matter. Perhaps we can discuss by phone?	☐	No objections, claims or issues raised	
1467	22-Jan-18	[redacted] (EAPL) received email from [redacted] (CSIRO): [redacted] and [redacted] are both great scientists and would be good to talk to. Let me have a quick look at [redacted] paper, then I'll give you a quick call. Phone call between [redacted] and [redacted] followed up by an email from [redacted]: I enjoyed chatting with you earlier this morning. Please find a few of the papers I told you about attached. (SEE ATTACHMENTS)	☐	No objections, claims or issues raised	
1464	22-Jan-18	Email sent from [redacted] (EAPL) to [redacted] (AMSA) and [redacted]: Thanks [redacted] Much appreciated. As you are aware, there is an existing field – Blackback - immediately to the north of the Baldfish wells (VIC/L20 Blackback subsea facility (BKA) Lat 38° 32' 26" south, Long 148° 33' 16" east). We are currently exploring the option of also decommissioning these two wells at the end of the Baldfish campaign"if time permits. " That would require the northern lane to be moved a few degrees northward, to run along the boundary of "The area to be avoided" (SEE ATTACHMENT). While we are reluctant to make any last minute changes to the plans AMSA proposed, it would be prudent to run this past AMSA, rather than change temporary fairways after they have been in place for several months. Your thoughts on this would be much appreciated. Perhaps we can discuss this by phone when convenient?	☐	No objections, claims or issues raised	
1468	23-Jan-18	[redacted] (EAPL) received an email from [redacted] (AMSA): I understand that at this stage it is a 'if time permits' thing, but could you please provide more detail on the proposed activities at Blackback such as indicative activity dates, duration and method of decommissioning? These details will assist in determining the most appropriate way ahead. [redacted] emailed reposonse to [redacted]: Drilling would like to do this at the back of the current drilling campaign (i.e. Q3, 2018), providing we can secure the necessary approvals and rig time.	☑	ISSUE: Interference with commercial shipping - provide more detail on the proposed activities at Blackback such as indicative activity dates, duration and method of decommissioning? These details will assist in determining the most appropriate way ahead. MERIT: Drilling would like to do this at the back of the current drilling campaign (i.e. Q3, 2018), providing we can secure the necessary approvals and rig time.	23-Jan-18

Organisation: Australian Maritime Safety Authority **ID** 2

Contact Name: [redacted]

Position: Senior Advisor Nautical & Hydrographic

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1470	30-Jan-18	Email sent from [redacted](EAPL) to [redacted] (CSIRO) and [redacted] (AMSA): Thank you for your valuable input, and for the references you provided. Indeed, there is no easy answer, as sub-lethal effects depend on a wide range of factors, as you point out: •Developmental stage – eggs and larvae are most sensitive; •Type of HC – 3-4 ring aromatic PAHs such as Phenanthrene, Anthracene, Pyrene are most toxic, while Alkanes such as methane, ethane, propane etc. are much less toxic; •Organism type – bivalves are able to close when exposed to HCs; •Exposure time (the shorter the duration of exposure, the less impact can be expected), and •Rate of depuration – finfish are able to rapidly metabolise after HC exposure. After further conversation with various specialists, we are strongly leaning towards adopting Smit et al (2009), who recommends that, following the recommendations by Van Straalen and Denneman (1998; Ecotoxicol Environ Saf 18:241-251), the median estimate of the HC5 from the SSD based on whole-organism responses (70.5 g/L of THC) can be regarded as a maximum allowable exposure level for oil. This correlates well with 100 ppb sublethal threshold described in French-McCay (2016). Consequently, we plan to adopt an exposure of 70.5 ppb @ 7 days (or 11,760 ppb.hrs) to determine the extent of potential sub-lethal effects resulting from entrained hydrocarbons. I trust you agree that this is a reasonable summary of what we discussed, and a defendable assumption.	☑	ISSUE: Esso plan to adopt an exposure of 70.5 ppb @ 7 days (or 11,760 ppb.hrs) to determine the extent of potential sub-lethal effects resulting from entrained hydrocarbons. MERIT: Esso understand CSIRO position, engaging CSIRO to formally review the thresholds and hence develop a written comment is however not considered necessary at this time.	31-Jan-18
1471	31-Jan-18	[redacted] (EAPL) received email from [redacted] (AMSA): To better inform our decision making, could you please provide more detail about the Blackback well decommissioning. I understand that this activity is subject to a variety of factors, but can you provide an indicative timeframe for how long a MODU/vessel would be at the well site and what activities are required to achieve decommissioning. Email sent from [redacted] (EAPL) to [redacted]: Following our earlier conversation, I received further update on Blackback P&A. All as described by phone, except that each of three BKA production Wells may require 3-4 weeks for P&A activities. 60-90 days all up, immediately following Hairtail-12 drilling (i.e. most of Q3, 2018).	☑	ISSUE: Interference with commercial shipping - can you provide an indicative timeframe for how long a MODU/vessel would be at the well site and what activities are required to achieve decommissioning. MERIT: Following our earlier conversation, I received further update on Blackback P&A. All as described by phone, except that each of three BKA production Wells may require 3-4 weeks for P&A activities. 60-90 days all up, immediately following Hairtail-12 drilling (i.e. most of Q3, 2018).	31-Jan-18
1472	08-Feb-18	Email sent from [redacted] (AMSA) to [redacted] (EAPL): Attached is a revised proposal for the temporary fairways in Bass Strait. Is there a time today I could give you a call to discuss further?	☐	No objections, claims or issues raised	

Organisation: Australian Maritime Safety Authority **ID** 2

Contact Name: [redacted]

Position: Senior Advisor Nautical & Hydrographic

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1592	19-Mar-18	Email sent from [redacted] (EAPL) to [redacted] (AMSA): Hi [redacted] I am following up on NTM 126(T)/2018 (see below) and wonder how long it will be before we can see that these measures for Temporary Fairways are working. I note that Latest Digital Vessel Tracking Data are of December 2017, so assume it will be a few months before we can expect Feb-Mar18 data to be available online (although I note that "Historic Vessel Tracking Request" may be within 2 weeks old). Will AMSA notify Esso once they have reviewed effectiveness of Temporary Fairways, or must we submit a formal request for this? Thanks, [redacted]	☐	No objections, claims or issues raised	

Organisation: Australian Maritime Safety Authority **ID** 2

Contact Name: [redacted]

Position: Senior Advisor Nautical & Hydrographic

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1579	19-Mar-18	Email sent from [redacted] (EAPL) to [redacted] (AMSA): Hi [redacted], I am following up on NTM 126(T)/2018 (see below) and wonder how long it will be before we can see that these measures for Temporary Fairways are working. I note that Latest Digital Vessel Tracking Data are of December 2017, so assume it will be a few months before we can expect Feb-Mar18 data to be available online (although I note that "Historic Vessel Tracking Request" may be within 2 weeks old). Will AMSA notify Esso once they have reviewed effectiveness of Temporary Fairways, or must we submit a formal request for this? Subject: eNotices Update Edition 3, February 9, 2018 ---------- NOTICES TO MARINERS for Aus357 ---------- 126(T)/2018 AUSTRALIA - VICTORIA - Ninety Mile Beach - Traffic separation scheme southwestwards. Australian Maritime Safety Authority Two shipping fairways have been established adjoining the existing traffic separation scheme (38° 44'.20 S 148° 15'.20 E) as follows: Direction Coordinates Westbound lane 38° 38'.41 S 148° 17'.58 E 38° 23'.68 S 148° 40'.29 E 38° 25'.42 S 148° 42'.28 E 38° 40'.80 S 148° 19'.72 E. Eastbound lane 38° 42'.02 S 148° 20'.84 E 38° 35'.93 S 148° 40'.69 E 38° 38'.92 S 148° 40'.68 E 38° 44'.51 S 148° 23'.08 E. Aus357 [NE 19/11/10]	☐	No objections, claims or issues raised	

Organisation: Australian Maritime Safety Authority **ID** 2

Contact Name: [redacted]

Position: Senior Advisor Nautical & Hydrographic

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1587	09-Apr-18	Email sent from [redacted] (EAPL) to [redacted] (AMSA): Hi [redacted], The rig used for Baldfish Drilling is in the process of finalising their Safety Case Revision. They completed a workshop in support of this early in February and arrived at the following navigation safety measures for the Baldfish campaign. Is AMSA in the position to review the below and confirm that it consider these measures adequate, so that we can close this matter out? Thanks in advance. Regard, [redacted]	☐	No objections, claims or issues raised	
1588	13-Apr-18	Email received from [redacted] (AMSA) to [redacted] (EAPL): Good afternoon [redacted], Thank you for the email regarding the navigational safety measures for the Ocean Monarch. AMSA note the implementation points to address the risk of passing marine vessel traffic. The implementation of these options is consistent with AMSA's previous advice on measures aimed at reducing the navigational risk for the area. It is assessed that these measures will have a positive impact on navigation practices in the area. AMSA will continue to monitor shipping traffic in the area in the lead up to the Ocean Monarch arriving and provide any relevant feedback that may be appropriate to her operations. Kind regards, [redacted]	☐	No objections, claims or issues raised	
1597	26-Apr-18	Phonecall made from [redacted] (EAPL) to AMSA: I've given AMSA a call to discuss access to their fixed wing remote sensing resources. Unfortunately both the person I normally deal with ([redacted]) and their aviation specialist are away until Monday. It was suggested that it would be best to discuss with them directly so I'll follow up next week.	☑	ISSUE: EAPL to identify and confirm the fixed wing / remote sensing resources available within AMSA and how EAPL could utilize then in the event of an oil spill.	

Organisation: Australian Maritime Safety Authority **ID** 2

Contact Name: [redacted], [redacted]

Position: Senior Advisor Nautical & Hydrographic

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1638	04-Jun-18	Email from [redacted] (EAPL) to [redacted] (AMSA): [redacted], An update on Baldfish and Blackback activities: - Baldfish has been pushed back until Cooper has completed their scope. We are now looking at Q4. EP is with NOPSEMA for acceptance. - Blackback Plug and Abandonment (P&A) has been given the go-ahead. It will be undertaken on completion of Baldfish (starting late 2018) and may take up to 83 days (i.e. completion in Q1, 2019). - Petroleum Safety Zone (PSZ) around Baldfish wells were gazetted in April 2018 (NOPSEMA Notice: A604295 of 17 April 2018) - Can you confirm that temporary fairways will be in place until completion of above activities (i.e. until Q1, 2019). - The Blackback wells are outside the northern temporary fairway (see attached). However, anchoring will require access to the temporary fairways (but well within the 2 NM buffer zone). Anchoring and retrieval is a brief activity. Nonetheless, it requires careful planning in order to minimise shipping interference. We would appreciate AMSAs view on this. - Terahiki-1 and Gudgeon-1 are outside current P&A scope because of location in or across Temporary Fairway. - Esso will apply for a PSZ around the Blackback wells later in the year (Q3, 2018). [redacted], Regulatory Lead, is responsible for PSZ applications.- Pam copying in [redacted], Esso Marine Advisor. [redacted] will oversee shipping-related aspects during Baldfish and Blackback. Please do not hesitate to contact us if you require further information.	☐	No objections, claims or issues raised	

Organisation: Australian Maritime Safety Authority **ID** 2

Contact Name: [redacted]

Position: Senior Advisor Nautical & Hydrographic

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1741	12-Jun-18	Email received from [redacted] (AMSA) to [redacted] (EAPL): Good morning [redacted], Thank you for the email providing an update on the Baldfish and Blackback activities whereby activities are delayed by six months. We appreciate Esso keeping us informed. The temporary fairways came into effect as NtM 126(T)/2018 dated 06 Apr 2018, in Edition #7 of the AHO's NTMs 267 – 308, and remain in effect as a temporary notice. With regard to the anchoring and retrieval activities that will take place for the Blackback wells - AMSA requires more information on the location of the anchors and how far the anchor laying vessel will venture into the temporary fairway, and for how long. To be specific, please provide the: • proposed coordinates for the anchor locations and where the vessels will operate to lay the anchors (if different from anchor location), • proposed timings and duration of anchor laying and retrieval activities, and • proposed location of the buoys if anchors are to be laid prior to the MODU arriving. An Auscoast warning will need to be issued if the anchor handling vessel is operating in or near to the temporary fairway as this is likely to represent an increased risk to other vessels using the fairways. It would also be expected that the vessels involved in laying anchors would display the appropriate day shapes/ lights applicable to the nature of work. As AMSA has previously stated, the MODU can expect to encounter approximately 12 vessels per day using the TSS, with over 90% comprised of cargo vessels, such as container ships and bulk carriers, or tankers. Could you please confirm that the additional 'location specific AtoN System' was installed between 24 – 26th April as noted below? We will continue to monitor shipping traffic in the area in the lead up to the Ocean Monarch arriving, and can provide further advice as required. Thanks very much for the update.	☑	EAPL to provide AMSA with Blackback info on: - proposed coordinates for the anchor locations and where the vessels will operate to lay the anchors (if different from anchor location), - proposed timings and duration of anchor laying and retrieval activities, and - proposed location of the buoys if anchors are to be laid prior to the MODU arriving. EAPL to confirm confirm that the additional 'location specific AtoN System' was installed between 24 – 26th April. MERIT: EAPL notified AMSA/AHS on 9 April that additional navigation safety measures were approved for Baldfish. AMSA confirmed that these measures are consistent with AMSA previous advice. - EAPL notified AMSA/AHS on 4 June that Baldfish was delayed due to change in Cooper Scope, possibly to Q4, 2018. - On 16 August we discussed further tools to ensure safe navigation by installation of Racon. Esso offered to share its experience on use of dual RACON. - Additional RACON was installed on Ocean Monarch in August 2018.	16-Aug-18
1745	14-Jun-18	Email sent from [redacted] (EAPL) to [redacted] (AMSA): Mel, Thank you for your email. The AtoN was installed on the Ocean Monarch on the 30th April 2018. The Blackback mooring engineering is currently being finalised. This process is expected to be completed by the end of August, and the information you requested will be forwarded at that time.	☐	No objections, claims or issues raised	

Organisation: Australian Maritime Safety Authority **ID** 2

Contact Name: [redacted], [redacted]

Position: Senior Advisor Nautical & Hydrographic

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
2125	09-Oct-18	Email sent from [redacted] (EAPL) to [redacted] (AMSA):[redacted] Following up on your email, and to provide further update: Current operations •As previously advised by Diamond Offshore, the Ocean Monarch completed drilling at Baldfish-1 and relocated to Hairtail-1 on 27th/28th September. •The Ocean Monarch continues to utilize the AtoN and RACON systems and is monitoring traffic movements in and near the temporary fairway. A copy of the latest available traffic data is attached showing the first week of operations at Baldfish-1. Blackback •The Blackback P&A program timing is currently targeting a commencement in Q1 or Q2 2019. Any further changes in timing will be advised. •A short ROV inspection campaign of approximately 7 days is planned for November 2018. The vessel will be operating outside of the temporary fairway during this campaign. •An application for a PSZ at Blackback A1/A2/A3 will be sent today. •The current proposed Blackback mooring design is attached oThere will be no pre-lay activities or use of buoys in the mooring system. oThe design utilizes a 30°/60°. This design minimizes the incursion into the temporary fairway. Leg 5 anchor position is approximately 0.5Nm inside the temporary fairway Leg 6 anchor position is approximately 0.2Nm inside the temporary fairway. oThe ring around the anchor pattern indicates an estimate of vessel position at its furthest extent to place the anchor in position. oThe timings and duration of anchor handling operations is still being developed and will be forwarded to AMSA once finalised. If you have any questions or comments, please do not hesitate to contact me.	☐	No objections, claims or issues raised	
2128	15-Oct-18	Email from [redacted] (AMSA) to [redacted] (EAPL): Thanks very much for keeping us informed of progress. Noting the current risk management strategies in place, AMSA is content with the plans for the Blackback program. Please note the guidance provided below on the promulgation of AUSCOAST warnings and NTM's as appropriate for vessels working anchors in the temp fairway etc	☐	No objections, claims or issues raised	

Organisation: Australian Fisheries Management Authority **ID** 4

Contact Name: [redacted]

Position: Environment Manager

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1160	26-Oct-17	[redacted] (EAPL) had phone call with [redacted] regarding: [redacted]enquired if we had spoken with SEFTIA. I responded that we have provided written information by Email, that we will follow up with telephone conversations shortly, as well as face to face discussions and have invited them to Lakes Entrance Meeting. [redacted]re-stated previous, that data are confidential, that only info on an area with less than 5 boats can be released, and that this determines minimum area they can release info on. I confirmed that we have studied ABARE data, that these are very useful, but that they do not provide adequate resolution on fishing activity in Block VIC/P70 [redacted]stated that she will request info on 1 degree square as minimum (60 x 60 NM). I confirmed that we are happy to receive what every resolution they are comfortable releasing AFMA will independently advise regulators also on fishing activity in Block VICP70, as a matter of routine. [redacted]will get quote to us ASAP.	☐	No objections, claims or issues raised	

Organisation: Lakes Entrance Fishermans' Co-op **ID** 17

Contact Name: [redacted]

Position: Operations Manager

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1475	09-Feb-18	Email sent from [redacted] (EAPL) to LEFCOL & SETFIA: Hi [redacted], [redacted], I'm in Lakes Entrance next Thursday 15th Feb, would be happy to pop in and give you an update on our planned activities on either the Thursday afternoon or Friday morning. Let me know if this is of interest. Response from [redacted] (SETFIA): Thursday works for me Email from [redacted] (EAPL) to [redacted] (SETFIA) and (LEFCOL): What time Thursday afternoon suits you - would 4pm at the LEFCOL offices work? If there is anything specific you want to know about please let me know or I can give you a general update and we can discuss things as they come up.	☐	No objections, claims or issues raised	

Organisation: Parks Victoria **ID** 27

Contact Name: [redacted]

Position: Manager, Fire and Emergency

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
2118	23-Aug-18	DEDJTR Discussion – focusing on Offshore Operations 23rd of August 2018. Attendees [redacted] – DEDJTR [redacted] DEDJTR [redacted] – DEDJTR [redacted] [redacted] – Parks Victoria [redacted] – ExxonMobil [redacted] – ExxonMobil [redacted] – ExxonMobil Apologies [redacted] – DELWP [redacted] - EPA Stakeholder newsletter Sean presented a copy of the Offshore Stakeholder Newsletter and an update on upcoming offshore activities. The Baldfish drilling program is kicking off next week in the VIC P70 license, 70 k offshore. The regulatory plans are approved by NOPSEMA. The activity is on the edge of the shipping lane and AMSA has been engaged. There will be standby vessel on location during the program. The rig will then proceed to conduct P&A program at Blackback. Marine pollution response plans mirror Baldfish plans. We have one OPEP for base business and now specific EP and OPEP for projects including the Cobia pipeline replacement. In the next couple of years we have a number of plans we will be working on and will develop a new OPEP/OSMP to cover all activities. The OPEP/OSMP planned to be completed by year end will cover all our future operations over the next 5 years. Are there any pollution risks for P&A program? – Vessel collision, blow out scenario were modeled. The release were considerably smaller due to the end of life of the field. There was no predicted shoreline impact or state waters. Supply vessel is operating from Corner Inlet, and has two anchor handlers operating out of Port of Melbourne on location. Will the subsea equipment (Blackback) be removed – Not as this stage this will be evaluated to determine future actions. The subsea trees and well heads will be removed. Stakeholder engagement with fisheries has been completed. Cobia pipeline replacement. We suspended operations a few years ago and we are planning on repairing the Cobia pipeline. Timing is December 2018. A vessel is coming in from North Sea and will bring a flexible pipeline. Short operation (2 weeks) and will be at Cobia and Halibut locations. The operations include cutting and fitting adapter to the old pipeline.	☐	No objections, claims or issues raised	

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
		5 ½ kilometers of pipeline is required to be repaired. The pipeline is only between platforms. The pipeline currently is filled with inhibited water. The vessel will come into Hastings and has met all regulatory requirements. Management arrangements regarding biofouling and ballast were discussed. Next year platform based Plug and Abandonment of well will commence. Kipper drilling programs is planned for later next year. The revised OPEP will also cover these activities. Reviews of response capabilities will be reviewed at this stage as the locations are closer to shore. Increased supply vessel operations may occur in the future due to these projects. PFW study has been conducted to understand the longer term impacts into the environment. Preparing the revised EP and associated OPEP/OSMP and is required to be submitted in the second half of 2019. Likely to engage AMOSC or OSRL to write the OPEP. Engagement of stakeholder will be included in the process. Copper Energy are looking to align on the work we are doing in relation to Tactical Response Plans. Do they form part of the OPEP? They will be an appendix. The draft TRP were provided to the state for their use. DEDJTR are very interested. Development of one regional OSMP. This has been looked at in WA. The participation has dropped away, however we will have further discussion with Cooper Energy to look at opportunities to collaborate. More sharing is occurring between title holders. Esso meet with [redacted] (DELWP) and [redacted]s (DEDJTR) earlier this year to discuss oiled wildlife response (now referred to as wildlife impacted by marine pollution) arrangements. Esso has a commitment to test the arrangements in our plan this year where NOPSEMA have indicated they would like Esso to explore access to resources detailed. DEDJTR are interested to be involved in some way. We would like to discuss conducting a test to be mutual benefit. OWR arrangements are also being tested nationally through AMOSC, including access to trained industry personnel and vets. Something to consider in testing arrangements is what would the incident management look like? Maritime Emergency sub plans have been finalized and can be found on the Vic Emergency Response Website. The Victorian wildlife plan is still in draft.[redacted] is the best person to talk to when he returns from leave. [redacted]provided an update on the new structure of the State Maritime Emergency Working Group and the proposed sub groups. Interest in conducting an exercise at Gellibrand from Mobil Altona Refinery SHE Manger. Still need to discuss with the port authority. DEDJTR discussed the recent sheen offshore near golden beach. There was confusion with regards to the regulatory notification as DEDJTR had heard from NOPSEMA. DEDJTR queried if there was any follow up from Esso with regards to			

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
		the sheen. Esso not aware of any follow up			

Organisation: South East Trawl Fishing Industry Association **ID** 37

Contact Name: [redacted]

Position: Executive Officer

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
215	01-Nov-17	[redacted] (EAPL) phoned [redacted] at 11 am, [redacted] busy, [redacted] text message asking if he could call later and was after an opportunity to discuss the projects Esso are planning and would like to discuss how best to manage any potential interactions.	☐	No objections, claims or issues raised	
216	03-Nov-17	Phone call between [redacted] (EAPL) and [redacted] to discuss the various projects that Esso have planned in the next 12 months. Fact Sheet also emailed to [redacted]. Main issues raised: - amount of consultation - proximity to FIS sites. [redacted] (EAPL) asked for coordinates of FIS sites to confirm separation distance but from the data we have looks about 20nM @ Baldfish which shouldn't have any impact.	☑	ISSUE #1: Level of consultation MERIT #1: Esso have to consult but will try to coordinate projects to limit the number of requests. [redacted] to provide coordinate of the FIS sites. ISSUE #2: Proximity to FIS sites MERIT #2: Proximity to FIS location tobe determined however from the data we have looks about 20nM @ Baldfish which shouldn't have any impact.	15-Feb-18
1164	14-Dec-17	[redacted] (EAPL) sent email looking to confirm location of nearest FIS locations to next years drilling campaign.	☑	Follow up with [redacted] in 2018 to confirm FIS location	15-Feb-18
1457	12-Jan-18	Email received from [redacted]: Please find FIS locations attached. SETFIA operates and maintains several SMS lists for commercial fisherman across three regions. You are interested in the eastern region. Here are a couple of examples (one from today) of the sort of SMS we send. The aim is to minimise the affects of oil/gas works on the fishing industry. SETFIA charges per SMS, the cost allows us to maintain software that sends group SMSs and to maintain the list, the maintenance is a lot of work. There are about 90 contacts on the eastern list. The list covers all sectors, State and C'wealth not just trawl. I suggest we need to meet and would like to do this in Lakes Entrance. This campaign will take some planning to minimise effects on the fishing industry.	☑	ISSUE 1: Proximity to FIS locations. MERIT 1: Not relevant to G&G campaign due to survey timing prior to FIS and distance from FIS locations. Not relevant for CBA due to timing. Needs to be reviewed further for Baldfish. ISSUE 2: Consultation with fishers via SMS. MERIT 2: Yes - EAPL agree consultation important.	15-Feb-18
1476	09-Feb-18	Email sent from [redacted] (EAPL) to LEFCOL & SETFIA: Hi [redacted], I'm in Lakes Entrance next Thursday 15th Feb, would be happy to pop in and give you an update on our planned activities on either the Thursday afternoon or Friday morning. Let me know if this is of interest. Response from [redacted] (SETFIA): Thursday works for me Email from [redacted] (EAPL) to [redacted] (SETFIA) and (LEFCOL): What time Thursday afternoon suits you - would 4pm at the LEFCOL offices work? If there is anything specific you want to know about please let me know or I can give you a general update and we can discuss things as they come up. Response from [redacted] (SETFIA):4pm Thursday good. Pls send a calander invite.	☐	No objections, claims or issues raised	

Organisation: South East Trawl Fishing Industry Association **ID** 37

Contact Name: [redacted], [redacted]

Position: Executive Officer

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1573	15-Feb-18	[redacted] (EAPL) met with [redacted] (LEFCOL) and [redacted] [redacted] (SETFIA) at LEFCOLs offices in Lakes Entrance on Thursday 15th Feb. Discussed West Barracouta G&G, Baldfish Drilling, Cobia pipeline repair and Kipper/Pilchard campaigns including the type of activity involved and the timing. [redacted] and [redacted] happy to hear that wells at WBT would probably be in the same PSZ. Asked about fishing activity in the area and [redacted] indicated that if we wanted he could investigate the type, nature and scale of fishing in the area subject to a commercial contract. [redacted] also indicated that PSZ may not be as rigorously complied with as he and oil and gas operators have assumed to date. Discussed if there was an opportunity for industry to develop a video explaining what PSZs are for and for this to be provided to fishermen – agreed to discuss this internally within Esso but noted that it should probably be something that APPEA should look into. Action raise issue of an Industry video with APPEA and internally within Esso. [redacted] raised the value of sending an SMS to all fishermen of campaigns and vessel activity in Bass Strait. Copper have been providing regular updates on the Sole project and their other assets, it seems to have been well received and as fishermen do not rigorously read navigation warnings and alerts from AMSA it provides an alternate means of raising awareness of the projects and what is happening where. [redacted] was happy to send an SMS for the G&G campaign on approval from Esso, subsequent SMSs will be entail a small cost. Action to be discussed within Esso, with [redacted] to be given go ahead to send G&G SMS text and an ongoing SMS protocol developed, i.e. SMSs to be sent regularly, month before, day before and on completion of activity. Talked about Baldfish and proximity to the FIS locations. [redacted] agreed that the distance from Baldfish Hairtail probably wouldn't have a significant impact on the FIS location. He indicated that he was a bit annoyed that while Oil and Gas operators had been provided with the FIS locations and dates that they hadn't planned their activities better to avoid any overlap. We talked about schedules and use of rigs of opportunity to minimise mobilisation and demobilisation costs and how these can be significant impediments to scheduling these campaigns around third party requests. [redacted] and [redacted] acknowledged how this would be an issue. The FIS work may not occur this year as there has been little statistically significant results obtained to date with this work, the work is arranged by AFMA? And is a significant cost that is sourced from the fishing industry that may be better spent / saved. Potential Blackback decommissioning following the Baldfish drilling campaign was also discussed. The temporary fairways recently announced by AMSA to protect the rig will also provide protection at Blackback. A temporary PSZ will be gazetted at Blackback for this work. Some discussion on whether the fishermen fish in the shipping lanes, thought was that they probably do as its near the drop off. After all the projects add	☐	Refer to LEFCOL consultation records regarding ISSUES / MERITS	

Organisation: South East Trawl Fishing Industry Association **ID** 37

Contact Name: [redacted], [redacted]

Position: Executive Officer

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
		The level of consultation was raised again and [redacted] indicated that he was getting numerous emails and phone calls and that it was taking up a significant amount of his time and that he couldn't and wouldn't always respond. We discussed it was a regulatory requirement and a NOPSEMA expectation that consultation was documented and could be demonstrated hence why [redacted] was being chased for responses. Acknowledged that in some cases it may be frustrating but without being able to provide a response from stakeholders the oil and gas industry had potential difficulty in gaining EP acceptance. A single point of contact within the oil and gas industry would be good but the mechanisms and arrangements for this to be conducted are not currently available. Discussed Cobia pipeline repair, still scheduled for December this year with a DSV from Europe. Another candidate for SMS messages. Discussed Kipper infield drilling and adjacent (Pilchard) development that is being examined. Kipper infield drilling to be contained within existing PSZ, adjacent development may require an additional PSZ will discuss these projects further as they progress. Another candidate for SMS messages and review of fishing intensity. Given the quantity of work and activities going on [redacted] suggested a monthly phone call to advise progress, changes and the dates of key activities taking place. An invite was sent out for this to occur the last Friday of every month starting the 30th March. There are a number of issues raised so we'll need to add these and document our response ISSUE: Development of Video to raise awareness of PSZ and subsea assets – good idea has merits will need to be raised internally within Esso and possibly APPEA			
1580	23-Mar-18	First monthly phone call between [redacted] (EAPL) and [redacted] [redacted] (SETFIA) following meeting in Lakes Entrance Provided an update of what EAPL are doing in Bass Strait – ongoing production and maintenance, supply vessels out of Barry's Beach and small catermeran supporting ROV inspection out of Lakes Entrance. No significant work scheduled in the next month or so. Drilling campaign at Baldfish / Hairtail still scheduled for July. Cooper are currently installing anchors for it at Sole and following that work Esso will use it at Baldfish, actual dates will firm up over the next few months. Based on above [redacted] saw no need to update the fishing community and we agreed to have another phone call update towards the end of April.	☐	No objections, claims or issues raised	

Organisation: South East Trawl Fishing Industry Association **ID** 37

Contact Name: [redacted], [redacted]

Position: Executive Officer

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1601	27-Apr-18	Spoke with [redacted] today 27th April. Discussed WBT geotechnical work and that the Dryden may be doing some work at WBT in mid May. Told him we were about to send an email regarding the work but wanted to get the date better confirmed. Indicated that the work would be completed in a week or two and that the Dryden would be stationary with reduced mobility for some time. Discussed and agreed that an SMS message nearer the time would be good. Also discussed rig mobilization to Baldfish and I indicated that nothing was likely before mid June and depending on Cooper activities it may be delayed till August. [redacted] said that Cooper were very busy and he was talking to them every few days. Agreed to keep in touch and notify [redacted] when the BTW dates are better defined and when Baldfish dates are clearer. Subsequently got the following SMS from SETFIA on Cooper (see attachment)	☑	ISSUE: provide [redacted] with WBT geotechnical details and dates such that he can send an SMS message to notify fishermen in Bass Strait MERIT: Esso agree and details will be provided for SMS alert once campaign timing is known.	16-May-18
2000	11-Jul-18	Email received from [redacted] [redacted] (SETFIA): Dear Oil, Gas, Carbon Sequestration and Seismic Survey Companies, The South East Trawl Fishing Industry Association (SETFIA) represents operators, quota holders and wholesalers in the South East Trawl Fishery. This fishery is the main supplier of locally wild-caught fish in Australia and the main supplier of local fish to Melbourne and Sydney. The fishery runs from Barrenjoey Head north of Sydney through southern NSW, Victoria and Tasmania west to Cape Jervis in South Australia. South-East Australia is also an area of strong interest for your companies. SETFIA prides itself on the positive working relationship it has with your industry, works hard to be a good neighbour and in line with your Act tries to help your industry reduce its impacts on the fishing industry where possible. Over the last few years SETFIA has run a 'Fishery Independent Survey' (FIS) in winter every second year. This survey is a key part of setting sustainable quotas. This survey was again planned for July and August this year (2018). SETFIA sent this distribution list several notices of the FIS over the past few years requesting that seismic surveys in particular do not occur in the fishery prior to the FIS because seismic works would likely affect the survey's results. The purpose of this e-mail is to advise your industry that the 2018 FIS is on hold pending a review of its results over the last 10+ years. It may or may not occur again in July and August 2020. SETFIA will advise you as soon as a decision is made. Somewhat disappointingly, we note that several seismic surveys were scheduled in the fishery in the lead up to July 2018 in spite of the advice about FIS timing from SETFIA. However, on a positive note we are currently working well with the operators of the Duntroon, Otway Deep, Dorrigo and Marin seismic surveys to reduce impacts on the fishing industry. Best Regards, [redacted] [redacted]	☐	No objections, claims or issues raised	

Organisation: South East Trawl Fishing Industry Association **ID** 37

Contact Name: [redacted], [redacted]

Position: Executive Officer

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
2001	20-Jul-18	Phone call between [redacted] (SETFIA) and [redacted] (EAPL) to discuss EAPL activities. First activity will be Baldfish which will take place following Cooper campaign at Basker Manta. Early date is probably in August and EAPL will know this better once Cooper have finished at Sole. The duration of the Cooper Basker Manta activities are also unknown but EAPL will try and ask for an SMS message to fishermen about 2 weeks before moving to Baldfish. Baldfish EP was accepted a couple of weeks ago by NOPSEMA. Baldfish campaign will last about 60 days. Second activity will be Blackback P&A campaign this will follow Baldfish and EAPL will look to issue an SMS for this too. Blackback is relatively close to Baldfish and on the edge of the continental shelf. A PSZ will be gazetted and as per Baldfish the anchor chains will need to be avoided by fishermen. Blackback may last 2-3 months. Cobia pipeline repair is still scheduled for December and will be the subject of another SMS message in November, a temporary PSZ will be gazette to protect the divers, ROV and vessel when repairing the pipeline as she will have limited maneuverability. Other projects at West Barracouta and Kipper are being planned with some minor work potentially in 2019 and drilling in 2020. SETFIA had no major concerns with these projects and had completed the paperwork to be added to the EAPL system to enable payment for SMS messages to be processed. There are a number of seismic campaigns taking place in and around the south east area and these have potentially a more significant impact on where fishing can take place. SETFIA have been commissioned to undertake fishing assessments within the seismic areas and have issued some of the seismic operators with detailed reports listing the key fishermen and their contact details who work the areas. A lack of this information has led to Eps being rejected. [redacted] has also been sent recent emails on Prelude and Crux and wanted to know what these were for. We discussed that these were from Shell and were for projects on the NW shelf and would have no impact on SETFIA activities.	☐	No objections, claims or issues raised	

Organisation: South East Trawl Fishing Industry Association **ID** 37

Contact Name: [redacted], [redacted]

Position: Executive Officer

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
2110	17-Aug-18	Phone call between [redacted] (EAPL) and [redacted] (SETFIA): Following [redacted]'s email dated 17 August RT rang him on the 17th August to discuss EAPL activities and SMS arrangements. [redacted] had received RT email re the SMS on the 7th August but has had computer and email / SMS issues. The SMS will be slightly reworded and will be sent to advise the fishing fleet of the rigs move to Baldfish and Hairtail. We discussed the drilling campaign at a high level and that it would likely move to Blackback to work on the wells following Baldfish Hairtail in around 60 days. [redacted] and [redacted] agreed to discuss nearer that move and look to send another SMS to the Eastern fleet. [redacted] indicated that SETFIA are now on the EAPL systems and payment for SMSs should be possible. [redacted] has been working on the proposed CGG seismic campaign that is being planned – this will cover the entire south east fishing area that provides fish to Melbourne and Sydney 18000 km2 and spread over 5 months. This will have a significant impact on the fishermen as fish are known to move away from seismic campaigns, there is a 5% mortality of scallops and it impacts rock lobsters and zooplankton. [redacted] didn't know what power seismic source was being proposed. Discussed Cobia PRP and that a vessel will be in the field for 10 days. [redacted] asked what information he would like and described some of the risks in the EP – noise, sewage, impact to the sea bed, minor release of chemicals, the temporary PSZ. He said that he had heard all he needed and that he had no concerns with the CBA project. [redacted] said that our level of consultation was being questioned by NOPSEMA, particularly the level of detail about the impacts and if he had any questions or would like to know anything else to let EAPL know. [redacted] again said that he had enough information on Cobia and that it was insignificant in comparison to the proposed seismic campaign. [redacted] indicated that he was writing a letter to NOPSEMA regarding the seismic campaign and said that the way EAPL dealt with and consulted with the fishing industry was a good example and one that the operators of the CGG seismic campaign should follow.	☐	No objections, claims or issues raised	

Organisation: Department of Economic Development, Jobs, Transport and Resources **ID** 43

Contact Name: [redacted]

Position: Manager, Marine Pollution - Emergency Management Division

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1992	09-Jul-18	Email received by [redacted] (EAPL) from [redacted] (DEDJTR): Hi [redacted], I was just talking to [redacted] about the Baldfish work and arrangements more generally. [redacted] suggested a meeting between the three of us, and any other interested parties from state government (DELWP, Parks, EPA, TSV) to discuss the work you have coming up in the next year or so, and I think that would be useful, certainly from my point of view to get me up to speed. Could you please let me know what your availability is like in the next few weeks and I'll set something up?	☑	ISSUE: meeting to be arranged between EAPL, DEDJTR, DELWP, Parks, EPA, TSV MERIT: A meeting between EAPL base business, EAPL projects and Vic State departments was held on 23 August 2018.	23-Aug-18
2002	25-Jul-18	[redacted] (EAPL) received invitation to a meeting with EcoDev / DEDJTR / parks victoria and EPA on 21/08/18. Attendees will be [redacted] (EAPL), [redacted] (EAPL), and possibly the following (they have been invited by [redacted] (DEDJTR) who is organizing it). [redacted] DEDJTR / ecodev [redacted] DEDJTR [redacted] DEDJTR [redacted] DEDJTR [redacted] Victoria [redacted] EPA [redacted] DEDJTR	☐	No objections, claims or issues raised	

Organisation: Department of Economic Development, Jobs, Transport and Resources **ID** 43
Contact Name: Holloway, Michael
Position: Manager, Marine Pollution - Emergency Management Division

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
2117	23-Aug-18	DEDJTR Discussion – focusing on Offshore Operations 23rd of August 2018. Attendees [redacted] – DEDJTR [redacted] – DEDJTR [redacted] [redacted] – DEDJTR [redacted] – Parks Victoria [redacted] – ExxonMobil [redacted]– ExxonMobil [redacted] – ExxonMobil Apologies [redacted] – DELWP [redacted] - EPA Stakeholder newsletter Sean presented a copy of the Offshore Stakeholder Newsletter and an update on upcoming offshore activities. The Baldfish drilling program is kicking off next week in the VIC P70 license, 70 k offshore. The regulatory plans are approved by NOPSEMA. The activity is on the edge of the shipping lane and AMSA has been engaged. There will be standby vessel on location during the program. The rig will then proceed to conduct P&A program at Blackback. Marine pollution response plans mirror Baldfish plans. We have one OPEP for base business and now specific EP and OPEP for projects including the Cobia pipeline replacement. In the next couple of years we have a number of plans we will be working on and will develop a new OPEP/OSMP to cover all activities. The OPEP/OSMP planned to be completed by year end will cover all our future operations over the next 5 years. Are there any pollution risks for P&A program? – Vessel collision, blow out scenario were modeled. The release were considerably smaller due to the end of life of the field. There was no predicted shoreline impact or state waters. Supply vessel is operating from Corner Inlet, and has two anchor handlers operating out of Port of Melbourne on location. Will the subsea equipment (Blackback) be removed – Not as this stage this will be evaluated to determine future actions. The subsea trees and well heads will be removed. Stakeholder engagement with fisheries has been completed. Cobia pipeline replacement. We suspended operations a few years ago and we are planning on repairing the Cobia pipeline. Timing is December 2018. A vessel is coming in from North Sea and will bring a flexible pipeline. Short operation (2 weeks) and will be at Cobia and Halibut locations. The operations include cutting and fitting adapter to the old pipeline.	☐	No objections, claims or issues raised	

Organisation: Department of Economic Development, Jobs, Transport and Resources **ID** 43
Contact Name: Holloway, Michael
Position: Manager, Marine Pollution - Emergency Management Division

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
		5 ½ kilometers of pipeline is required to be repaired. The pipeline is only between platforms. The pipeline currently is filled with inhibited water. The vessel will come into Hastings and has met all regulatory requirements. Management arrangements regarding biofouling and ballast were discussed. Next year platform based Plug and Abandonment of well will commence. Kipper drilling programs is planned for later next year. The revised OPEP will also cover these activities. Reviews of response capabilities will be reviewed at this stage as the locations are closer to shore. Increased supply vessel operations may occur in the future due to these projects. PFW study has been conducted to understand the longer term impacts into the environment. Preparing the revised EP and associated OPEP/OSMP and is required to be submitted in the second half of 2019. Likely to engage AMOSC or OSRL to write the OPEP. Engagement of stakeholder will be included in the process. Copper Energy are looking to align on the work we are doing in relation to Tactical Response Plans. Do they form part of the OPEP? They will be an appendix. The draft TRP were provided to the state for their use. DEDJTR are very interested. Development of one regional OSMP. This has been looked at in WA. The participation has dropped away, however we will have further discussion with Cooper Energy to look at opportunities to collaborate. More sharing is occurring between title holders. Esso meet with [redacted] (DELWP) and [redacted] (DEDJTR) earlier this year to discuss oiled wildlife response (now referred to as wildlife impacted by marine pollution) arrangements. Esso has a commitment to test the arrangements in our plan this year where NOPSEMA have indicated they would like Esso to explore access to resources detailed. DEDJTR are interested to be involved in some way. We would like to discuss conducting a test to be mutual benefit. OWR arrangements are also being tested nationally through AMOSC, including access to trained industry personnel and vets. Something to consider in testing arrangements is what would the incident management look like? Maritime Emergency sub plans have been finalized and can be found on the Vic Emergency Response Website. The Victorian wildlife plan is still in draft. [redacted] is the best person to talk to when he returns from leave. [redacted] provided an update on the new structure of the State Maritime Emergency Working Group and the proposed sub groups. Interest in conducting an exercise at Gellibrand from Mobil Altona Refinery SHE Manger. Still need to discuss with the port authority.			

Organisation: Department of Economic Development, Jobs, Transport and Resources **ID** 43

Contact Name: Holloway, Michael

Position: Manager, Marine Pollution - Emergency Management Division

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
		DEDJTR discussed the recent sheen offshore near golden beach. There was confusion with regards to the regulatory notification as DEDJTR had heard from NOPSEMA. DEDJTR queried if there was any follow up from Esso with regards to the sheen. Esso not aware of any follow up			

Organisation: Department of Primary Industries, Parks, Water and Environment (Tasmania) **ID** 63

Contact Name: [redacted]

Position: Marine Pollution Officer

CorespID	Corresp Date	Summary	F/U	Objections/Claims/Issues/Merits	Closed Out
1744	14-Jun-18	Email sent from [redacted] (EAPL) to [redacted] (DPIPWE): Hi Letitia, As discussed here is a copy of the Baldfish OPEP as issued to NOPSEMA for your records. The operational Bass Strait OPEP is in the process of being revised and updated and we will send you a copy of that once completed. Once the drilling campaign at Baldfish is complete (expected to be September this year) the rig will be used to plug and abandon our three Blackback subsea wells. A separate EP and OPEP is being developed to cover this activity and will also be submitted to NOPSEMA in due course. Oil spill modelling to support the Blackback OPEP is underway and if the results are significantly different from that included in the Baldfish OPEP we will let you know.	☐	No objections, claims or issues raised	