GRIFFIN GAS EXPORT PIPELINE DECOMMISSIONING ENVIRONMENT PLAN

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Acronyms and Glossary

Term	Description
"	inch
µ	micron
ADG	Australian dangerous goods
AFMA	Australian Fisheries Management Authority
AHO	Australian Hydrographic Office
AHS	Australian Hydrographic Service
AIS	automatic identification system
ALARP	as low as reasonably practicable
AMOSC	Australian Maritime Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Association
ANZECC	Australian & New Zealand Environment and Conservation Council
APPEA	Australian Petroleum Production and Exploration Association
APU	Australian Production Unit
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AS	Australian Standard
ASS	Atomic Absorption Spectrometry
ASBTIA	Australian Southern Bluefin Tuna Industry Association
Ba	Barium
BHP	BHP Petroleum Pty Ltd
BIA	biologically important area
BTAC	Buurabalayji Thalanyji Aboriginal Corporation
BTEX	benzene, toluene, ethyl benzene, xylene
BWM	ballast water management
CEM	crisis and emergency management
CEO	Chief Executive Officer
CFA	Commonwealth Fisheries Association
CRG	Community Reference Group
CHARM	chemical hazard and risk management
CODA	Centre of Decommissioning Australia
CP	cathodic protection
CWC	concrete weight coating
Cwlth	Commonwealth
CVAAS	Cold Vapour Atomic Absorption Spectrometer
DAWE	Department of Agriculture, Water and the Environment
dB	decibel
DBCA	Department of Biodiversity, Conservation and Attractions
DMIRS	Department of Mines, Industry Regulation and Safety (formerly Department of Mines and Petroleum)
DMP	WA Department of Mines and Petroleum
DNP	Director of National Parks
DoD	Department of Defence
DoEE	Department of Environment and Energy
DoF	Department of Fisheries
DoT	WA Department of Transport
DP	dynamic positioning
DPIRD	WA Department of Primary Industries and Regional Development
ECC	Emergency and Crisis Centre
EIA	Environmental Impact Assessment
EMBA	environment that may be affected
EMT	Emergency Management Team
ENVID	environment impact (and risk) identification
EP	Environment Plan, prepared in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPO	environmental performance outcome
EPS	environmental performance standard
ERP	Emergency Response Plan
ESD	ecologically sustainable development
FBE	fusion bonded epoxy
FRT	Field Response Team
FPSO	Floating Production Storage and Offloading
FOB	Forward Operations Base

Term	Description
GEP	gas export pipeline
GHG	greenhouse gas
HEX	heat exchanger
Hg	mercury
HgS	sulfide mercury
HMA	Hazard Management Agency
HR	human resources
HSEC	health, safety, environment and community
HSE	health, safety and environment
HSS	heat shrink sleeve
IAP	Incident Action Plan
IAPP	international air pollution prevention
ICS	Incident Command Structure
IGN	Industry Guidance Note
IMCRA	Interim Marine and Coastal Regionalisation of Australia
IMO	International Maritime Organisation
IMS	introduced marine species
IMT	Incident Management Team
IOPP	international oil pollution prevention
ISQG	Interim Sediment Quality Guidelines
ISPP	international sewage prevention pollution
IUCN	International Union for Conservation of Nature
JRCC	AMSA's Joint Rescue Coordination Centre
JSCC	Joint Strategic Coordination Committee
KEF	key ecological feature
kHz	kilohertz
km	kilometre
KP	kilometre point
L	litre
LED	light emitting diode
m	metre
MBES	multibeam echo sounder
MIC	microbial induced corrosion
mm	Millimetre
m3	cubic metre
m/s	metres per second

Term	Description
MEECC	Maritime Environmental Emergency Coordination Centre
MC	measurement criteria
MEE	maritime environment emergency
MEER	maritime environmental emergency response
MARPOL	Convention for the Prevention of Pollution from Ships (MARPOL Convention)
MDB	mid-depth buoy
MDO	marine diesel oil
MEPS	Marine Environmental Protection Services
MMA	Marine Management Area
MNES	matters of national environmental significance, according to the EPBC Act
MOP	marine oil pollution
MoU	Memorandum of Understanding
nm	nautical mile
NCWHAC	Ningaloo Coast World Heritage Advisory Committee
NGI	Norwegian Geotechnical Institute
NLPG	National Light Pollution Guidelines
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Petroleum Titles Administrator
NORMs	naturally occurring radioactive materials
NSW	New South Wales
NTM	Notice to Mariners
NWMR	North West Marine Region
NWS	North West Shelf
NRT	National Response Team
NRST	National Response Support Team
OCNS	Offshore Chemical Notification Scheme
ODS	ozone-depleting substance
OPGGS Act	*Offshore Petroleum and Greenhouse Gas Storage Act 2006*
OPEP	Oil Pollution Emergency Plan
OSTBs	Oil Spill Tracking Buoys
OSRA	Oil Spill Response Agency

Term	Description
OSRL	Oil Spill Response Limited
OSRC	Oil Spill Response Coordination
OWR	oiled wildlife response
PPA	Pearl Producers Association
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
PAH	polycyclic aromatic hydrocarbons
PFW	produced formation water
PK	peak
PLEM	pipeline end manifold
PLONOR	OSPAR definition of a substance that Poses Little Or No Risk to the environment
PMS	preventative maintenance system
PMST	Protected Matters Search Tool
pXRF	Portable X-Ray Fluorescence
POLREP	pollution report
PPE	personal protective equipment
PSZ	Petroleum Safety Zone
PTS	permanent threshold shift
PTW	permit to work
PUF	polyurethane foam
RCC	Rescue Coordination Centre
ROV	remotely operated vehicle
RTM	riser turret mooring
SCAT	shoreline clean-up assessment technique
SCB	Source Control Branch
SEL	sound exposure level
SEEMP	Ship Energy Efficiency Management Plan
SHP-MEE	State Hazard Plan for Maritime Environmental Emergencies
SIMAP	Spill Impact Mapping and Analysis Program
SITREP	Situation report
SQG	Sediment Quality Guidelines
SMEEC	State Maritime Environmental Coordinator
SMPEP	Shipboard Marine Pollution Emergency Plan
SOLAS	Safety of Life at Sea

Term	Description
SOPEP	Shipboard Oil Pollution Emergency Plan
SPL	sound pressure level
SQGV	Sediment Quality Guideline Value
SSS	side scan sonar
t	tonne
TBT	tributyltin
TOC	total organic carbon
TRP	Tactical Response Plan
TRH	total recoverable hydrocarbons
TTS	temporary threshold shift
UNCLOS	United Nations Convention on the Law of the Sea
VIV	vortex induced vibrations
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council
WAOWRP	WA Oiled Wildlife Response Plan
XT	Xmas tree
Zn	Zinc

1 Introduction

1.1 Proposed Activity

BHP Petroleum (Australia) Pty Ltd (BHP) as Titleholder under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Commonwealth) (referred to as the Environment Regulations), proposes to remove mercury scale from the Griffin gas export pipeline (GEP) and decommission the GEP. The Griffin GEP is located within Pipeline Licence WA-3-PL, in Commonwealth waters, and extends from the pipeline end manifold (PLEM) in the Griffin field through WA State waters (Pipeline Licence TPL/10) to the shore. Water depths along the GEP range from 130 m at the pipeline end manifold (PLEM) to 90 m at the State/Commonwealth waters boundary.

This GEP mercury removal and decommissioning activity will hereafter be referred to as the petroleum activity and forms the scope of this Environment Plan (EP). A detailed description of the petroleum activity is provided in Section 4.

This EP has been prepared as part of the requirements under the Environment Regulations, as administered by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

1.2 Purpose of the Environment Plan

In accordance with the objectives of the Environment Regulations, the purpose of this EP is to demonstrate that:

- the potential environmental impacts and risks from planned (routine and non-routine) activities and unplanned events (including emergency situations) of the petroleum activity are identified and described
- appropriate management controls will be implemented to reduce impacts and risks to a level that is 'as low as reasonably practicable' (ALARP) and acceptable
- the petroleum activity is performed in a manner consistent with the principles of ecologically sustainable development (as defined in Section 3A of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act)).

The EP describes the process used by BHP to identify and evaluate potential environmental impacts and risks arising from the petroleum activity, and defines the environmental performance outcomes, performance standards and measurement criteria to be applied to manage the impacts and risks to ALARP and acceptable levels. This EP includes an implementation strategy for monitoring, auditing and managing the petroleum activity to be performed by BHP and its contractors. The EP documents and considers consultation with relevant authorities, persons and organisations.

1.3 Scope of this Environment Plan

A detailed description of the petroleum activity is provided in Section 4. The spatial boundary of the petroleum activity has been described and assessed using the operational area, which is described in Section 4.4.

The scope of this EP does not include the movement of the project vessels outside of the operational area. These activities will be performed in accordance with other relevant maritime and aviation legislation, most notably the *Navigation Act 2012* (Cwlth) and *Civil Aviation Act 1988* (Cwlth).

The Griffin Decommissioning and Field Management EP (GV-HSE-E-0014) includes removal of Griffin field infrastructure and management of field infrastructure to ensure it may be removed in accordance with section 572(3) of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act), unless NOPSEMA accepts and is satisfied that an alternative decommissioning approach delivers equal or better environmental, safety and well integrity outcomes compared with complete removal.

1.4 Overview of HSE Management System

All BHP-controlled activities associated with the petroleum activity will be conducted in line with:

- BHP Charter (Appendix A)
- BHP Environment and Climate Change – Our Requirements
- BHP Wells and Seismic Delivery Management System
- BHP Australian Production Unit (APU) Management System
- BHP Petroleum Health, Safety and Environment (HSE) Standard
- any specific commitments laid out in this EP.

All BHP petroleum sites must maintain up-to-date practices that adhere to the requirements contained in the BHP Petroleum Health, Safety and Environment Management System and Standard. Activity-specific environmental management measures specific to the petroleum activity are implemented through this EP.

1.5 Environment Plan Summary

An EP summary will be prepared based on the material provided in this EP, addressing the items listed in Table 1-1 as required by Regulation 11(4) of the Environment Regulations.

Table 1-1: Environment Plan Summary

EP Summary material requirement	Relevant section of this EP containing EP Summary material
The location of the activity	Section 4.2
A description of the receiving environment	Section 5
A description of the activity	Section 4
Details of the environmental impacts and risks	Section 8 and 9
The control measures for the activity	Section 8 and 9
The arrangements for ongoing monitoring of the titleholder's environmental performance	Section 8 and 9 Section 12.4
Response arrangements in the oil pollution emergency plan	Section 12.6
Consultation already undertaken and plans for ongoing consultation	Section 6
Details of the titleholder's nominated liaison person for the activity	Section 1.7

1.6 Structure of the Environment Plan

The EP has been structured to reflect the process and requirements of the Environment Regulations, as outlined in Table 1-2.

Table 1-2: Environment Plan Process Phases, Applicable Environment Regulations and Relevant Section of Environment Plan

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
Regulation 10A(a): *is appropriate for the nature and scale of the activity*	Regulation 13: *Environmental Assessment* Regulation 14: *Implementation strategy for the environment plan*	The principle of 'nature and scale' applies throughout the EP	Section 3 Section 3 Section 6 Section 7 Section 8

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
	Regulation 16: *Other information in the environment plan*		Section 9
Regulation 10A(b): *demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable* Regulation 10A(c): *demonstrates that the environmental impacts and risks of the activity will be of an acceptable level*	Regulation 13(1)–13(7): *13(1) Description of the activity* *13(2)(3) Description of the environment* *13(4) Requirements* *13(5)(6) Evaluation of environmental impacts and risks* *13(7) Environmental performance outcomes and standards* *Regulation 16(a)–16(c):* *A statement of the titleholder's corporate environmental policy* *A report on all consultations between the titleholder and any relevant person*	Set the context (activity and existing environment) Define 'acceptable' (the requirements, the corporate policy, relevant persons) Detail the impacts and risks Evaluate the nature and scale Detail the control measures – ALARP and acceptable	Section 1 Section 2 Section 3 Section 3 Section 6 Section 7 Section 8 Section 9
Regulation 10A(d): *provides for appropriate environmental performance outcomes, environmental performance standards and measurement criteria*	Regulation 13(7): *Environmental performance outcomes and standards*	Environmental Performance Outcomes Environmental Performance Standards Measurement Criteria	Section 8 Section 9
Regulation 10A(e): *includes an appropriate implementation strategy and monitoring, recording and reporting arrangements*	Regulation 14: *Implementation strategy for the environment plan*	Implementation strategy, including: • systems, practices and procedures • performance monitoring • Oil Pollution Emergency Plan (OPEP) and scientific monitoring • ongoing consultation	Section 7 Section 11 Appendix E (OPEP)
Regulation 10A(f): *does not involve the activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, being undertaken in any part of a declared World Heritage property within the meaning of the EPBC Act*	Regulation 13 (1)–13(3): *13(1) Description of the activity* *13(2) Description of the environment* *13(3) Without limiting [Regulation 13(2)(b)], particular relevant values and sensitivities may include any of the following:* *(a) the world heritage values of a declared World Heritage property within the meaning of the EPBC Act;* *(b) the national heritage values of a National Heritage place within the meaning of that Act;* *(c) the ecological character of a declared Ramsar wetland within the meaning of that Act;* *(d) the presence of a listed threatened species or listed threatened ecological*	No activity, or part of the activity, undertaken in any part of a declared World Heritage property	Section 3 Section 8 Section 9

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
	community within the meaning of that Act; *(e) the presence of a listed migratory species within the meaning of that Act;* *(f) any values and sensitivities that exist in, or in relation to, part or all of:* *(i) a Commonwealth marine area within the meaning of that Act; or* *(ii) Commonwealth land within the meaning of that Act.*		
Regulation 10A(g): *(i) the titleholder has carried out the consultations required by Division 2.2A* *(ii) the measures (if any) that the titleholder has adopted, or proposes to adopt, because of the consultations are appropriate*	Regulation 11A: *Consultation with relevant authorities, persons and organisations, etc.* Regulation 16(b): *A report on all consultations between the titleholder and any relevant person*	Consultation in preparation of the EP	Section 6
Regulation 10A(h): *complies with the Act and the regulations*	Regulation 15: *Details of the Titleholder and liaison person* Regulation 16(c): *Details of all reportable incidents in relation to the proposed activity.*	All contents of the EP must comply with the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and the Environment Regulations	Section 1.7

1.7 Titleholder Details

The nominated Titleholder for this activity is BHP Petroleum (Australia) Pty Ltd.

BHP has exploration, development, and production activities in more than a dozen countries around the globe, including a significant deep-water position in the Gulf of Mexico, and operations in Australia, and Trinidad and Tobago. BHP's Australian assets include:

- Macedon Gas Plant – natural gas and condensate (operator)
- Pyrenees Floating Production, Storage and Offloading (FPSO) vessel - crude oil (operator)
- Bass Strait – crude oil, condensate, liquid petroleum gas and natural gas (non-operator)
- North West Shelf – crude oil, condensate, and liquefied natural gas (non-operator).

In accordance with Regulation 15(1) of the Environment Regulations, details of the titleholder are provided in Table 1-3.

Table 1-3: Titleholder Details

Name	BHP Petroleum (Australia) Pty Ltd
Business address	125 St Georges Terrace, Perth, Western Australia 6000
Telephone number	+61 8 6321 4496
Email address	clive.jones@bhp.com
Australian Company Number	39 006 923 879

In accordance with Regulation 15(2) of the Environment Regulations, details of the titleholder's nominated liaison person are provided in Table 1-4.

Table 1-4: Titleholder Nominated Liaison Person

Name	Steve Jeffcote
Position	Regional HSE Lead, Australia
Business address	125 St Georges Terrace, Perth, Western Australia 6000
Telephone number	+61 8 6321 2789
Email address	Steve.Jeffcote@bhp.com

In the event of any change in the titleholder, titleholder parent company, a change in the titleholder's nominated liaison person or a change in the contact details for either the titleholder or the liaison person, BHP will notify NOPSEMA in writing in accordance with Regulation 15(3) of the Environment Regulations.

2 Legislative Framework

2.1 Commonwealth Legislation

Environmental aspects of petroleum activity in Australian Commonwealth waters are controlled by two main statutes, the OPGGS Act and the EPBC Act. Each of these, as applicable to the petroleum activity, is described in the next sections. There are also applicable Commonwealth and West Australian statutes and regulations, International Agreements and Conventions and other applicable standards, guidelines, and codes under which the activities are implemented. These are listed in Appendix B of this EP.

2.1.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006

The OPGGS Act provides the regulatory framework for all offshore exploration and production activities in Commonwealth waters (those areas beyond three nautical miles from the Territorial sea baseline and in the Commonwealth Petroleum Jurisdiction Boundary). The Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations (referred to as the Environment Regulations) have been made under the auspices of the OPGGS Act for the purposes of ensuring (as described in Section 3) "…any petroleum activity or greenhouse gas activity carried out in an offshore area is:

- carried out in a manner consistent with the principles of ecologically sustainable development set out in section 3A of the EPBC Act
- carried out in a manner by which the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable
- carried out in a manner by which the environmental impacts and risks of the activity will be of an acceptable level".

This EP meets the requirements of the Environment Regulations by providing a plan that:

- is appropriate for the nature and scale of the activity
- demonstrates the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable
- demonstrates the environmental impacts and risks of the activity will be of an acceptable level
- provides for appropriate environmental performance outcomes, environmental performance standards and measurement criteria
- includes an appropriate implementation strategy and monitoring, recording, and reporting arrangements
- does not involve the activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, being performed in any part of a declared World Heritage property within the meaning of the EPBC Act
- demonstrates that:
    - an appropriate level of consultation, as required by Division 2.2A, has been performed
    - the measures (if any) adopted, or proposed to adopt, because of consultations are appropriate
    - complies with the OPGGS Act and the Environment Regulations.

The OPGGS Act and supporting regulations address licensing, health, safety and environmental matters for offshore petroleum and gas exploration and production operations in Commonwealth waters. Obligations in relation to the maintenance and removal of equipment and property brought onto title are provided in OPGGS Act section 572. Section 572 requires the removal of property when it is no longer used, unless NOPSEMA has accepted alternative arrangements where justification is appropriate and with regard to the Australian Government *Offshore Petroleum Decommissioning Guideline* (Commonwealth of Australia, 2018). Field management covered under the Griffin Decommissioning and Field Management EP (GV-HSE-E-0014) evaluates the infrastructure integrity and applies applicable measures, based on risk, to ensure subsea infrastructure may be removed in accordance with section 572(3) of the OPGGS Act. All Griffin subsea infrastructure (including GEP) will be removed before 31 December 2024, in accordance with section 572(3) of the OPGGS Act, unless NOPSEMA approves and is satisfied that an alternative decommissioning approach delivers equal or better environmental, safety and well integrity outcomes compared with complete removal.

2.1.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act aims to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places in Australia. These are defined in the Act as Matters of National Environmental Significance (MNES). NOPSEMA, through the Streamlining Offshore Petroleum Environmental Approvals Program, implements these requirements with respect to offshore petroleum activity in Commonwealth waters. The Streamlining Offshore Petroleum Environmental Approvals Program is applicable to all offshore petroleum activity authorised by the OPGGS Act and requires the petroleum activity to be conducted in accordance with an accepted EP, consistent with the principles of ecologically sustainable development (ESD). The definition of ‘environment’ in the Streamlining Offshore Petroleum Environmental Approvals Program is consistent with that used in the EPBC Act and encompass all matters protected under Part 3 of the EPBC Act.

Under s268 of the EPBC Act:

> “*A Commonwealth agency must not take any action that contravenes a recovery plan or a threat abatement plan*.”

In respect to offshore petroleum activity in Commonwealth waters, the above is implemented by NOPSEMA. Commitments relating to listed threatened species and ecological communities under the Act are included in the Program Report (Commonwealth of Australia, 2014):

- NOPSEMA will not accept an Environment Plan that proposes activities which will result in unacceptable impacts to a listed threatened species or ecological community.
- NOPSEMA will not accept an Environment Plan that is inconsistent with a recovery plan or threat abatement plan for a listed threatened species or ecological community.
- NOPSEMA will have regard to any approved conservation advice relating to a threatened species or ecological community before accepting an Environment Plan.

Recovery and management plans relevant to this EP are outlined in Section 10.

2.1.3 Environment Protection (Sea Dumping) Act 1981

The Commonwealth *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act) is the legislative instrument that addresses Australia’s obligations under the London Protocol. The aims of the London Protocol are to protect and preserve the marine environment from all sources of pollution, and to prevent, reduce and eliminate pollution by controlling the dumping of wastes and other materials at sea. The Sea Dumping Act regulates the dumping at sea of controlled material (including certain wastes and other matter), the incineration at sea of controlled material, loading for the purpose of dumping or incineration, export for the purpose of dumping or incineration, and the placement of artificial reefs. Permits are required for any authorised sea dumping activities.

The Sea Dumping Act and associated sea dumping permits are administered by the Department of Agriculture, Water and the Environment (DAWE). Preliminary discussions with DAWE indicate the GEP is exempt from the requirements of a Sea Dumping Permit, as a pipeline that conveyed a petroleum product to shore. Written confirmation from DAWE has been sought.

2.2 State Legislation

In the event of a hydrocarbon release from a tank rupture from a vessel collision (Section 9.2), there is the potential for the release to impact State waters and shorelines. Relevant state legislation is listed in Appendix B.

The State component of the GEP is outside of the scope of this EP and will be managed in accordance with an appropriate State Environment Plan, submitted to Department of Mines, Industry, Regulation and Safety

(DMIRS) in accordance with the Petroleum (Submerged Lands) (Environment) Regulations 2012 and Petroleum Pipelines (Environment) Regulations 2012.

2.3 Environmental Guidelines, Standards and Codes of Practice

Multiple international codes of practice and guidelines are relevant to environmental management of the petroleum activity. Those considered most relevant are listed in Appendix B.

The following two international conventions and protocols are considered most relevant to the petroleum activity. An assessment of the petroleum activity against these is provided in Section 8.1.5 and 8.7.5.

2.3.1 Article 192 of the United Nations Convention on the Law of the Sea 1982 (UNCLOS)

A general obligation of Article 192 of the United Nations Convention on the Law of the Sea 1982 (UNCLOS) is to protect and preserve the marine environment. International Maritime Organization (IMO) resolution A.672 (1989) recognises that the general requirement is base case of removal with the objective of protecting and preserving the marine environment. Further details are provided in paragraph 3.9 of the resolution describing that equipment left in situ should not move under environmental loading and paragraph 3.2 further describes that infrastructure less than 4000 tonnes in less than 100 m water should be removed.

2.3.2 Annex I(2) of the 1996 London Protocol

Annex I(2) of the 1996 London Protocol to the convention on the prevention of marine pollution by dumping of waste and other matter (update to London Convention and Protocol 1972) describes that material capable of creating floating debris or otherwise contributes to the pollution of the marine environment has to be removed.

3 GEP Decommissioning Options Environmental Impact Assessment

3.1 Regulatory Context

Article 60 of the 1982 United Nations Convention on the Law of the Sea (UNCLOS), to which Australia is a party, states:

"Any installations or structures which are abandoned or disused shall be removed to ensure safety of navigation, taking into account any generally accepted international standards established in this regard by the competent international organization. Such removal shall also have due regard to fishing, the protection of the marine environment and the rights and duties of other States."

Australia is a member state of the IMO, a body created by agreement of member states of the United Nations. The IMO is regarded as the competent organization to deal with the requirement of Article 60 of the UMCLOS. Following UNCLOS, the IMO published *Resolution A.672(16) Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone* (IMO 1989). This resolution recognizes that structures on the continental shelf should be removed, but coastal states (such as Australia) may make decisions to leave structures partially or completely in the sea.

Section 572 of the OPGGS Act requires that titleholders maintain their property and remove their property from a petroleum title area when it is no longer in use, which is consistent with the requirement of Article 60 of UNCLOS. However, the Commonwealth recognises that removal of property may not be feasible, or may result in environmental, safety and economic outcomes that are worse than leaving property in the sea. The *Offshore Petroleum Decommissioning Guideline* (Commonwealth of Australia, 2018) outlines the Commonwealth's principles on decommissioning property used for offshore oil and gas exploration and production:

- Decommissioning is the responsibility of the titleholder
- Early planning for decommissioning is encouraged
- Complete removal of property is the base case
- Decommissioning must be completed before the surrender of the petroleum title

Noting these principles, the *Offshore Petroleum Decommissioning Guideline* (Commonwealth of Australia, 2018) states that NOPSEMA may approve options other than complete removal. The guideline requires titleholder to demonstrate that any proposed alternatives to full removal must result in equal or better environmental, safety and well integrity outcomes compared to full removal.

The *Section 572 Maintenance and Removal of Property* policy (NOPSEMA, 2020b) outlined NOPSEMA's position on Section 572 of the OPGGS Act and the *Offshore Petroleum Decommissioning Guideline* (Commonwealth of Australia, 2018). This policy reinforces full removal of property is the base case for decommissioning and outlines NOPSEMA's position on alternatives to full removal of property. The policy states that any EP proposing an alternative to full removal is to include:

- An evaluation of the feasibility of all options, including partial and complete removal of property
- An evaluation of environmental impacts and risks of all feasible options, including complete property removal, to enable NOPSEMA to have regard to the Australian Government Decommissioning Guideline policy principle that deviations will provide an equal or better environmental outcome when compared to complete property removal. The evaluation of all the environmental impacts and risks of each option must include consideration of control measures necessary to manage the impacts and risks
- Evaluation of all environmental impacts and risks within Australia's environment including, where relevant, indirect consequences that may arise from the petroleum activity of removing property from a title area
- Where deviation/s to removal of property or relocation of property is proposed, titleholders are to address arrangements for long term monitoring and management. Environment plans requiring long term monitoring for property will be subject to environmental performance reporting requirements and compliance monitoring by NOPSEMA for the duration of the monitoring program. NOPSEMA advises

the Joint Authority of EPs requiring long term monitoring for property and this may be a matter taken into account when considering surrender of titles

- Consideration of relevant persons' consultation with respect to the options being proposed

3.2 Environmental Impact Assessment of Feasible Decommissioning Options

As described in Section 4, BHP proposes to clean and abandon *in situ* the GEP. BHP has removed, or will remove, most of the equipment in the Griffin Field, as detailed in the Griffin Field Management and Equipment Removal EP (411012-00328-20000-REP-003).

In accordance with NOPSEMA's *Section 572 Maintenance and Removal of Property* policy (NOPSEMA, 2020b), BHP identified the following feasible decommissioning options for the GEP:

- Removal of the GEP in Commonwealth waters between the PLEM and approximately KP35, including removal of designed buried sections (referred to as full removal). Full removal is assumed to be implemented using the cut and lift method described in Section 4.8.
- Removal of the unburied sections GEP in Commonwealth waters between the PLEM and approximately KP35, with the buried sections of the GEP abandoned *in situ* (referred to as partial removal). Very little of the GEP in Commonwealth waters is buried, so the partial removal option will remove most of the GEP. Partial removal is assumed to be implemented using the cut and lift method described in Section 4.8.
- Abandonment in situ of the GEP following cleaning that is confirmed to reduce mercury concentrations in the GEP to acceptable levels (referred to as abandonment in situ). The state of the GEP at the time of abandonment *in situ* is assumed to be the same as documented during the as-left survey described in Section 4.9 (i.e., following successful cleaning of mercury to an acceptable level).

The specifics for the full removal, partial removal, and abandonment *in situ* options for the GEP are based on preliminary engineering, however the methodologies and required activities for each option are considered reasonably straight forward. Only limited detailed engineering is needed to complete the activity. The methods and vessels presented are sufficient to inform the EIA for the feasible decommissioning options.

Each of the feasible options has different environmental outcomes. NOPSEMA's *Section 572 Maintenance and Removal of Property* policy (NOPSEMA, 2020b) requires that BHP evaluate the environmental impacts and risks of the feasible decommissioning options listed above. BHP did this by undertaking an environmental impact assessment (EIA) of the feasible decommissioning options, which is summarised in this section. The EIA used the analytic hierarchy process (AHP) to determine the relative impacts of each of the feasible decommissioning options on environmental values and sensitivities that may credibly be impacted.

3.2.1 EIA Methodology

An environmental impact assessment of the feasible decommissioning options for the GEP was undertaken using the AHP. The AHP is a multi-criteria decision analysis (MCDA) method, where the alternatives to achieving a goal can be compared using a suite of criteria. The AHP method has been studied extensively in a range of disciplines (e.g., defence, finance, and medicine) and is supported by a wide body of literature. The AHP methodology is available in more detail in Saaty (1996). A concise description of the AHP in the context of environmental impact assessment has been provided by Ramanathan (2001).

Determining the relative environmental outcomes of the feasible options for the GEP considered requires consideration of many factors. The AHP facilitates this by identifying these factors and making determinations about each independently. Once each of these smaller determinations has been made, they are aggregated to summarise the deliberations made.

The AHP was composed of a hierarchy comprising:

- the statement of the goal
- the environmental criteria

- the feasible alternatives to be considered for the GEP

Each of these elements is discussed below.

Define the Goal

The AHP commenced with the formulation of a goal statement. The goal statement is the root of the AHP hierarchy. The goal statement for the AHP to assess the relative environmental outcomes of the feasible decommissioning options for the GEP was:

> *“Determine the relative environmental outcomes of the feasible decommissioning options for the GEP”*

Identify the Feasible Options

BHP identified the feasible decommissioning options for the GEP, as outlined above in Section 3.2. Each of these feasible options was considered in the EIA. These options were identified through:

- A review of relevant requirements, particularly *Section 572 Maintenance and Removal of Property* policy (NOPSEMA, 2020), which requires titleholders proposing alternatives to full removal to:
    - Evaluate the feasibility of all options, including partial and complete removal of property
    - Evaluate the environmental impacts and risks of all feasible options, including complete removal, to demonstrate that the alternative yields equal or better environmental outcomes than full removal
- A review of offshore decommissioning activities globally
- Preliminary engineering consideration of the methods by which an option may be implemented
- Preliminary assessment of the acceptability of the options

Care was taken when selecting the methods for the full removal and partial removal options. Methods that clearly had unacceptable impacts and risks to the environment, or could be substituted with less hazardous alternatives, were not considered. This ensures that the EIA was not unduly biased against the full removal or partial removal options. The methods presented for each equipment group are reasonable and consistent with contemporary offshore engineering practices. All the feasible options were assumed to have controls applied to manage environmental impacts and risks to a level that is acceptable and ALARP.

The EIA did not explicitly consider risks (i.e., impacts that may occur due to accidents or emergencies) to environmental values and sensitivities. The risk profile from unplanned events of each of the feasible decommissioning options is broadly similar, with risks generally arising from vessel-based activities (e.g., introductions of invasive marine species and hydrocarbon spills). BHP has a proven ability to prevent vessel-based risks becoming realised, and hence unplanned events are unlikely to differentiate the feasible decommissioning options.

Identify the Criteria and Sub-criteria

Given the EIA demonstrates the relative environmental outcomes of the feasible decommissioning options, the criteria in the AHP were based on the environmental receptors that could credibly be impacted by these options. Environmental receptors considered in the EIA were identified based on the nature and scale of the environmental aspects of the feasible options, such as:

- the spatial extent of each aspect
- the temporal extent of each aspect
- the magnitude or intensity of environmental hazards that may arise from each aspect

No consideration was made for the environmental receptors that may credibly be at risk of impacts from unplanned events.

Each environmental receptor identified as a criterion was assessed to determine if the receptor warranted decomposition into sub-criteria. The decision to break down a criterion further into sub-criteria considered:

- whether the sub-criteria differed in their scale, environmental value, and vulnerability to impacts
- whether the sub-criteria could reasonably be impacted by the decommissioning alternatives in different ways

- whether the sub-criteria had specific relevant requirements that warranted consideration to meet the needs of the Environment Regulations

The environmental receptors identified as criteria by the process described above comprise:

- Sediment quality
- Water quality
- Benthic habitats
- Marine fauna
- Greenhouse gasses
- Onshore environmental receptors
- Other users

The other users criterion comprises several groups; hence the following sub-criteria were identified within this the other users criterion:

- Commercial fishers
- Tourism and recreation
- Petroleum industry
- Commercial shipping

The AHP hierarchy with these criteria, sub-criteria, as well as the goal and the feasible options, is shown in Figure 3-1.

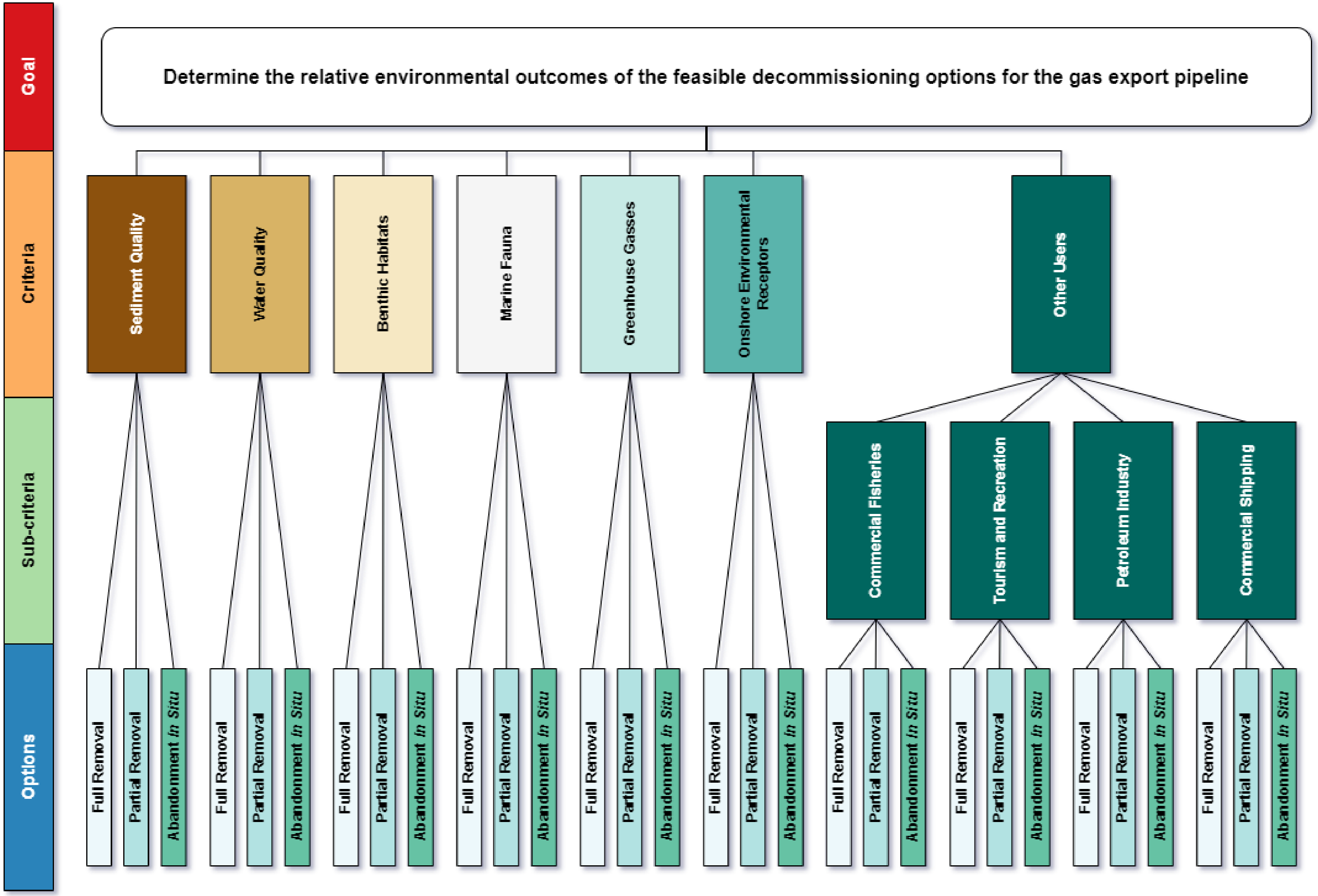


Figure 3-1: AHP hierarchy for GEP environmental impact assessment

The environmental receptors identified as criteria and sub-criteria in the AHP hierarchy were compared to determine the relative priority (i.e., weighting) each should receive using the AHP process. The relative environmental value of each criterion and sub-criterion was determined by considering:

- the value placed on the criterion by legislation (which is intended to protect extrinsic and intrinsic value of the environmental receptor), cultural value, economic value, recreational value
- the value placed on it because it supports other environmental values – i.e., the "connectedness" of the receptor
- the uniqueness of the environmental value within the environment

Sources of information on the environmental value of criteria and sub-criteria included work commissioned specifically to inform decommissioning of the Griffin field and GEP. Other inputs, such as environmental studies, material published by the Commonwealth on threatened and migratory species, and stakeholder consultation were also used.

Descriptions of these environmental receptors are provided in the description of the environment (Section 5).

Pairwise Comparisons

Following construction of the AHP hierarchy, all possible pairwise comparisons were made between the child nodes below the goal and the criteria nodes in the hierarchy. These pairwise comparisons were used to determine the weightings for each of the nodes below the goal in the hierarchy.

Deliberations on pairwise comparisons considered the relative merits of the items being compared. The comparisons within each node of the hierarchy were limited to the scope of the node. For example:

- the comparisons between environmental criteria and sub-criteria only considered the relative importance of the criteria or sub-criteria being compared.
- the comparisons of the decommissioning options within a criterion or sub-criterion only considered the potential impacts of each option on that criterion.

The comparison ratings and definitions are listed in Table 3-1.

Table 3-1: Relative qualitative judgment criteria used for pairwise comparisons (after Ramanathan 2001)

Rating	Definition	Description
1	Equal importance/preference	Both elements are of equal importance
3	Moderate importance/preference	Experience and judgment slightly favour one element over the other
5	Strong importance/preference	Experience and judgment strongly favour one element over the other
7	Very strong importance/preference	One element is very strongly favoured over the other
9	Extreme importance/preference	The evidence favouring one element is of the highest possible order of affirmation

Pairwise comparisons between criteria generally gave a relatively high weighting to:

- Marine fauna (approximately 33.2% of the criteria weighting), based on the high degree of protection of some species (e.g., threatened and migratory species) and the economic and social benefits provided by fishes in the Griffin field
- other users (approximately 32.7% of the criteria weighting), based on the interest shown to date by members of the local communities in Exmouth and Ashburton

Sediment quality and water quality both received moderate weightings (approximately 12.1% and 8.8% respectively) based on their high environmental connectivity. The remaining three criteria (benthic habitats, greenhouse gasses and onshore environmental receptors) accounted for only approximately 13% (Figure 3-2 and Table 3-2).

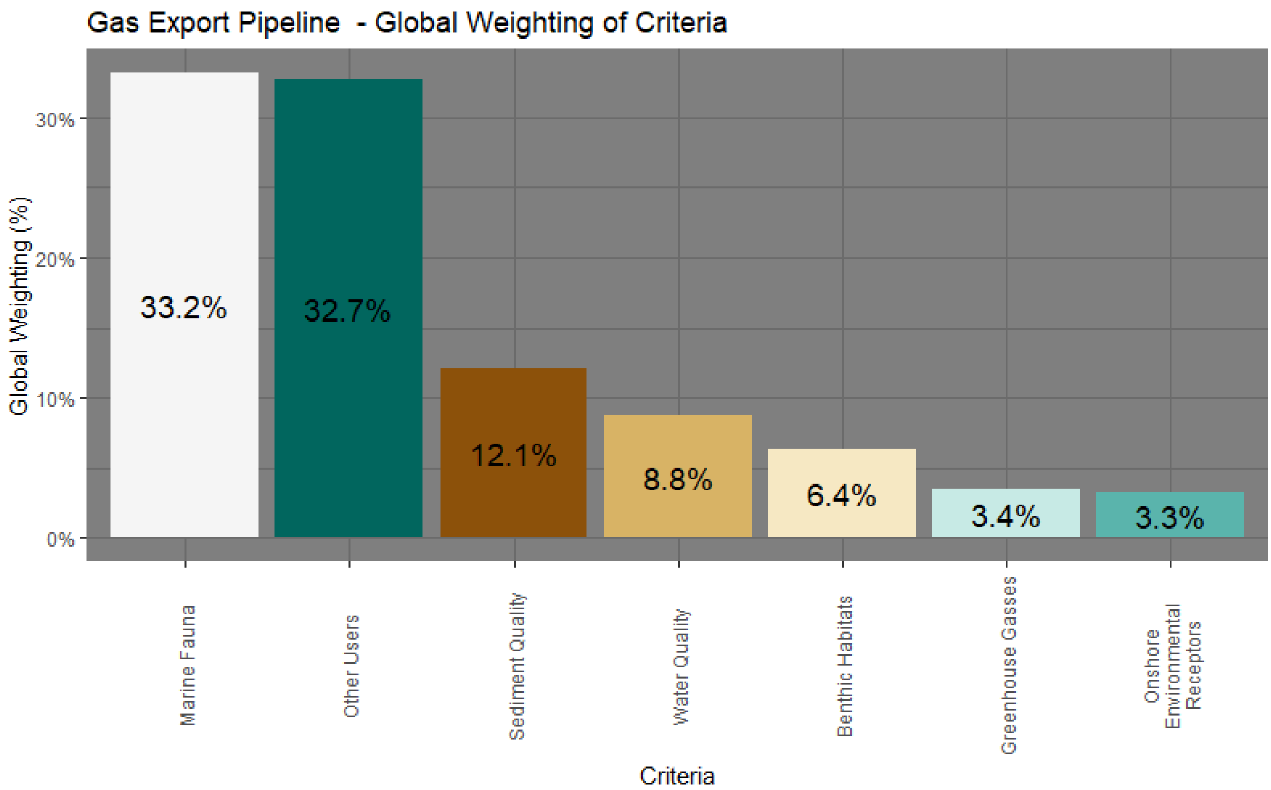


Figure 3-2: Global weightings for criteria within the AHP hierarchy for the feasible decommissioning options EIA

Table 3-2: Relative weightings of criteria within the AHP hierarchy for the feasible decommissioning options EIA

Option	Global Weighting
Marine Fauna	33.2%
Other Users	32.7%
Sediment Quality	12.1%
Water Quality	8.8%
Benthic Habitats	6.4%
Greenhouse Gasses	3.4%
Onshore Environmental Receptors	3.3%
Total	**100%**

Pairwise comparisons between the sub-criteria within the other users criterion:

- gave relatively high weighting to both commercial fishing and tourism and recreation, both of which received 43% of the weighting within the other users criterion (the local weighting). This was equivalent to a global weighting of 14.1% each (Figure 3-3 and Table 3-3). As a result, these sub-criteria have greater influence on the outcome of the assessment than criteria such as sediment quality and water quality, which have a lower weighting.
- Commercial shipping and the petroleum industry received little local weighting (8.9% and 5.1% respectively), with associated low global weightings (2.9% and 1.7% respectively) (Figure 3-3 and Table 3-3).

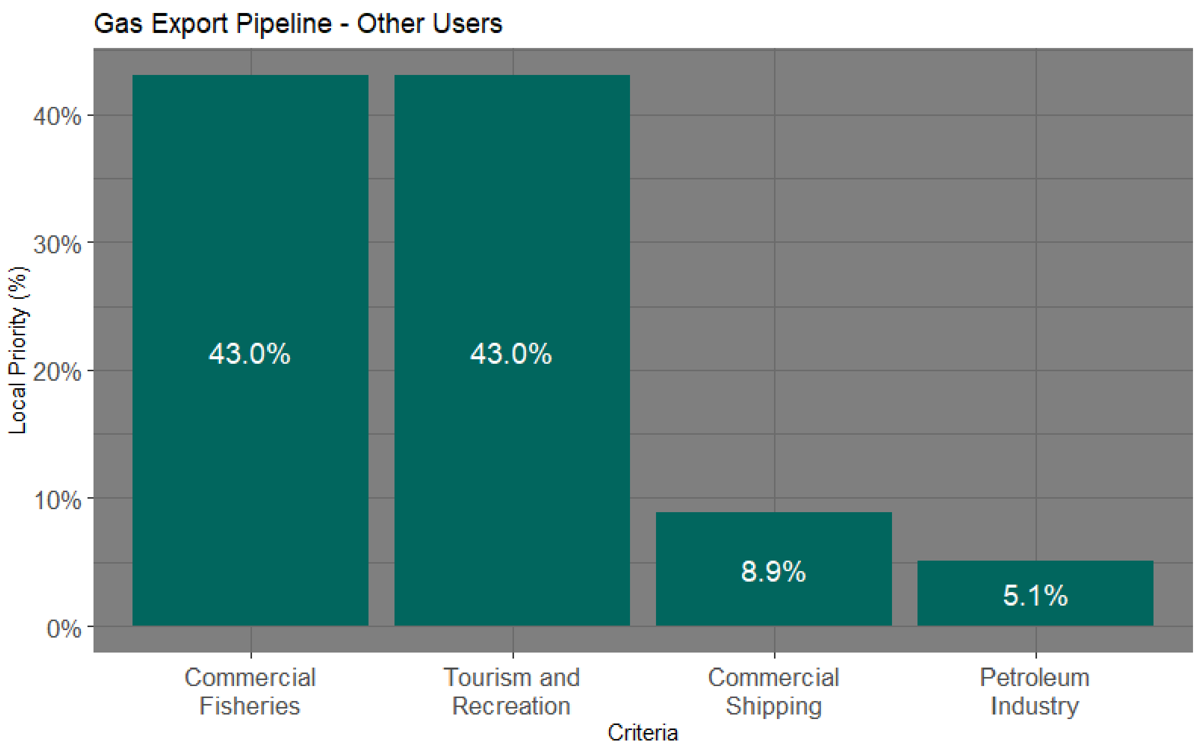


Figure 3-3: Local priorities for sub-criteria within the AHP hierarchy for the feasible decommissioning options for the GEP

Table 3-3: Local and global weightings for the sub-criteria within the other users criterion

Option	Local Weighting	Global Weighting
Commercial fisheries	43.0%	14.1%
Tourism and recreation	43.0%	14.1%
Commercial shipping	8.9%	2.9%
Petroleum industry	5.1%	1.7%
Total	**100%**	**32.7%**

3.2.2 Summary of EIA Deliberations

Pairwise comparisons between the decommissioning options within each of the criteria and sub-criteria were made as per the AHP process. The relative weightings of the feasible decommissioning options were then derived from these comparisons, which indicated a strong preference for the abandonment in situ option (Figure 3-4).

The vessel-based activities and seabed disturbance required to recover the GEP, and the potential impacts to fauna and other users, accounted for some of the preference for the abandonment *in situ* decommissioning option. The habitat provided by the GEP, which has been demonstrated to have a distinct demersal fish assemblage that has a higher biomass and greater value to commercial and recreational fishers than the surrounding habitat (Bond et al. 2017), also favoured the abandonment *in situ* option within the fauna criterion.

The plastics components of the GEP may result in marine debris and microplastics that may pose a risk to fauna, however much of the plastic is negatively buoyant and will become part of the sediment as the GEP degrades, where it poses little risk. The majority of the GEP is steel and concrete, which poses negligible risk to environmental receptors. This resulted in the abandonment *in situ* option being less preferred within the sediment quality criterion.

The GEP poses a snagging risk to trawled fishing gear, however demersal fish trawling is currently prohibited in the vicinity of the GEP. The GEP in Commonwealth waters is too deep to overlap areas that support prawns; hence, no prawn trawl fishing will occur in the vicinity of the GEP in Commonwealth waters. Consultation with the Western Australian Department of Fisheries indicates the management of the fishery in the foreseeable future will not change the boundaries where trawl fishing is permitted.

Consultation with stakeholders in the region, particularly recreational and commercial fishing stakeholders, indicated there is widespread support for abandonment of the GEP *in situ*. These stakeholders believe that the GEP and the associated fish assemblages are of value and that the loss of the GEP resulting from full or partial removal would be detrimental to their interests. Given the high weighting of the other users criterion, and the commercial fishing and tourism and recreation sub-criteria, these stakeholder opinions substantially influenced the outcome of the EIA.

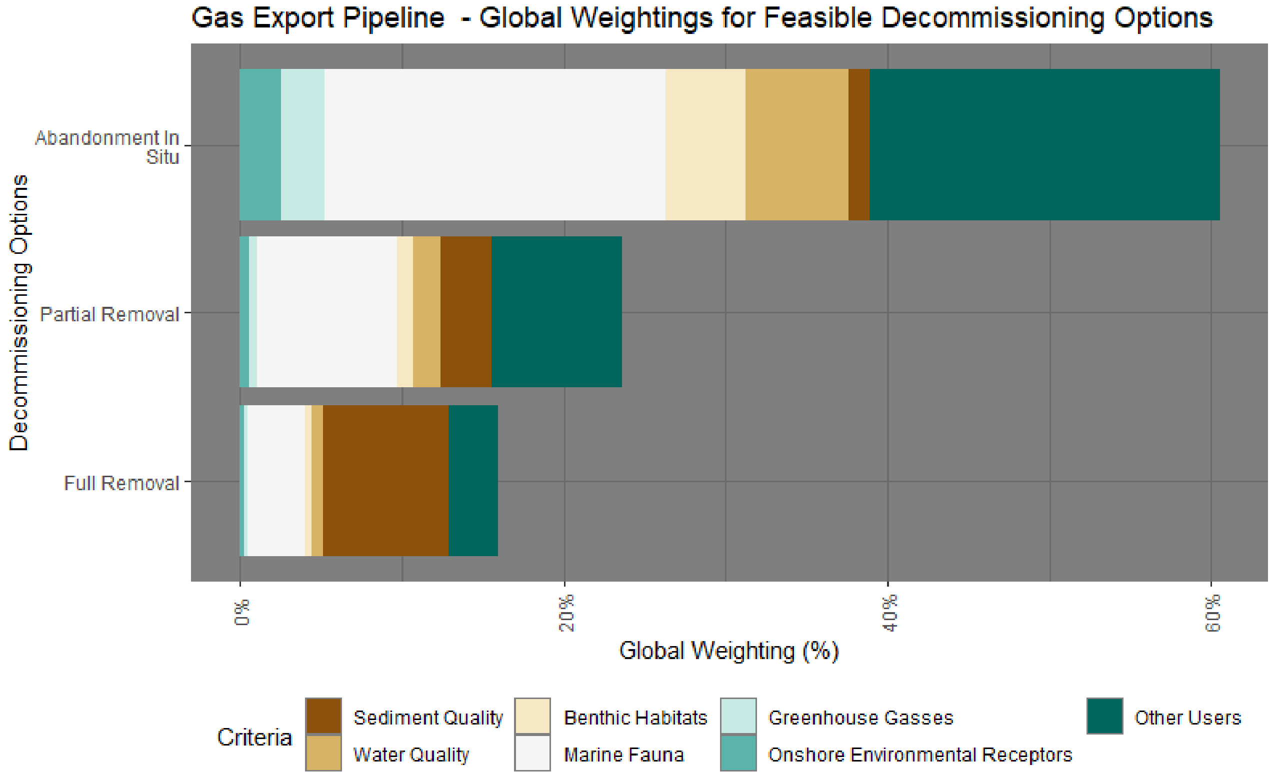


Figure 3-4: Stacked bar plots of weightings of the feasible decommissioning options within each criterion for the GEP

4 Description of Activity

4.1 Overview

This section has been prepared in accordance with Regulation 13(1) of the Environment Regulations, and describes the petroleum activity to be performed under this EP.

When in production, the Griffin field comprised the Griffin Venture, a FPSO vessel, with 12 production wells from the Griffin, Scindian and Chinook reservoirs routed to the riser turret mooring (RTM) via flexible and rigid flowlines. Oil products were stabilised and stored for offloading via tanker, while gas products were transported to the shore via the Griffin GEP for domestic sale.

The Griffin field ceased production in 2009. Since then, the following cessation activities have been completed:

- the Griffin Venture floating production, storage and offloading vessel was disconnected from the RTM and demobilised from the field.
- all production flowlines and gas lift lines were flushed and filled with treated seawater.
- the GEP was purged with nitrogen and positively pressurised.
- all wells were plugged and abandoned.
- all Xmas trees (XTs) were removed and placed onto mud mats around 25 m from the wells.
- all mid-depth buoys (MDBs) were removed and recovered. MDB mooring chains were laid on the seabed at the concrete gravity bases. Flexible risers were laid on the seabed.

BHP proposes to:

- prepare the GEP for the removal of mercury (Section 4.6)
- remove mercury contamination from the GEP to an acceptable level (Section 4.7)
- conduct an as-left survey of the GEP (Section 4.9)
- decommission the GEP *in situ.*

Whilst the EIA (Section 3) demonstrates the abandonment *in situ* alternative will result in equal or better environmental outcomes compared to full removal, which is required by NOPSEMA's Section 572 Maintenance and Removal of Property policy (NOPSEMA, 2020b), a contingency GEP full removal option (Section 4.8) has been included in this EP for the event that an acceptable level of GEP mercury decontamination has not been achieved (refer to Section 8.7.5 for acceptability criteria). To ensure BHP can comply with the timing of the General Direction Notice issued by NOPSEMA, BHP continue to plan for full removal until an *in situ* alternative has been accepted by NOPSEMA.

4.2 Location of the Activity

The Griffin field is located within Permit Area WA-10-L, located in Commonwealth waters, around 58 km north-west of Exmouth, Western Australia and in water depths of about 130 m (Figure 4-1). Key points along the GEP are presented in Table 4-1.

Table 4-1: Key points along the GEP (Eastings / Northings)

GEP	Easting	Northing
PLEM / GEP flange	256421.7	7650203.0
Commonwealth / State boundary crossing	268769.1	7627374.2

The Griffin GEP is located within Pipeline Licence WA-3-PL and extends from the PLEM in the Griffin field through WA State waters (Pipeline Licence TPL/10) to the shore (Figure 4-1). Water depths along the GEP range from 130 m at the PLEM to 90 m at the State/Commonwealth waters boundary.

The relative distances of key islands/mainland from the closest point in the operational area are provided in Table 4-2.

Table 4-2: Operational area distance/direction from Key Islands and Mainland

Key Islands / Mainland	Distance and Direction from Operational Area
Muiron Islands	48 km south west
Thevenard Island	18 km south east
Exmouth	58 km north east
Onslow	45 km south east
Barrow Island	80 km north east
Dampier	235 km north east

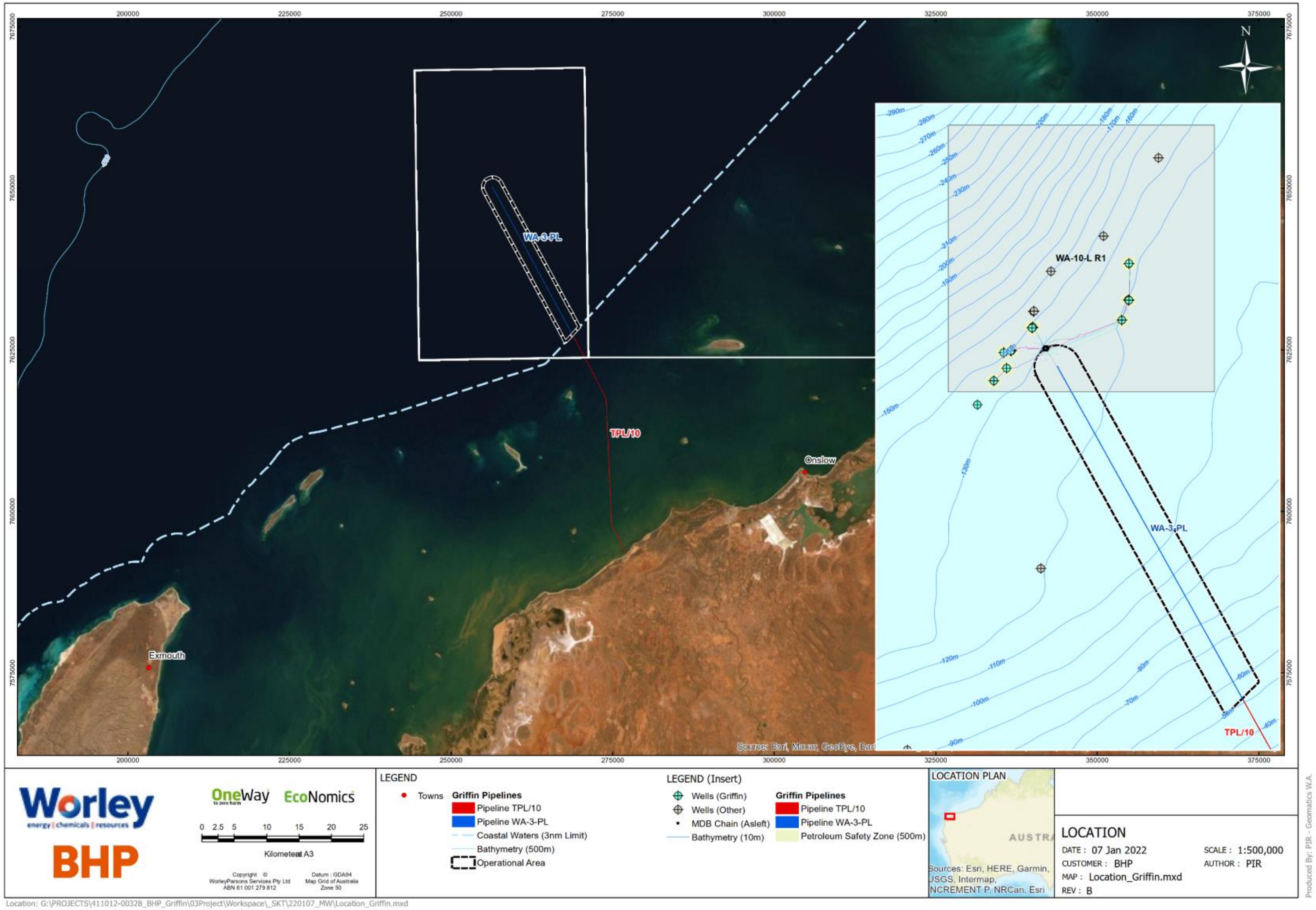


Figure 4-1: Location of the Activity and Operational Area

4.3 Timing of Activity

The mercury preparation (Section 4.6) and removal activities (Section 4.7) will be conducted over a period of approximately 2 to 4 months, with activities to be completed before 31 December 2024. Further details about the mercury removal scope of works are provided in Section 4.6.

An as-left survey (Section 4.9) will be undertaken over a period of approximately 2 to 4 weeks.

BHP proposes the petroleum activity is considered to have been completed once the environmental performance standards within the EP have been met and closed out.

4.4 Operational Area

The operational area shown Figure 4-1 is the spatial boundary of the petroleum activity, and the extent within which the impacts and risks have been assessed and will be managed by this EP. The operational area includes the area encompassing a 1,500 m radius around the GEP, within Commonwealth waters. A temporary 500 m radius exclusion zone will be maintained around the project vessels during pigging operations at the PLEM and while surveying the GEP.

The GEP does extend into State waters. Activities in State waters are outside the scope of this EP and will be managed in accordance with an appropriate State Environment Plan, submitted to Department of Mines, Industry, Regulation and Safety (DMIRS) in accordance with the Petroleum (Submerged Lands) (Environment) Regulations 2012 and Petroleum Pipelines (Environment) Regulations 2012.

4.5 Griffin Gas Export Pipeline Overview

The GEP has a total length of 61.6 km (PLEM to shoreline) and has a 219.1 mm outer diameter and 11.1 mm wall thickness. The GEP concrete weight coating (CWC) thickness ranges from 30 mm to 75 mm. The GEP crosses the State/Commonwealth waters boundary 25 km from the PLEM. Details of the GEP composition and materials by weight are provided in Table 4-3 and Table 4-4 respectively.

Table 4-3: GEP Composition

Component	Material
Linepipe	API 5L X60 Carbon Steel
Density steel	7850 kg/m^3
Pipeline Coating	Fusion Bonded Epoxy - Plastic
Concrete Weight Coating (CWC)	3040 kg/m^3 Concrete, Carbon Steel Reinforcement
External Corrosion Coating Thickness	0.4 mm
External Corrosion Coating Density	1,440 kg/m^3
Anode	Aluminium
Rock Bolts	Carbon Steel
Field Joint Coating	Heat Shrink Sleeve - Plastic
Field Joint Cutback Infill	Bitumen Mastic
Field Joint Coating Thickness	0.5 mm
Field Joint Coating Density	940 kg/m^3

Table 4-4: Materials within the Total GEP Length and Weight

Material	Weight (Tonnes)[1]
Steel Corrosion Product	3,513
FBE Coating	31
HSS Field Joint Coating	4
Concrete Weight Coating	5,448
Field Joint Filler (Mastic)	188

Note 1: Weights relate to the whole GEP, weights in Commonwealth waters only are provided in Table 8-27

Since the Griffin field ceased production, the Griffin field and GEP has been the subject of surveys to establish status and condition. The following reports contains details of the survey results:

- 00GA-BHPB-S00-0001 DOF Subsea Griffin Field Abandonment Survey Report 2014 (DOF, 2014)
- 00GA-BHPB-N00-0009 Griffin Field Pre-Abandonment Environmental and ROV Survey 2015 (Gardline, 2015)
- PET-GDC20-DR-REP-00008 – Griffin P&A End of Campaign Report 2017 (BHP, 2017a)
- 00GA-BHPB-T40-0002 – Griffin Field & Export Pipeline 2017 Subsea Survey (BHP, 2017b)

Based on previous ROV and Side Scan Sonar (SSS) surveys, the GEP has not experienced any major displacement during its operating life. Marine growth has been observed, including hydroid grass (5-15%) with entrapped sediment and assorted shellfish (barnacles, mussels etc) (10 to 20%).

As part of the field cessation activities, the GEP was depressurized, and hydrocarbons were flushed and displaced with nitrogen to 14 bar (~875,000 scf). The PLEM and topside valves were shut. The GEP pressure is approximately 13 bar and is no longer connected to any source of hydrocarbons. The GEP has aluminium based sacrificial anodes attached at various spacings and a cluster of anodes at the shore crossing. GEP corrosion is not considered an integrity concern at present as the pipeline carried dry / treated export quality gas over the life of field operations and external cathodic protection measurements confirm there is approximately 100 years of design life remaining in the cathodic protection system.

Mercury contamination is present in the GEP (Qa[3], 2021) and considered to be above acceptable limits (refer Section 4.5.3).

The GEP status is further described in the sections below. Kilometre Points (KP) are referenced and refer to the distance of the GEP from the shore point (KP 0.074) to the PLEM (KP 61.60). The GEP crosses from State to Commonwealth waters at approximately KP 35. Whilst the Sections below also describe the status of the GEP in State waters, this is for context and information purposes.

4.5.1 GEP Stabilisation

Secondary stabilisation was achieved using trenching and / or rock-bolting from KP4.46 to the 68m LAT water depth contour at KP38.90. The trenching in this section was performed using a plough which produced a V-shaped trench with an approximate 30 degree trench wall angle (BHP, 2008). For certain sections along the GEP where the required trench depth could not be achieved, the GEP was stabilised using rock bolts. A total number of 522 rock bolts are installed, three of these within Commonwealth waters.

Successfully trenched sections of GEP and locations of the installed rock bolts are presented in Figure 4-2 and Figure 4-4.

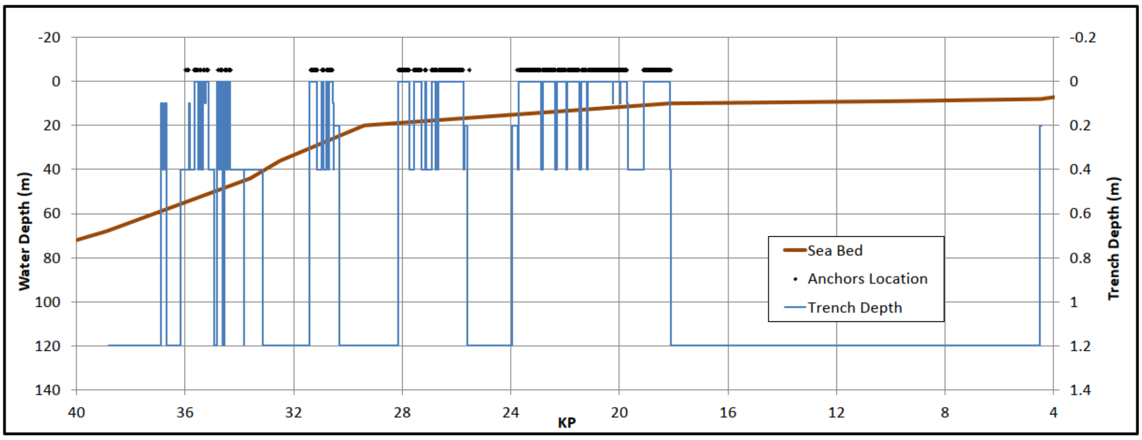


Figure 4-2: Details of the Trench Depth and Rock-Bolts Location

Figure 4-3: Rock-Bolts Location Along GEP

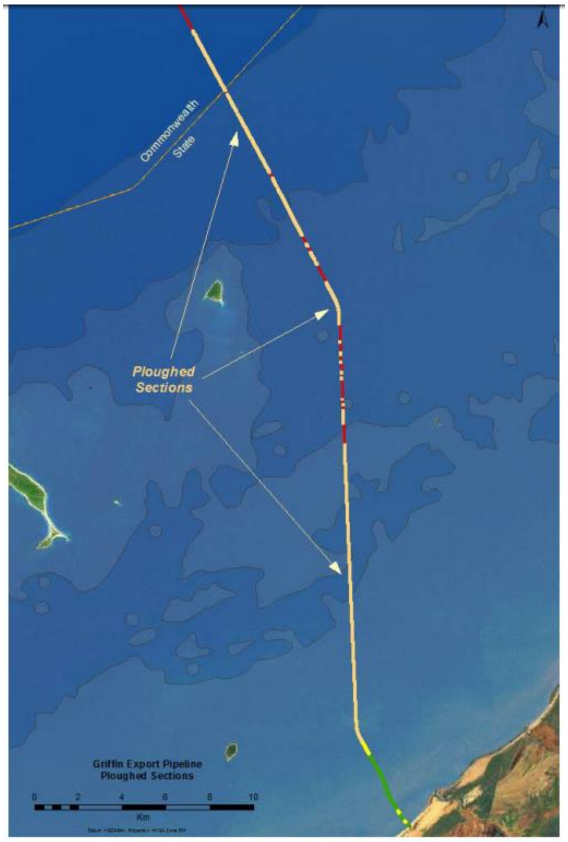


Figure 4-4: Ploughed Sections Along GEP

From KP 38.8 onwards to the PLEM, no secondary stabilisation measures were implemented as the GEP was determined to be stable under its own self weight (e.g. no rock bolts or trenching required). While this section of the GEP was unburied at installation, the self-burial process has been observed with the localised GEP lowering into the seabed and observation of freespans. KP 38.8 to the PLEM is considered partially to fully exposed.

Selected GEP images taken during Griffin Field & Export Pipeline 2017 Subsea Survey (BHP, 2017b) are provided in Appendix C.

4.5.2 GEP Burial and Stability

A GEP abandonment stability assessment of the GEP has been completed by Atteris (Atteris, 2014). The results of the stability assessment indicate the following:

- The sections of the GEP that were post-lay trenched between the shoreline at KP0 and KP38.8 are considered completely stable.
- The section of the GEP where no secondary stabilisation measures were implemented between KP38.8 and the PLEM at KP61.7 (PLEM) is demonstrated to be stable in a 100 year return period event.
- The sections of the GEP that were rock bolted post-lay between KP18 and KP38.8 rely on the rock bolts to ensure the GEP has adequate stability.

4.5.3 Mercury Contamination

Mercury is ubiquitous in oil and gas reservoirs and can pose a serious risk to health and the environment in aged facilities that have reached end of operational life and are selected for decommissioning. It is well documented that mercury will deposit onto the internal process infrastructure via several mechanisms including chemisorption, adsorption, and precipitated scale deposits.

Mercury contamination is present as a scale (average scale depth of 18 µm) and as concentration in whole steel and considered above acceptable limits (ANZECC, 2000 for mercury in sediments) in the following assets (Qa^3, 2021a):

- GEP
- PLEM.

A section of pipe (spool piece) was removed from the PLEM in 2018 and a number of coupons were cut from it. The coupons were analysed to determine the concentration of mercury in the PLEM. This was then used to calculate expected mercury concentrations in the GEP (Qa^3, 2021b, Qa^3, 2021c).

The concentration of mercury in whole steel is dependent upon the following factors: the concentration of mercury in the scale, the mass of scale present, the steel thickness and the surface area to mass ratio. Taking into account all studies (nine coupons taken from the PLEM in the initial trials, and 48 coupons in this latest set of trials), the overall range of total mercury from a total of 57 coupons was 6.4 – 86.3 mg/kg with an average of 23.6 mg/kg (Qa^3, 2021b). Expressed as concentrations in the steel of the GEP (which has a thinner pipe wall and a marginally smaller internal surface area to the PLEM spool piece), this equates to an average mercury concentration of 34.5 mg/kg (Table 4-5) (Qa^3, 2021b). The calculated mass of mercury in the 61.6 km Griffin GEP is 121 kg (0.1 tonnes), assuming the concentration measured at the PLEM is uniform along the length of the pipeline. Given the nature of the deposition, this is considered conservative (Qa^3, 2021b).

Table 4-5 presents a summary of the mercury concentrations measured in PLEM and calculated for GEP.

Table 4-5: Mercury Concentrations Measured in PLEM and Calculated for GEP (Qa^3, 2021b)

Mercury in Whole Steel (mg/kg) by Acid Digestion	
Measured in PLEM	Calculated for GEP[1]
23.6	34.5

Note 1: 57 analysed coupons had a Hg range of 6.4 – 86.3 mg/kg with an average of 23.6 mg/kg (Qa3, 2021a). This value is for the pipeline end manifold (PLEM) which has a thicker wall (15.875 mm) than the GEP (gas export pipeline). Taking the wall thickness into account, the number 23.6 mg/kg becomes 34.5 mg/kg for the GEP. However, the internal diameter is approximately similar for the GEP and PLEM, so the amount of Hg per metre will not be significantly different if the concentration measured in the PLEM is representative for the whole GEP.

The PLEM is to be removed under the Griffin Decommissioning and Field Management EP (GV-HSE-E-0014). Due to the nature of the mercury (present as a scale) in the PLEM, it will not be discharged during removal, as further described in the Griffin Decommissioning and Field Management EP (GV-HSE-E-0014).

4.6 Mercury Removal Preparation

The following will be conducted at the PLEM end of the GEP in preparation for mercury removal activities (Section 4.7):

- Disconnection of the GEP from the PLEM by cutting the GEP with a diamond wire saw from a Remotely Operated Vehicle (ROV)
- Installation of PIG launcher/ receiver, deployed from the project vessel to the GEP via crane

Note, removal of the PIG launcher/ receiver and GEP z-spool at the PLEM will occur following completion of the pigging activities, recovered to the project vessel via crane.

Project vessel use has been further discussed in Section 4.10.1.

4.7 Mercury Removal Activities

Prior to the decommissioning of the GEP *in situ* there is a requirement to remove the mercury contamination (described in Section 4.5.3) to an acceptable level. MerCure has been determined as the most suitable and efficient method for removing the mercury from the GEP (Atteris 2019b, Qa^3, 2021a). An acceptable level of mercury removal has been defined in Section 8.7, based on the ANZECC Interim Sediment Quality Guidelines (ISQG) (ANZECC, 2000).

4.7.1 MerCure as a Decontamination Solution

Atteris (2019b) identified and ranked methods and technologies that could remove mercury from the GEP to an acceptable level. Based on the outcomes, the use of MerCure has been selected as the best means for achieving an acceptable level (as defined in Section 8.7.5) of mercury decontamination in the GEP.

MerCure is a complex acid-based decontamination chemical which can dissolve scale, releasing elemental and compound mercury (Hg), before stabilising the elemental Hg as a salt and sequestering all compound Hg into solution. Its lixiviant properties help to draw chemisorbed Hg from steel and scale and hold it in solution preventing it from re-depositing.

The efficacy of MerCure as a decontamination solution has been investigated in trials commissioned by BHP (Qa^3, 2021b, Qa^3, 2021c). Trials were performed at increasing contact time intervals to determine the most appropriate Pipeline Inspection Gauge (pig) pill length for the *in situ* decontamination of the GEP.

Initial trials showed that MerCure treatments travelling along the GEP have the potential to achieve total mercury removal within the GEP (by acid digestion / AAS) of 97.3 % after a 16-hour contact period (Qa^3, 2021b). 97.3% being the average of removal obtained during the trial.

Subsequent trials have shown that the percentage of mercury removed by a 16-hour MerCure decontamination treatment is in the range of 97.9 – 99.5%, with an average removal of 98.8% (by acid digestion / AAS). This is in good agreement with the historical average (determined in Qa^3, 2021b) of 97.3% removal for this MerCure decontamination regimen (Qa^3, 2021c).

Mercury concentrations in the steel of the GEP has been determined to be at an average concentration of 34.5 mg/kg (refer Table 4-5, Section 4.5.3). Table 4-6 presents the mercury remaining in GEP Steel after an effective MerCure treatment.

Table 4-6: Mercury in GEP Steel after MerCure Treatments

Mercury Removal	Mercury Remaining in GEP Steel (mg/kg)
95%[1]	1.73

Note 1: provided as a conservative lower limit of removal efficiency

Assuming an average of 97.3% mercury removal efficacy (Qa^3, 2021b), this would equate to a calculated weight of 3.3 kg of mercury remaining across the 61.6 km GEP, present within whole steel (Qa^3, 2021b, 2021c) (Table 4-7).

Table 4-7: Mass of Mercury Across the GEP post 16 hour MerCure treatment (Qa^3, 2021c).

Mass of Mercury Across the 61.6 km Griffin Pipeline (kg)					
Total Before Treatment	Remaining After 16-Hour MerCure Treatment				
	Organic	Dilute Acid Soluble Salts	Elemental	Stable	Total*
121	< 0.006	< 0.003	0.25	3.05	3.3

*Assuming 97.3% removal of mercury during the MerCure decontamination treatment

Initial work by Genesis (2019) found by GC-ICP-MS (Gas Chromatography - Inductively Coupled Plasma - Mass Spectrometry) that mercury mostly exists in the form of elemental (61 %) and organic (36 %) mercury, with very little sulfide mercury (HgS) (0.76 %). Qa3 Laboratories (2021a) on the other hand used extraction/UV and N_2 gas purging to estimate levels of organic and elemental mercury, respectively. This follow-up study provides a more accurate determination of the amount of HgS and other mercury species in the pipeline after a 16 hr cleaning procedure with MerCure. The vast majority (92.3% on average) of the mercury remaining in coupons after treatment with MerCure is in a stable form, most likely to be as HgS. The remaining 7.7% was found to be in elemental form, which may have been adsorbed into the steel prior to a scale being deposited on the internal surface of the pipe when the pipe was first commissioned and brought into service (Qa^3, 2021c). Figure 4-5 presents what this looks like for 98.8% mercury removal (Qa^3, 2021c). The masses of mercury from individual mercury species remaining in the pipeline can be calculated as shown in Table 4-7 (Qa^3, 2021c).

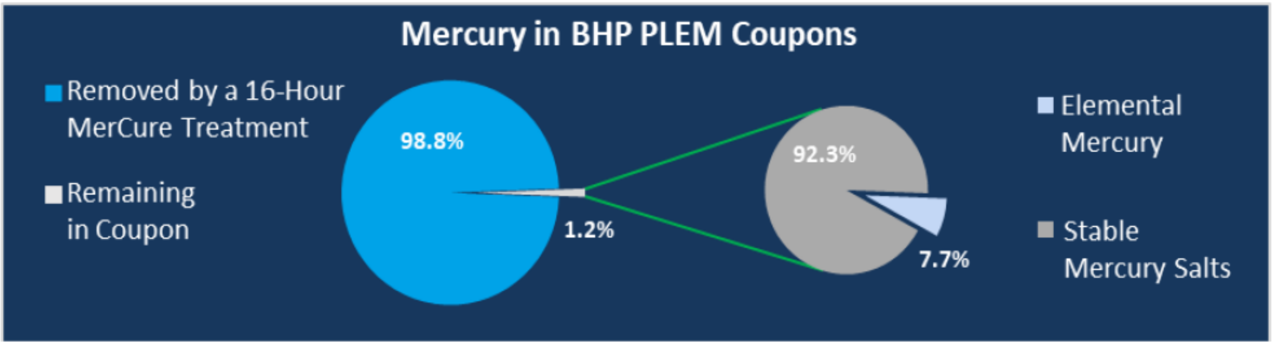


Figure 4-5: Mercury in BHP PLEM coupons (Qa[3], 2021c)

In coupons treated with MerCure to remove >97 % of the mercury, an extended leaching test was conducted lasting 112 days (Qa[3], 2021c). The ratio of exposed surface and volume of seawater used in the test corresponded to the ratio in the GEP. No mercury was detected in the seawater after 112 days. The detection limit of mercury was 0.2 µg/L, and no mercury was detected above the detection limit during the experiment. This is in line with the speciation data for the MerCure treated samples, which show that mercury for the most part remains as stable and insoluble after the treatment. (Qa[3], 2021c).

Based on a mercury removal of >95% (by acid digestion / AAS) (which can be achieved using MerCure treatments, as described above and is assumed a conservative lower limit of removal efficiency), the average concentration of mercury in sediment (mg/kg), as the GEP breakdowns and mercury disperses over the seabed, is determined to be below 0.15 mg Hg/kg (below the ANZECC ISQG-Low value) (NGI, 2021), which is an acceptable level within sediment (refer Section 8.7.5 for further information).

The fate of remaining mercury in the GEP in the marine environment as the GEP breakdowns has been further assessed and described in Section 8.7.

4.7.2 GEP Pigging Overview

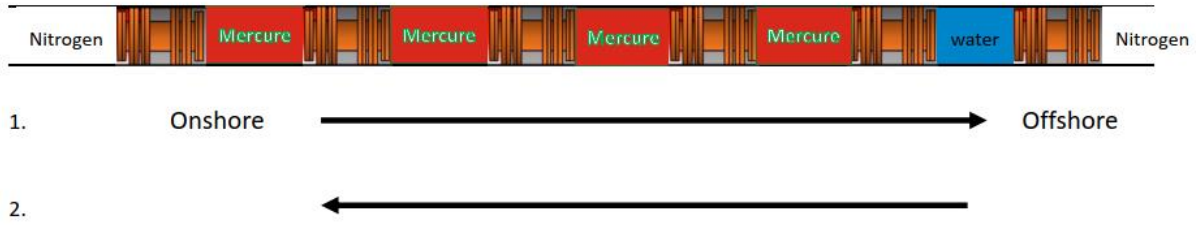
The GEP MerCure pigging methodology to remove mercury has been investigated by Total Hazardous and Integrated Solutions (THIS, 2021). Pig runs to and from the offshore PLEM will utilise Nitrogen to drive the pig train. Based on the laboratory trials (Qa[3], 2021b and Qa[3], 2021c) it was determined that optimum MerCure contact time was 16 hours, therefore the pig train will be driven at approximately 0.35 m/s in both directions, i.e., onshore to offshore, with a 16 hour hold time before being pushed back to onshore (Qa[3], 2021b, Qa[3], 2021c).

It is currently assumed five pigging runs will be required as follows:

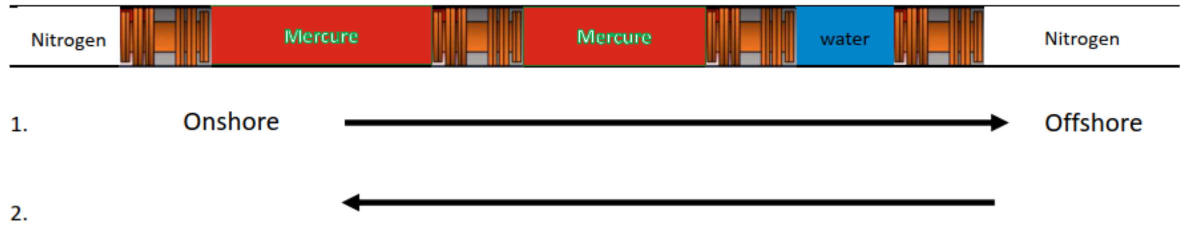
- Run # 1 – Verification to confirm pipeline is piggable – one direction (offshore to onshore) (approximately 2 days)

- Run # 2 – Hydrocarbon cleaning with two chemical pills of HyDex – one direction (offshore to onshore). Hydrocarbon cleaning will aid in the performance of the mercury removal chemical MerCure (approximately 2 days)

- Run #3 – Decontamination – 2 directions (onshore to offshore) – pig train 4-6 pigs with MerCure (10 km long pig train) – pig speed 0.35 m/s – with 16 hr hold time at PLEM before being pushed back (offshore to onshore) with MerCure being collected onshore (approximately 5 days)



- Run #4 –Verification run – two directions – pig train 2 pigs with MerCure (1 km long pig train) – pig speed 0.5 m/s. MerCure shall be captured and analysed onshore to confirm decontamination (approximately 5 days)



- Run #5 – Filling with seawater (approximately 2 days)

Project vessel requirements for this activity are discussed in Section 4.10.

4.7.3 Waste Management

Spent chemicals and contaminated water will be neutralized (where required) and filtered. Spent MerCure will be treated with a reciprocal amount of the neutralization chemical (e.g. Sodium Hydroxide).

The waste neutralization and reduction will be performed onshore in Onslow to minimize transportation requirements. Stabilised chemical waste will be further reduced using a filtration system. This results in all mercury being extracted as a dry-cake sludge and while most of the waste fluid (typically 75-95%) is predicted to be compliant for normal disposal, the highly concentrated sludge will be packaged and transported to a licensed final disposal facility (refer Section 8.8 for further detail).

4.7.4 Mercury Removal Verification

The following will be undertaken to verify that mercury within the GEP has been removed to an acceptable level, as defined in Section 8.7.5:

- Initial mercury levels will be tested at the onshore end of the GEP using a portable X-Ray Fluorescence (pXRF) analyser.
- As the Decontamination Chemical Pill (Run #3) is being received, continual samples of MerCure will be taken. This will be analyzed onsite using both the pXRF analyser and a benchtop Cold Vapour Atomic Absorption Spectrometer (CVAAS) to give an indication of the levels of mercury removed from the GEP as well as other variables but indicative characteristics of the chemical including iron content, pH, saturation limits etc.

- Samples will be similarly taken from the verification run (Run #4) and will be analyzed onsite using both the pXRF analyser and a benchtop CVAAS. If the verification run indicates that no additional mercury is being removed, the maximum removal efficiency has been reached.

The objectives of the sampling of these pills is to quantify the mercury concentration in all samples of MerCure. Using the mercury concentrations measured in all solutions a calculation can be performed to determine the total mass of mercury removed and predict the total mass of mercury remaining in the decontaminated pipeline.

As described above, the chemicals pills will be analyzed onsite using both the pXRF analyser and a benchtop CVAAS.

All mercury determinations will be conducted at an onshore site at the shore end of the GEP due to the rapid absorption and adsorption characteristics of mercury into sample container walls, this ensures sample integrity is maintained and allows for resampling where required. No samples will need to be transported off site for analysis. On site analysis will be performed using a benchtop LECO AMA-254 Combustion Analyser which is capable of analysing all types of mercury and mercury compounds. Samples are thermally combusted inside the unit and broken back down into their elemental form prior to CVAAS analysis.

Once the chemical cleaning process is complete, a sample/coupon of the cleaned GEP will be recovered from the PLEM end of the GEP for pXRF and destructive testing (acid digestion) to determine the mercury is removed to an acceptable level (as defined in Section 8.7.5). Testing of this GEP sample will be undertaken by acid digestion / AAS method to determine mercury in whole steel.

pXRF Analysis and Correlation to Mercury in Whole Steel

Through the work carried out during the mercury trials (Qa^3, 2021a, Qa^3, 2021b, Qa^3, 2021c), a correlation between the pXRF surface measurements and the more definitive acid digestion/ AAS measurements has been developed. It has been demonstrated that, when used to obtain comparative measurements before and after decontamination regimens, pXRF provides an accurate measurement of mercury removal efficiency that is comparable with the data obtained from absolute measurement of mercury in the whole steel by acid digestion/ AAS (Qa^3, 2021b).

Taking into account the pipe thickness, from the total mercury concentration (by acid digestion / AAS) and the pXRF surface measurement, a mercury penetration depth has been calculated. The average mercury penetration (scale) depth was found to be 18 µm. By applying this average depth, to the pXRF surface measurement the total mercury can be quantified, and hence pXRF can be employed as an easy-to-use field technique for semi-quantification of average total mercury in whole steel terms.

The efficacy of MerCure as a decontamination solution was also monitored by pXRF surface mercury determinations during the trials. Good agreement in the rate of mercury removal by both digestion / AAS and pXRF surface measurements was observed, which also strengthens the suitability of pXRF to evaluate the percentage of mercury removed, showing good agreement with the data obtained by acid digestion AAS (Figure 4-6) (Qa^3, 2021b).

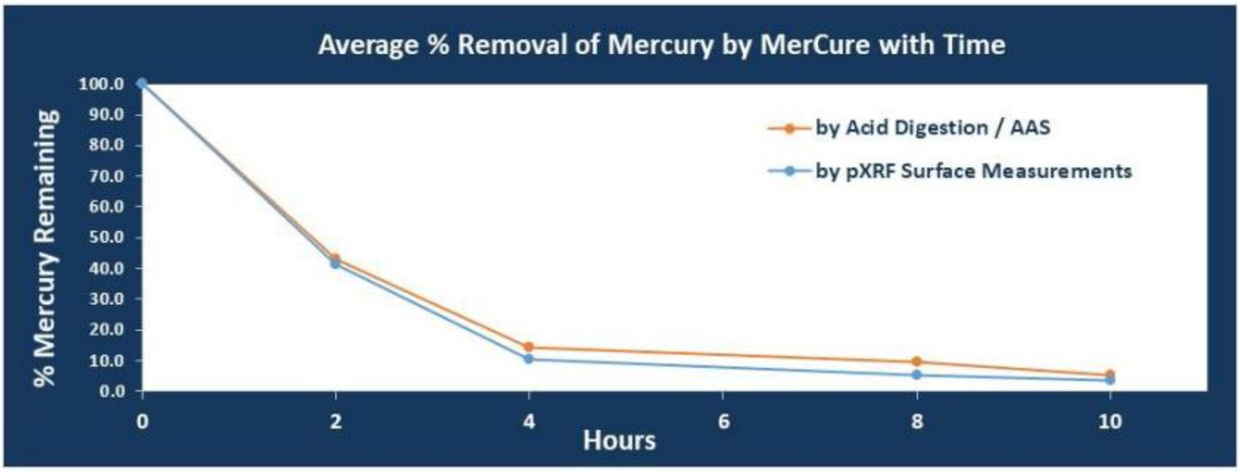


Figure 4-6: Mercury removal with increasing MerCure treatment time – pXRF and acid digestion / AAS (Qa^3, 2021b)

4.8 GEP Full Removal – Contingency Option

A contingency full removal option has been included in this EP, as BHP continue to plan for full removal in the event that an acceptable level of mercury decontamination has not been achieved (refer to Section 8.7.5 for acceptability criteria)..

There have been two methods identified for the removal of the GEP from Commonwealth waters. These consist of subsea cut and recovery and reverse S-lay.

The subsea cut and recovery method involves exposing the GEP subsea (via seabed excavation or lifting) and cutting it into single-lift sections which are then recovered directly to a CSV (construction support vessel)/barge. This technique is time-intensive and requires a significant number of lifts and cuts to recover the 27km section of GEP.

The s-lay method requires the use of a purpose-built pipelay vessel. This method involves recovering one end of the GEP into a tensioning spread onboard the vessel, pulling the GEP onto the deck, then cutting the GEP into manageable sections as the vessel travels along the lay path. S-lay recovery is more time effective method that the cut and recover approach. However, the feasibility of this method dependents on the condition of the concrete coating and the steel. At this stage it is not clear that this method is feasible, this can only be determined following recovery and testing of a section of the pipeline to confirm concrete integrity can withstand the tensioner loads.

The information required to determine if the s-lay method can be used will not available until after the mercury cleaning and decontaminations pigging scope (Section 4.7) has been completed. Hence, the subsea cut and recovery option is the default method.

4.8.1 Subsea Cutting and Recovery

The cut and recover methodology for the removal of the GEP from Commonwealth waters is presented in the table below. The final detail of sequence and removal activities will be confirmed by the selected GEP removal contractor. A detailed reverse s-lay timeframe is not presented, however the GEP removal activity in Commonwealth waters is anticipated to take 70 days to complete.

Initial status and exclusions are as follows:

- PLEM has been recovered under the Griffin Decommissioning and Field Management EP (GV-HSE-E-0014) and the GEP is ready for removal.
- CSV/barge has been mobilised to site, ready to commence removal activities.

Table 4-8: Indicative GEP Removal Method (subsea cut and recovery) and Durations

Step	Duration (hrs)	Discharges during removal
Conduct pre-recovery ROV survey from PLEM disconnection to KP35. ROV to take fixes at cutting intervals (~36m). **Note: 36m segments are a conservative estimation, larger lengths may be achievable depending on allocated vessel.**	12	N/A
Expose pipe for cutting and grabbing activities. **Note: This may be done using dredging/excavation or via a lift and shift of the pipe utilising the vessel crane.**	2	N/A
Complete first cut 30m from PLEM disconnection point. **Note: Cutting method to be confirmed by contractor, methods to consider include shears, HP water jet, or diamond wire saw.**	2	Swarth/concrete coating loss during cutting
Recover pipe segment to CSV/barge deck using pipe lifting frame/grabber and project vessel crane.	1	Concrete coating loss during recovery
Repeat cutting and recovery for remaining sections of pipe.	36m sections (~750 cuts) = 156.5days 48m section (~563 cuts) = 117.3days	Swarth/concrete coating loss during cutting and recovery

Step	Duration (hrs)	Discharges during removal
Removal of rock bolts (three within Commonwealth waters) (to be completed in conjunction with GEP recovery) via cutting of saddles.	6	N/A
Total duration	**140 – 170 days**	-

4.9 As-left Survey

Post GEP mercury decontamination (refer Section 4.7) and at the completion of all subsea works including removal of the z-spool and a section of the GEP not exposed to the MerCure, a final as-left survey will be performed along the entire length of the GEP, to determine:

- final position of the GEP
- burial status and depths
- location, length and height of freespans
- location and general physical condition of pipeline anchors
- general physical condition of GEP
- evidence of adjacent seabed disturbance
- evidence of debris or foreign objects
- evidence of anchor scars or other third-party interference
- marine growth coverage, type and thickness.

High resolution SSS will be used to acquire the as-left survey data. The survey will be planned to obtain optimum representation of the completed GEP scope. In addition, sediment samples at the PLEM end of the GEP will be acquired to assess sediment quality.

In the event the contingency removal of the GEP occurs, the as-left survey will comprise of:

- ROV seabed inspection
- SSS
- sediment sampling to assess sediment quality.

4.10 Project Vessel Types

The vessels that will be required to perform the petroleum activity are:

- general support / supply vessel
- support vessel / installation vessel
- construction support vessel (CSV) (contingency removal of the GEP, cut and removal method)
- pipelay vessel (contingency removal of the GEP, reverse s-lay method)

Vessel specifications for the above are provided in Table 4-9. Vessels detailed above have been referenced as ‘project vessels’ throughout the EP.

Typically, a maximum of two vessels (an installation vessel and a general support vessel) will be in the operational area at the PLEM location at any one time during mercury removal activities for a period of approximately 2 to 4 months. The installation vessel will be in the operational area and the general support vessel will be transporting equipment to and from the installation vessel. Typically, only one general support vessel will be performing the as-left survey in the operational area for a period of approximately 2 to 4 weeks. Typically, a maximum of two vessels (CSV or pipelay and a support vessel) will be in the operational area for the GEP removal activities for a period of up to 170 days for a cut a recover method and 2 months for a s-lay recovery method.

General support vessels may be used to transport equipment and materials between the operational area and port during the activities.

A variety of materials are routinely bulk transferred from general support vessels, including equipment, fluids or chemicals and waste, as required. Loading and back-loading to general support vessels from other project vessels is performed using cranes to lift materials.

All project vessels will be commercial vessels with a suitable survey class for the activities they are performing. The vessels will run on marine diesel oil (MDO); no intermediate or heavy fuel oils will be used.

Table 4-9: Typical Vessel Specifications for Project Vessels

Parameter	General support / supply vessels	Installation vessel / CSV	Pipelay vessel
Draft (max) (m)	6 to 8	8 to 9	8 to 9
Length (m)	75 to 100 m	110 to 130 m	110 to 130 m
Berths (persons)	100	130	130
Gross tonnage (Gt)	3000	5000	5000
Fuel type	Marine diesel oil	Marine diesel oil	Marine diesel oil
Total fuel volume (m^3)	2000	3000	3000
Volume of largest fuel tank (m^3)	250	1000	1000

4.10.1 Vessel Operations

The project vessels will be subject to BHP's Marine Management Procedure. All required audits and inspections will assess compliance with the laws of the international shipping industry, which include safety and environmental management requirements, and maritime legislation including International Convention for the Prevention of Pollution from Ships 1973 as modified by the Protocol of 1987 (MARPOL) and other International Maritime Organisation (IMO) standards.

The project vessels will display navigational lighting and external lighting, as required for safe operations. Lighting levels will be determined primarily by operational safety and navigational requirements under relevant legislation, specifically the *Navigation Act 2012*. The vessels will be lit to maintain operational safety on a 24-hour basis.

Operational discharge streams from project vessels include:

- deck drainage
- putrescible waste and sewage/grey water
- oily water
- cooling water
- desalination plant effluent (brine) and backwash water discharge
- ballast water.

Further details about the above discharge streams from project vessels are included in Section 8.5.

4.10.2 Refuelling

Fuel transfers that may occur within the operational area include refuelling of cranes, helicopters or other equipment as required. Vessel refuelling and bunkering at sea will occur during the mercury removal activities.

4.10.3 Dynamic Positioning

The project vessels will not anchor in the operational area, instead using dynamic positioning (DP) to maintain position. DP uses satellite navigation and radio transponders in conjunction with thrusters to maintain the position.

4.10.4 Helicopters

Whilst unlikely, crew changes may be performed using helicopters during the petroleum activities, on an required basis. Helicopter operations within the operational area are limited to take-off and landing on the helideck. Crew changes are not required during the as-left survey.

4.11 Chemical Assessment Process

Chemicals will be used operationally for:

- Mercury removal of GEP (MerCure)
- Hydrocarbon cleaning of GEP (HyDex).

BHP has adopted a risk-based approach for selecting chemicals with the least potential for environmental impacts. Where a product may be discharged to the environment, an environmental assessment is completed before the product is approved for use. BHP APU Hazardous Materials Acquisition Environmental Supplement Procedure (AO-HSE S-0002) details the chemical selection procedures to be followed. The assessment must be demonstrated through completing the New Material Request and Approval Form. The assessment includes a review of the product's ecotoxicity, biodegradation and bioaccumulation.

Central to the chemical selection process is the use of the Offshore Chemical Notification Scheme (OCNS). The OCNS conducts hazard assessments on chemical products, and lists and ranks all chemicals used in exploration, exploitation and associated offshore processing of petroleum on the United Kingdom Continental Shelf. The OCNS promotes the substitution of hazardous substances by less hazardous, or preferably, non-hazardous alternatives.

The chemical hazard and risk management (CHARM) model calculates the ratio of Predicted Effect Concentration against No Effect Concentration (PEC:NEC). This is expressed as a hazard quotient, which is then used to rank the product. Data used in the CHARM assessment includes ecotoxicity, biodegradation and bioaccumulation. Using the CHARM model, chemicals ranked Gold have the lowest environmental hazard, followed by the Silver ranking. Products not applicable to the CHARM model (in other words, inorganic substances, hydraulic fluids or chemicals used only in pipelines) are assigned an OCNS grouping, A to E. Group A includes products considered to have the greatest potential environmental hazard and Group E the least.

Preference in the chemical selection process will be given to CHARM products that are listed as Silver and Gold category chemicals, or D or E, on the OCNS Definitive Ranked List of Approved Products, which indicates the lowest potential for environmental hazard. If chemicals are not rated on the OCNS list, but there is a technical justification, a chemical selection environmental assessment process will be conducted to determine if the impacts and risks are ALARP and acceptable.

Chemicals fall into the following assessment types:

- no further assessment:
- further assessment and technical justification

Chemicals that require no further assessment will be automatically approved for use. These chemicals are:

- with reference to the United Kingdom's OCNS CHARM Model Algorithm Definitive Ranked List of Approved Products, chemicals with a hazard quotient of Gold or Silver or Group E or D (CEFAS, 2017)
- substances listed on the Oslo and Paris Commission for the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) List of Substances Used and Discharged Offshore, which are considered to Pose Little or No Risk to the Environment (PLONOR).

Chemicals that require further assessment and technical justification before approval for use are:

- those with substitution warnings under the OCNS system
- products where the OCNS rating is not available.

Where further assessment is required, available ecotoxicity, biodegradability and bioaccumulation information will be reviewed. Chemicals will be approved if they fall within the following toxicity criteria and at least one other criterion can be determined:

- low or very low toxicity (LC50/EC50 >100 to >1000 mg/L)
- biodegradability of >20%
- non-bioaccumulative to Log PoW <3.

Chemicals that do not meet the above criteria may only be approved for use after sufficient economic, safety and operational justification.

5 Description of Environment

The purpose of this section is to address the requirements of Regulation 13(2) and 13(3) of the Environment Regulations through describing the existing environment, including values and sensitivities that may be affected by both planned activities and unplanned events.

The description of the environment applies to two spatial areas:

- the operational area – the area where planned activities will occur and includes the area encompassing a 1,500 m radius around the GEP.
- the wider EMBA. This is the environment that may be affected by the worst-case hydrocarbon spill scenario identified as relevant to the activity (Figure 5-1).

The information contained in this section has been used to inform the evaluation and assessment of the environmental impacts and risks presented in Section 8 and 9. The level of detail is appropriate to the nature and scale of the impacts and risks to the particular values and sensitivities.

A detailed and comprehensive description of the environment in the operational area and EMBA is provided in Appendix D.

5.1 Determination of the Environment that May Be Affected

Stochastic hydrocarbon dispersion and fate modelling (described in Section 9.1), has been performed on the worst-case hydrocarbon release, which was determined to be a 1,000 m^3 marine diesel oil (MDO) release as a result of a vessel collision (described in Section 9.2). The results have been used to inform the EMBA. The EMBA (Figure 5-1) encompasses the outer most boundary of the worst-case spatial extent of four hydrocarbon phases (refer Table 5-1). The exposure threshold values used to define the EMBA are presented in Table 5-1 and have been justified in Section 9.1.2.

Table 5-1: Hydrocarbon Components and EMBA Exposure Thresholds

Hydrocarbon components	EMBA exposure value
Surface hydrocarbons	1 g/m^2
Shoreline hydrocarbons	10 g/m^2
Entrained hydrocarbons	100 ppb
Dissolved aromatic hydrocarbons	50 ppb

Hydrocarbon contact below the defined thresholds may occur outside the EMBA; however, the effects of these low exposure values will be limited to temporary exceedance of water quality triggers.

The EMBA presented does not represent the predicted coverage of any one hydrocarbon spill or a depiction of a slick or plume at any particular point in time. Rather, the area is a composite of a large number of theoretical paths, integrated over the full duration of multiple spill simulations under various metocean conditions.

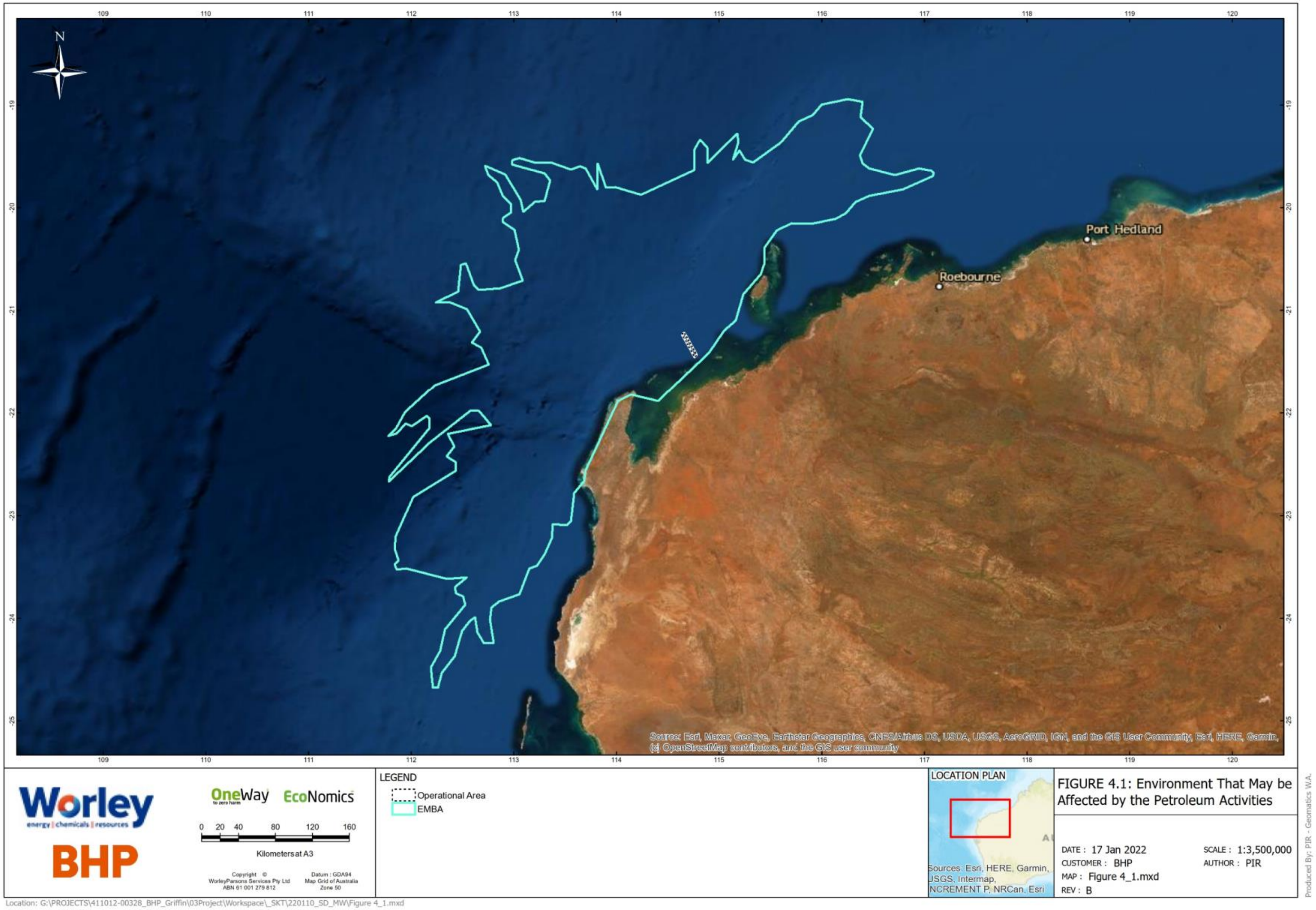


Figure 5-1: Environment that May Be Affected by the Petroleum Activity

5.2 Particular Relevant Values and Sensitivities of the Environment

Regulation 13(2) of the Environment Regulations states that "the environment plan must:

13(2)(a) Describe the existing environment that may be affected by the activity; and

13(2)(b) Include details of the particular relevant values and sensitivities (if any) of that environment".

Regulation 13(3) of the OPGGS (E) Regulations states that "Without limiting paragraph 13(2)(b), particular relevant values and sensitivities may include any of the following:

13(3)(f) Any values and sensitivities that exist in, or in relation to, part or all of:

(i) A Commonwealth marine area within the meaning of that Act; or

(ii) Commonwealth land within the meaning of that Act".

This section summarises environmental values and sensitivities, including physical, biological, socio-economic and cultural features in the marine and coastal environment that are relevant to the operational area and the EMBA. Searches for matters of national environmental significance (MNES) and other matters protected by the EPBC Act were undertaken for the operational area and the EMBA using the Protected Matters Search Tool (PMST).

A full description of the values and sensitivities relevant to the operational area and EMBA is provided in Appendix D, along with the PMST Search Reports.

5.2.1 Bioregions

The operational area is located approximately 45 km North-West of Onslow, Western Australia and within Commonwealth waters of the Integrated Marine and Coastal Regionalisation of Australia (IMCRA) Northwest Shelf Marine Provincial Bioregion.

The EMBA overlaps the following IMCRA Provincial Bioregions:

- Northwest Shelf Province
- Northwest Province
- Northwest Transition
- Central Western Transition
- Central Western Shelf Transition
- Central Western Shelf Province

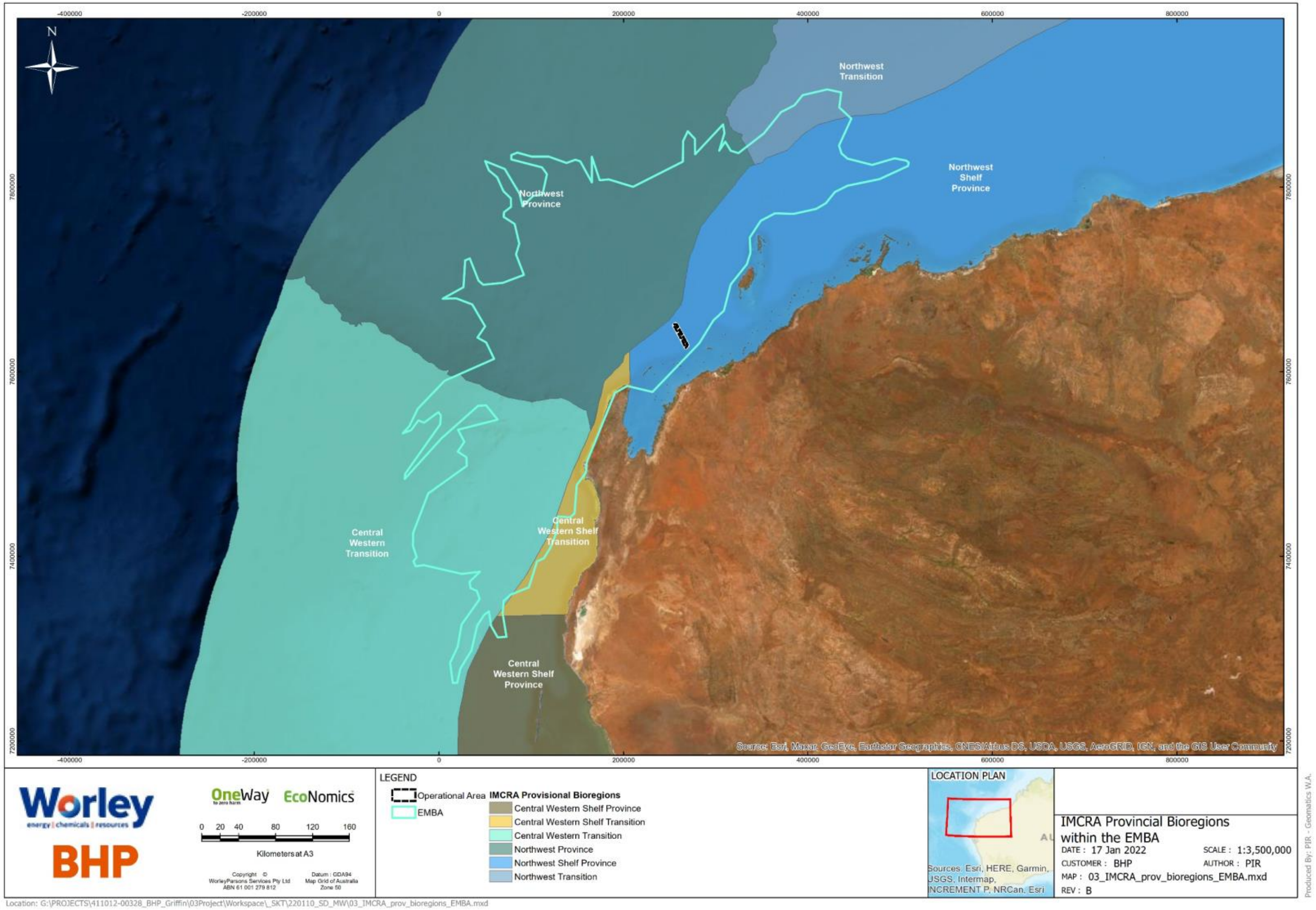


Figure 5-2: IMCRA 4.0 Provincial Bioregions in Relation to the Operational Area and EMBA

5.2.2 Matters of National Environmental Significance (EPBC Act)

Table 5-2 and Table 5-3 summarise the MNES identified as potentially occurring within the operational area and EMBA, respectively, as determined by the PMST results (Appendix D).

Additional information on identified MNES are provided throughout this Section and in Appendix D, Section 2.4.

Table 5-2: Summary of MNES within the Operational Area

MNES	Number	Relevant Section
World Heritage Properties	0	N/A
National Heritage Places	0	N/A
Wetlands of International Importance (Ramsar)	0	N/A
Marine Parks	0	N/A
Listed Threatened Ecological Communities	0	N/A
Listed Threatened Species[1]	31	Section 5.6.1
Listed Migratory Species[1, 2]	33	Section 5.6.1

Note 1 Terrestrial species (such as terrestrial mammals, reptiles and bird species) that appear in the PMST results of the EMBA and do not have habitats along shorelines are not relevant to the petroleum activity impacts and risks, and have therefore not included in these numbers

Note 2 The EPBC Act categorise migratory and threatened species independently, therefore migratory spp. can also be threatened.

Table 5-3: Summary of MNES within the EMBA

MNES	Number	Relevant Section
World Heritage Properties	1	Section 5.5.2
National Heritage Places	1	Section 5.5.3
Wetlands of International Importance (Ramsar)	0	N/A
Marine Parks	3	Section 5.5.4
Listed Threatened Ecological Communities	0	N/A
Listed Threatened Species[1]	32	Section 5.6.1
Listed Migratory Species[1, 2]	53	Section 5.6.1

Note 1 Terrestrial species (such as terrestrial mammals, reptiles and bird species) that appear in the PMST results of the EMBA and do not have habitats along shorelines are not relevant to the petroleum activity impacts and risks, and have therefore not included in these numbers

Note 2 The EPBC Act categorise migratory and threatened species independently, therefore migratory spp. can also be threatened.

5.3 Griffin Field and GEP Environmental Surveys and Studies

The Griffin field and GEP has been the subject of a number of environmental surveys and research studies to understand the fish assemblages and seabed habitat (Table 5-4). Where relevant these studies have been referenced within this Section and throughout the EP.

Table 5-4: Environmental Surveys and Studies relevant to the GEP

Study / Research	Description
00GA-BHPB-N00-0009 Griffin Field Pre-Abandonment Environmental and ROV Survey (Gardline, 2015)	The survey was conducted within the Griffin field, in water depths between 115 m and 215 m in October 2014. A total of sixteen 0.1 m^2 day grab stations were selected in the field and eight water sampling stations (water quality and profiling). To inform decommissioning, samples were collected to determine the physico-chemical and benthic infaunal characteristics surrounding infrastructure in the Griffin field. Additionally, a remotely operated vehicle (ROV) was deployed for the capture of digital stills and video footage of the subsea infrastructure, to allow for a visual flora and fauna assessment on the structures at seabed. Sediments and waters hydrocarbons and metals were compared to 'background concentrations' in the wider area of the NW Shelf of Australia. In the absence of any background reference data for the region the Australian and New Zealand Environment and Conservation Council (ANZECC), the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) Water Quality Guidelines (ANZECC, 2000) Simpson et al. (2013) Sediment Quality Guidelines (SQG) are referenced to establish trigger value exceedances. Appendix F provides the Griffin Field infrastructure layout and environmental target locations.
00GA-BHPB-S00-0001 DOF Subsea Griffin Field Abandonment Survey Report 2014 (DOF, 2014) PET-GDC20-DR-REP-00008 – Griffin P&A End of Campaign Report 2017 (BHP, 2017a) 00GA-BHPB-T40-0002 – Griffin Field & Export Pipeline 2017 Subsea Survey (BHP, 2017b)	Various environmental and ROV surveys investigating the status of Griffin field Infrastructure and the GEP, includes details on: - Freespans along the GEP - Sediment characteristics along GEP - Geotechnical data along GEP - Marine growth on GEP
00GA-BHPB-R00-0004 Griffin Field Commercial Fisheries Assessment (GHD, 2015)	Provides an assessment of the commercial (state only) and recreational fishing interests that exist in, or in close proximity to, the Griffin field. Anecdotal evidence was obtained from several commercial fishers and recreational (game) fishers in the region to establish presence of commercial fisheries use.
00GA-BHPB-R00-0050 A Comparison of Fish Assemblages associated with the Griffin Pipeline and Adjacent Seafloor (Bond et al, 2017)	Compares fish assemblages on and off the GEP at various water depths. Study used baited remote underwater stereo-video systems (stereo-BRUVs) to assess fish assemblages.
00GA-BHPB-R00-0051 The Ecology of The Griffin Field (UTS Decommissioning Ecology Group, 2020)	Desktop study using images taken from ROV in October 2014 to investigate the biodiversity value of the Griffin field. Specifically to: • determine the biodiversity value of Griffin Field infrastructure and determine how diversity varies with individual structure location and depth. • assess fisheries potential.

5.4 Biological Environment

This sub-section focuses on the biological environment in the operational area. Refer to Appendix D, Section 2.3 for description of the biological environment in the EMBA.

The below sections summarise the results from the various environmental and ROV surveys undertaken along the GEP (DOF, 2014; Gardline, 2015; BHP, 2017b). Whilst stations sampled during the Gardline 2015 survey may be outside of the operational area, they remain relevant for an overview of the sediments along the GEP, given the proximity. Appendix F provides the environmental target locations sampled during the Gardline, 2015 survey.

5.4.1 Sediments

Operational Area – Along GEP

From the Commonwealth / State waters boundary for 3 km seaward the GEP was trenched and has naturally backfilled. Three rock bolts are present at the Commonwealth / State waters boundary. From 3 km onwards, to the PLEM no secondary stabilisation measures were implemented and while previously unburied, the self-burial process has already begun to occur with the observation of freespans and localised GEP lowering into the seabed.

The seabed is dominated by sandy substrates along the GEP. From the Commonwealth / State waters boundary for 3 km the GEP areas of cementation carbonate materials - hard mud exists. Depths >0.8 - 2.15 m below the seabed are dark sands or silty gravely sand. As water depths progress, a thin layer of carbonate sediments (0 – 1 m) exists, which is underlain by a layer of light silty sand. Closer to the PLEM a deep layer (>7 m) of soft carbonate mud is present (BHP, 2017b).

Operational Area – PLEM end of GEP / Griffin Field

<u>Sediment Characteristics</u>

Analysis of particle size across the stations sampled (refer Appendix F) showed heterogeneity in sediment composition in the survey area. Stations GEP and PLEM were described as very poorly sorted medium to very coarse silt under the Wentworth classification of mean grain size.

Stations GEP and PLEM were defined as muddy sand (fines ≥10% of the sample) (Gardline, 2015).

<u>Sediment Organotins, Polychlorinated Biphenyls and Radionuclides</u>

Concentrations of sediment organotins (monobutyltin, dibutyltin and tributyltin [TBT]) were <0.5 ngSn g^{-1} and <1.0 ngSn g^{-1} (TBT) at all stations with the exception of the RTM location, where a TBT concentration of 6.2 ± 1.3 ngSn g^{-1} was above the Sediment Quality Guideline Value (SQGV) as cited in Simpson et al. (2013). TBT was used in marine paints as a biocide to prevent fouling on subsea infrastructure until 2008. The RTM structure was coated in anti-foulant paint, and it was therefore the erosion of this paint which was thought potentially responsible for the elevated concentrations of TBT in the sediments nearby this location. Higher TBT concentration at this location could also have resulted from an historic input from the Griffin Venture vessel, and therefore, this contamination could extend to the sediments within the swing-arc of the vessel and/or a little further. There was no evidence of produced formation water (PFW) discharge contamination in sediment. Concentrations of the remaining sediment radionuclides (including naturally occurring radioactive material; NORM) were low and uniform, with small variations attributed to depth and/or variations in sediment size, and were therefore thought representative of background conditions at all stations (Gardline, 2015).

<u>Sediment Hydrocarbons</u>

Analyses across the survey area showed total recoverable hydrocarbons concentrations to be composed mainly of petroleum hydrocarbons. Concentrations were generally low and representative of the wider area. All TPH concentrations were found below the SQGV of 280 µg g^{-1}. Gas chromatograms revealed all stations, bar Station GR5, to present highly weathered heavy weight petrogenic and biogenic hydrocarbons, with very low traces of 'fresher' hydrocarbons of the same sources. These traces resembled those observed in areas of historic oil and gas activity such as the North Sea (Gardline, 2015).

Concentrations of the PAH acenaphthene at Station RTM (Riser Turret Mooring) and HEX (Heat Exchanger Position) were above the ISQG Low trigger value, while the remainder of the PAHs were below the trigger values at all stations (ANZECC, 2000) and total PAH concentrations were below the SQGV at all stations (Simpson et al., 2013). Overall concentrations of total PAH were found significantly similar at all stations, and were found to increase with proximity to existing drilled wells, indicating a potential impact of the oil and gas activities on the sediment. Concentrations of BTEX were <LoR at all stations and did not indicate monocyclic aromatic hydrocarbon contamination within the sediments in the vicinity of the infrastructure targeted (Gardline, 2015).

<u>Sediment Metals</u>

Concentrations of sediment metals across the survey area were found generally representative of the wider region, with concentrations of all metals below their respective SQGV (Simpson et al., 2013) and apparent effect threshold (AET; Buchman, 2008). Most metals concentrations were correlated to the sediment characteristics and depths across the survey area, and their variability was therefore attributed to the heterogeneous nature of the sediment and varying depth. Barium (Ba) in the sediment was generally low, with concentrations ≤30µg g^{-1} at a number of stations, including reference stations and the RTM location. However, concentrations of Ba reached up to 68.6 ± 8.8 µg g^{-1} at Station HEX and CH1 (Chinook-1 well) and up to 1400.0 ± 340.0 µg g^{-1} at Stations GR3 (Griffin-3 well), GR5 (Griffin-5 well) and SC3 (Scindian-3 well) and were increasing with proximity to existing drilled wells, which indicated potential contamination from drilling fluids in the sediments close to infrastructure (Gardline, 2015).

Mercury concentrations at all stations is ≤ 0.01 µg g-1 (Gardline, 2015).

5.4.2 Benthic Habitats and Infauna

Operational Area

The GEP in Commonwealth waters currently provides hard substrate resulting in the creation of new habitat. Marine growth was observed at a thickness of 50 mm along the GEP and consists of hydroid grass (5-15%) with entrapped sediment and assorted shellfish (barnacles, mussels etc) (10 to 20%).

The presence of benthic and coastal habitats within the operational area and EMBA is summarised in Table 5-5 and a detailed description of these habitats is provided in Appendix D, Section 2.3.

Table 5-5: Benthic and Coastal Habitats Occurring within the Operational Area and EMBA

Value / Sensitivity	Operational Area	EMBA
Benthic Habitats / Receptors		
Soft Sediment	✓	✓
Seagrass Beds	x	✓
Coral Reef Communities	x	✓
Macroalgal Beds	x	✓
Dominant Shoreline Habitats / Receptors		
Rocky Shorelines	x	x
Sandy Beaches	x	✓
Mangroves	x	✓

5.4.3 Fish Assemblages Associated with the Griffin GEP and Adjacent Seafloor

Fish assemblages associated with the Griffin GEP and adjacent seafloor have been studied by Bond et al (2017) using baited remote underwater stereo-video systems (stereo-BRUVs) to assess fish assemblages.

Fish assemblages, both on and off GEP, changed markedly with increasing depth, as did the availability of natural adjacent hard-substrate habitats which became limited in depths >80 m. In depths >80 m (and out to 136 m), the GEP was characterised by the presence of commercially important species and abundances of larger-bodied, commercially important species such as: *P. multidens* (goldband snapper), *Lutjanus malabaricus* (saddletail snapper) and *Lutjanus russelli* (Moses' snapper) among others. Whilst off-pipeline deployments were typified by smaller *Nemipterus spp*. (threadfin breams), and other sand affiliated species (*Saurida undosquamis*) known to characterise these historically heavily trawled grounds.

The most ubiquitous species on and off-pipeline at depth are listed in Table 5-6. Five out of the 10 species occurring on the GEP are commercial species compared to two out of 10 off-pipeline. The most commonly occurring species on the GEP in water depths >80 m was *P. multidens*, an important commercially targeted species in this region.

Table 5-6: The ten most ubiquitous fish species recorded on stereo-BRUVs deployed in depths >80 m, calculated as the percentage of deployments that each species was recorded on. Commercial species are indicated with *

Pipeline		Off-pipeline	
Species	Ubiquity (%)	Species	Ubiquity (%)
*Pristipomoides multidens ** (goldband snapper)	96.30	*Nemipterus spp* (threadfin bream)	85.25
*Argyrops spinifer ** (frypan snapper)	74.07	*Pristipomoides multidens ** (goldband snapper)	63.93
Nemipterus spp (threadfin bream)	51.85	*Decapterus sp1* (scad)	63.93
Seriola dumerili (greater amberjack)	48.15	*Argyrops spinifer ** (frypan snapper)	59.02
*Lutjanus malabaricus ** (saddletail snapper)	44.44	*Lagocephalus lunaris* (lunartail puffer)	49.18
*Lutjanus sebae ** (red emperor)	33.33	*Saurida undosquamis* (brushtooth lizardfish)	40.98
Carcharhinus plumbeus (sandbar shark)	29.63	*Carangoides chrysophrys* (longnose trevally)	39.34
Decapterus sp1 (scad)	29.63	*Netuma thalassina* (giant sea catfish)	31.15
Netuma thalassina (giant sea catfish)	29.63	*Carangoides caeruleopinnatus* (onion trevally)	31.15
*Lutjanus russellii ** (Moses snapper)	29.93	*Terapon jarbua* (crescent grunter)	22.95

The abundance distribution of all commercial species is displayed as a heat map (using latitude and longitude only) in Figure 5-3. Plots suggest a higher abundance of commercial species on the GEP than off. Commercial fish were, on average, larger at greater depth and the commercial value of species on the GEP appears higher than that off-pipeline (Bond et al, 2017).

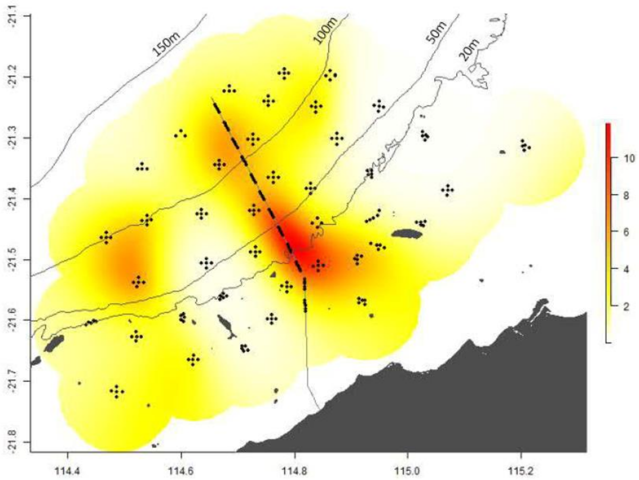


Figure 5-3: Smooth spline fits (GAMs) of the predicted total abundance of commercial species. Colour ramp represents the abundance predicted by latitude and longitude alone

Trap fishers target pipelines and other infrastructure on the North West Shelf (NWS) in depths >80 m to obtain higher catches with great success, although a knowledge gap exists regarding the amount of time commercial fishers allocate to targeting subsea infrastructure (Bond et al. 2017).

One endangered species of shark was observed at water depths >80 m, the scalloped hammerhead shark (*Sphyrna lewini),* which was observed off the pipeline in a depth of 128.2 m (Bond et al., 2017).

5.5 Protected/Significant Areas

5.5.1 Key Ecological Features

Key ecological features (KEFs) are areas of regional importance for either biodiversity or ecosystem function and integrity within the Commonwealth marine environment and have been identified through the marine bioregional planning process.

The presence of KEFs within the operational area and EMBA is summarised in Table 5-7 and a detailed description of these KEFs is provided in Appendix D, Section 2.10.3.

KEFs within the operational area and EMBA are presented in Figure 5-4.

Table 5-7: Key Ecological Features the Operational Area and EMBA

KEF	Operational Area	Distance from Operational Area	EMBA
Ancient coastline at 125 m depth contour	✓	N/A	✓
Continental slope demersal fish communities	x	5 km	✓
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	x	14 km	✓
Commonwealth waters adjacent to Ningaloo Reef	x	59 km	✓
Exmouth Plateau	x	109 km	✓
Glomar Shoals	x	253 km	✓

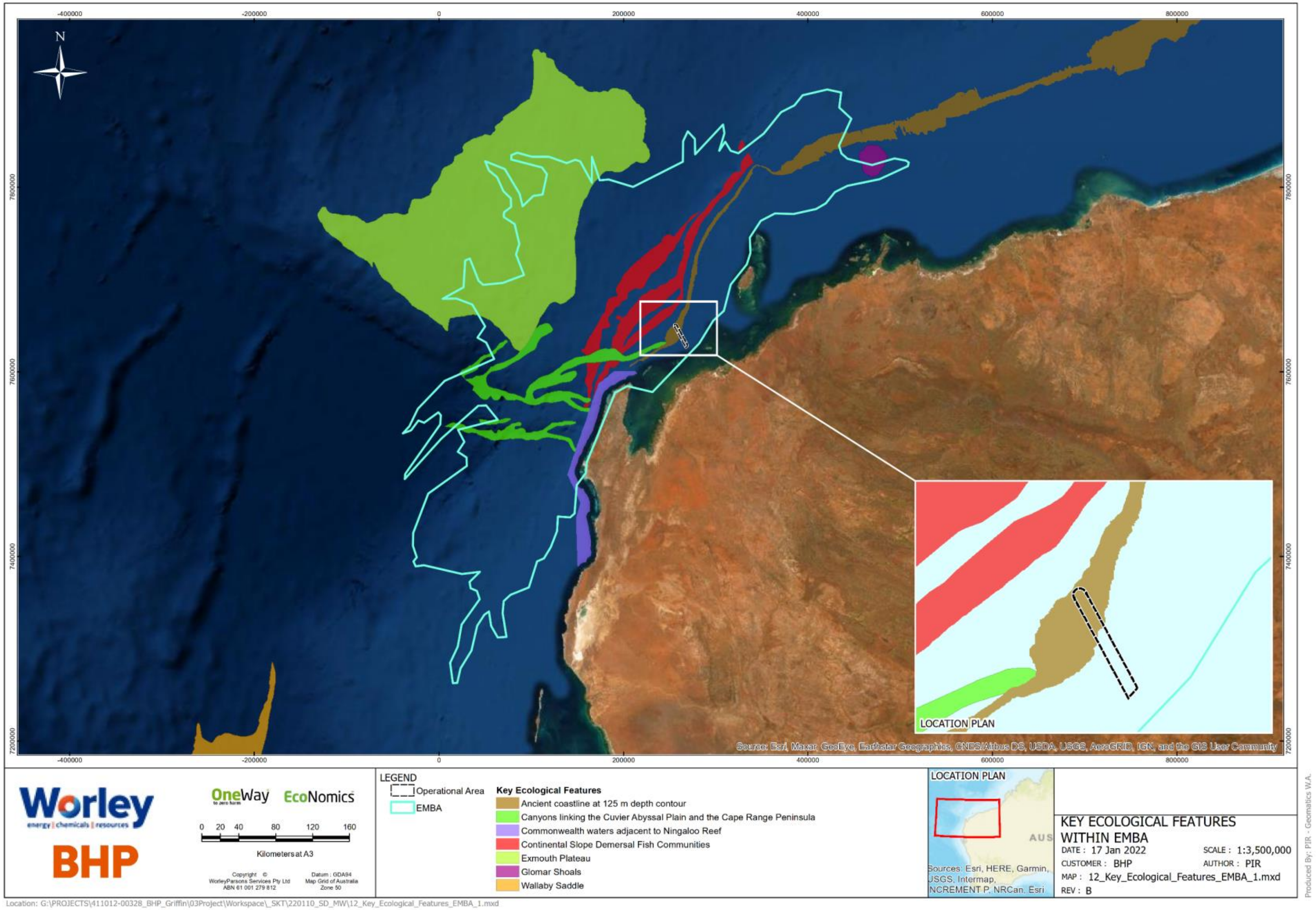


Figure 5-4: Key Ecological Features within the Operational Area and EMBA

5.5.2 World Heritage Properties

World Heritage Properties represent the best examples of the world's cultural and natural heritage. There are no World Heritage Properties within the operational area. The EMBA intercepts the boundary of one World Heritage Property: the Ningaloo Coast (refer Appendix D, Section 2.4.2).

5.5.3 National Heritage Properties

There are 13 National Heritage Places located in WA, of which none are in the operational area. One National Heritage Property lies within the boundaries of the EMBA, the Ningaloo Coast (refer Appendix D, Section 2.4.3).

5.5.4 State and Australian Marine Parks

There are no Australian or State Marine Parks located in the operational area. Three Australian Marine Parks and five State Marine Parks and Marine Management Areas fall within the EMBA (Table 5-8). A detailed description of these Australian and State Marine Parks is provided in Appendix D, Section 2.10.1 and 2.10.2, respectively.

Australian and State Marine Parks within the operational area and EMBA are presented in Figure 5-5.

Table 5-8: Australian and State Marine Parks within the Operational Area and EMBA

Value / Sensitivity	IUCN category* or relevant park zone	Operational Area	Distance from Operational Area	EMBA
Australian Marine Parks				
Gascoyne Marine Park	Habitat Protection Zone (IUCN Category IV) Multiple Use Zone (IUCN Category VI)	x	75 km	✓
Montebello Marine Park	Multiple Use Zone (IUCN Category VI	x	67 km	✓
Ningaloo Marine Park	National Park Zone (IUCN Category II) Recreational Use Zone (IUCN Category IV)	x	60 km	✓
State Marine Parks and Marine Management Areas				
Muiron Islands Marine Management Area	-	x	41 km	✓
Barrow Island Marine Management Area	-	x	64 km	✓
Ningaloo Marine Park	-	x	60 km	✓
Barrow Island Marine Park	-	x	73 km	✓

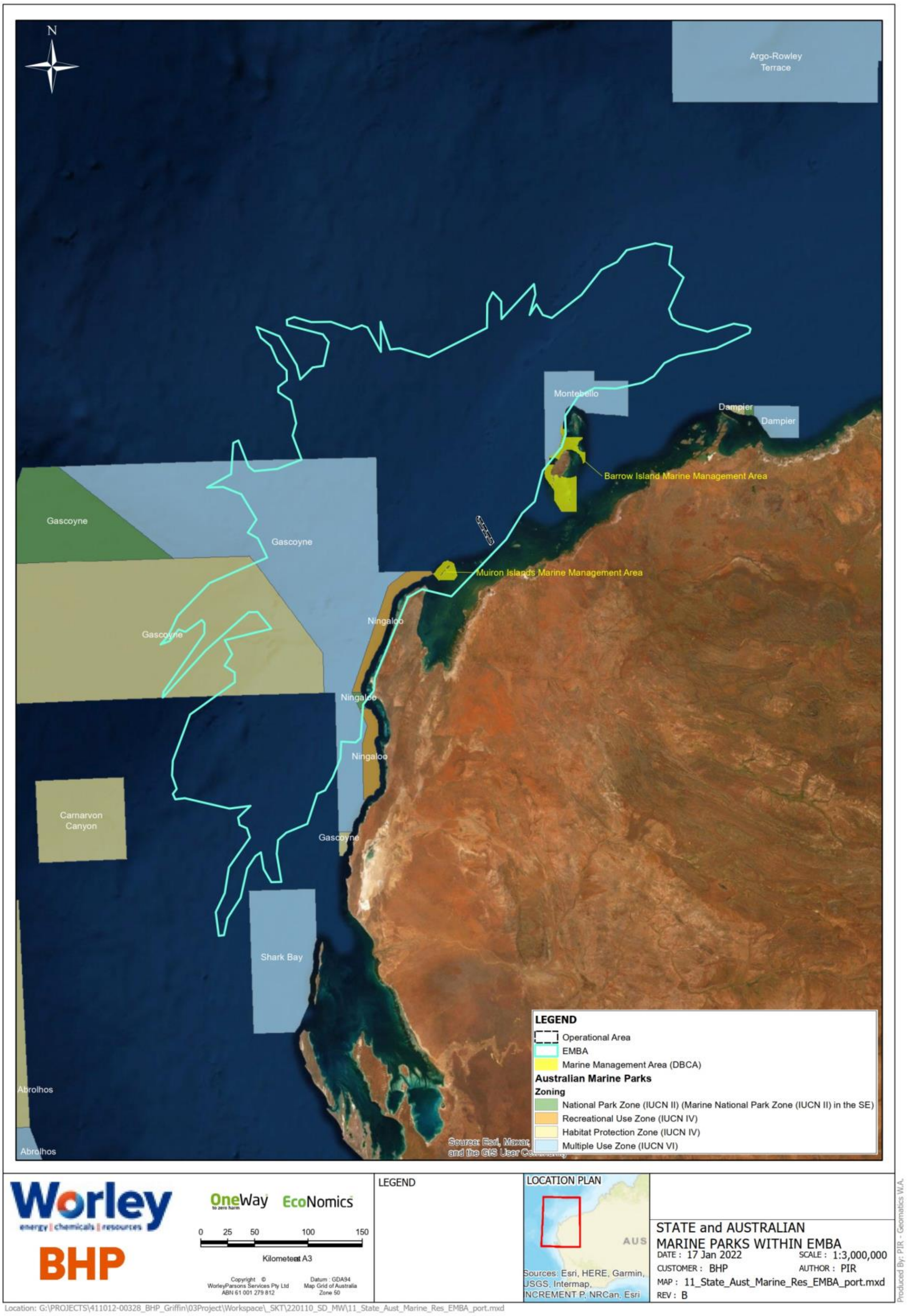


Figure 5-5: Australian and State Marine Parks within the Operational Area and EMBA

5.6 Marine Fauna

5.6.1 Threatened and Migratory Species

Table 5-9 presents the threatened and migratory species within the operational area and the EMBA. These include all relevant MNES protected under the EPBC Act, as identified in the PMST search for the operational area and EMBA (PMST search results are provided in Appendix D, Attachment 1). For each species identified, the extent of likely presence is noted.

The PMST results identified 31 marine fauna species listed as `threatened' species and 33 marine fauna species listed as `migratory' within the operational area. Within the EMBA the PMST results identified 32 marine fauna species listed as `threatened' species and 53 marine fauna species listed as `migratory'. Terrestrial species (such as terrestrial mammals, reptiles and bird species) that appear in the PMST results of the EMBA and do not have habitats along shorelines are not relevant to the petroleum activity impacts and risks and have therefore been excluded from Table 5-9.

A description of the identified threatened and migratory species is included in Appendix D, Section 2.6 – 2.9.

Species with designated biologically important areas (BIAs) and Habitat Critical to their Survival (Habitat Critical) overlapping the EMBA and operational area have been identified in Section 5.6.2.

Table 5-9: Threatened and Migratory Species Predicted to Occur within the Operational Area and EMBA

Value/Sensitivity		Threatened Status	Migratory Status	Operational area presence	Sensitivities within operational area	EMBA presence	Sensitivities within EMBA
Common Name	Scientific Name						
Fish, sharks and rays							
Grey nurse shark (west coast population)	*Carcharias taurus*	Vulnerable	-	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area
White shark	*Carcharodon carcharias*	Vulnerable	Migratory	✓	Species or species habitat may occur within area	✓	Species or species habitat known to occur within area
Dwarf sawfish	*Pristis clavata*	Vulnerable	Migratory	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area
Green sawfish	*Pristis zijsron*	Vulnerable	Migratory	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area
Whale shark	*Rhincodon typus*	Vulnerable	Migratory	✓	Foraging, feeding or related behaviour known to occur within area	✓	Foraging, feeding or related behaviour known to occur
Scalloped Hammerhead	*Sphyrna lewini*	Conservation Dependent	-	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area
Southern Bluefin Tuna	*Thunnus maccoyii*	Conservation Dependent	-	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area
Narrow sawfish	*Anoxypristis cuspidata*	-	Migratory	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area
Shortfin mako	*Isurus oxyrinchus*	-	Migratory	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area
Longfin mako	*Isurus paucus*	-	Migratory	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area

Value/Sensitivity		Threatened Status	Migratory Status	Operational area presence	Sensitivities within operational area	EMBA presence	Sensitivities within EMBA
Common Name	Scientific Name						
Giant manta ray	*Manta birostris*	-	Migratory	✓	Species or species habitat likely to occur within area	✓	Species or habitat known to occur to occur within area
Reef manta ray	*Manta alfredi*	-	Migratory	✓	Species or habitat known to occur to occur within area	✓	Species or habitat known to occur to occur within area
Oceanic whitetip shark	*Carcharhinus longimanus*	-	Migratory	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area
Porbeagle, mackerel shark	*Lamna nasus*	-	Migratory	-	-	✓	Species or species habitat may occur within area
Southern dogfish	*Centrophorus zeehaani*	Conservation Dependent	-		-	✓	Species or species habitat likely to occur within area
Marine Mammals							
Sei whale	*Balaenoptera borealis*	Vulnerable	Migratory	✓	Species or species habitat likely occur within area	✓	Foraging, feeding or related behaviour likely to occur within area
Blue whale	*Balaenoptera musculus*	Endangered	Migratory	✓	Species or species habitat likely to occur within area	✓	Migration route known to occur within area
Fin whale	*Balaenoptera physalus*	Vulnerable	Migratory	✓	Species or species habitat likely to occur within area	✓	Foraging, feeding or related behaviour likely to occur within area
Southern right whale	*Eubalaena australis*	Endangered	Migratory	✓	Species or species habitat may occur within area	✓	Species or species habitat likely to occur within area
Humpback whale	*Megaptera novaeangliae*	Vulnerable	Migratory	✓	Breeding known to occur within area	✓	Breeding known to occur within area

Value/Sensitivity		Threatened Status	Migratory Status	Operational area presence	Sensitivities within operational area	EMBA presence	Sensitivities within EMBA
Common Name	**Scientific Name**						
Sperm whale	*Physeter macrocephalus*	-	Migratory	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area
Killer whale	*Orcinus orca*	-	Migratory	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area
Spotted bottlenose dolphin	*Turdiops aduncus*	-	Migratory	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area
Bryde's whale	*Balaenoptera edeni*	-	Migratory	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely occur within area
Australian Humpback Dolphin	*Sousa sahulensis as Sousa chinensis*	-	Migratory	✓	Species or species habitat may occur within area	✓	Species or species habitat likely occur within area
Dugong	*Dugong dugong*	-	Migratory	✓	Species or species habitat likely to occur within area	✓	Breeding known to occur within area
Antarctic minke whale	*Balaenoptera bonaerensis*	-	Migratory	-	-	✓	Species or species habitat likely occur within area
Indo-Pacific humpback dolphin	*Sousa chinensis*	-	Migratory	-	-	✓	Species or habitat known to occur within area
Marine Reptiles							
Loggerhead turtle	*Caretta caretta*	Endangered	Migratory	✓	Species or species habitat known to occur within area	✓	Breeding known to occur within area
Green turtle	*Chelonia mydas*	Vulnerable	Migratory	✓	Species or species habitat known to occur within area	✓	Breeding known to occur within area

Value/Sensitivity		Threatened Status	Migratory Status	Operational area presence	Sensitivities within operational area	EMBA presence	Sensitivities within EMBA
Common Name	**Scientific Name**						
Leatherback turtle	*Dermochelys coriacea*	Endangered	Migratory	✓	Species or species habitat likely to occur within area	✓	Species or species habitat known to occur within area
Hawksbill turtle	*Eretmochelys imbricata*	Vulnerable	Migratory	✓	Species or species habitat known to occur within area	✓	Breeding known to occur within area
Flatback turtle	*Natator depressus*	Vulnerable	Migratory	✓	Congregation or aggregation known to occur within area	✓	Breeding known to occur within area
Short-nosed seasnake	*Aipysurus apraefrontalis*	Critically Endangered	-	-	-	✓	Species or habitat known to occur within area
Leaf-scaled seasnake	*Aipysurus foliosquama*	Critically Endangered	-	-	-	✓	Species or habitat known to occur within area
Marine Birds							
Red knot	*Calidris canutus*	Endangered	Migratory	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area
Curlew sandpiper	*Calidris ferruginea*	Critically Endangered	Migratory	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area
Southern giant petrel	*Macronectes giganteus*	Endangered	Migratory	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area
Eastern curlew	*Numenius madagascariensis*	Critically Endangered	Migratory	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area
Australian fairy tern	*Sternula nereis nereis*	Vulnerable	-	✓	Breeding known to occur within area	✓	Breeding known to occur within area
Indian Yellow-nosed Albatross	*Thalassarche carteri*	Vulnerable	Migratory	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area

Value/Sensitivity		Threatened Status	Migratory Status	Operational area presence	Sensitivities within operational area	EMBA presence	Sensitivities within EMBA
Common Name	Scientific Name						
Streaked shearwater	*Calonectris leucomelas*	-	Migratory	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area
Lesser frigatebird	*Fregata ariel*	-	Migratory	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area
Fairy Tern	*Sterna nereis*	-	Migratory	✓	Breeding known to occur within area	✓	Breeding known to occur within area
Lesser Crested Tern	*Thalasseus bengalensis*	-	Migratory	✓	Breeding known to occur within area	✓	Breeding known to occur within area
Northern Siberian Bar-tailed Godwit	*Limosa lapponica menzbieri*	Critically Endangered	-	-	-	✓	Species or species habitat known to occur within area
Christmas Island White-tailed Tropicbird	*Phaethon lepturus fulvus*	Endangered	-	-	-	✓	Species or species habitat may occur within area
Common noddy	*Anous stolidus*	-	Migratory	-	-	✓	Species or species habitat likely to occur within area
Flesh-footed shearwater	*Ardenna carneipes*	-	Migratory	-	-	✓	Species or species habitat likely to occur within area
Wedge-tailed shearwater	*Puffinus pacificus*	-	Migratory	-	-	✓	Breeding known to occur within area
Great frigatebird	*Fregata minor*	-	Migratory	-	-	✓	Species or species habitat may occur within area
Caspian tern	*Hydroprogne caspia*	-	Migratory	-	-	✓	Breeding known to occur within area
Roseate tern	*Sterna dougallii*	-	Migratory	-	-	✓	Breeding known to occur within area
Sooty Tern	*Sterna fuscata*	-	Migratory	-	-	✓	Breeding known to occur within area

Value/Sensitivity		Threatened Status	Migratory Status	Operational area presence	Sensitivities within operational area	EMBA presence	Sensitivities within EMBA
Common Name	Scientific Name						
Shy albatross	*Thalassarche cauta*	Endangered	Migratory	-	-	✓	Species or species habitat may occur within area
Campbell albatross	*Thalassarche impavida*	Vulnerable	Migratory	-	-	✓	Species or species habitat may occur within area
Black-browed albatross	*Thalassarche melanophris*	Vulnerable	Migratory	-	-	✓	Species or species habitat may occur within area
White-capped albatross	*Thalassarche cauta steadi*	Vulnerable	Migratory	-	-	✓	Species or species habitat may occur within area
Common sandpiper	*Actitis hypoleucos*	-	Migratory	-	-	✓	Species or species habitat known to occur within area
Sharp-tailed sandpiper	*Calidris acuminata*	-	Migratory	-	-	✓	Species or species habitat known to occur within area
Common Greenshank	*Tringa nebularia*	-	Migratory	-	-	✓	Species or species habitat likely to occur within area

5.6.2 Biologically Important Areas and Critical Habitats

Biologically important areas (BIAs) are those locations where aggregations of members of a species are known to undertake biologically important behaviours, such as breeding, resting, foraging or migration (DAWE, 2021). BIAs have been identified using expert scientific knowledge about species abundance, distribution and behaviours (DoEE, 2017).

Relevant BIAs and Critical Habitat areas identified within the operational area and EMBA are presented in Table 5-10 and Table 5-11 respectively.

Figure 5-6 to Figure 5-13 show the spatial overlap with relevant BIAs and Habitat Critical areas and the operational area and EMBA.

Table 5-10: Biologically Important Areas within the operational area and EMBA

Value / Sensitivity	BIA Type	Operational Area	EMBA	Closest distance to Operational Area
Marine Mammals				
Humpback whales	Migration	✓	✓	-
	Resting	x	✓	60 km
Pygmy blue whales	Distribution	✓	✓	-
	Migration	x	✓	94 km
	Foraging	x	✓	24 km
Dugong	Foraging including high density seagrass beds, breeding, nursing, calving	x	✓	65 km
Fish, Sharks and Rays				
Whale sharks	Foraging (high density prey)	x	✓	86 m
	Foraging	✓	✓	-
Marine Turtles				
Flatback turtle	Internesting buffer	✓	✓	-
	Nesting	x	✓	55 km
Green turtles	Internesting buffer	x	✓	23 km
	Nesting	x	✓	55 km
	Foraging	x	✓	65 km
Hawksbill turtles	Internesting buffer	✓	✓	-
	Nesting	x	✓	55 km
	Foraging	x	✓	65 km
Loggerhead turtles	Internesting buffer	x	✓	23 km
	Nesting	x	✓	55 km
Birds				
Wedge-tailed shearwater	Breeding	✓	✓	-
Lesser crested tern [1]	Breeding	✓	✓	-
Australian fairy tern	Breeding	x	✓	7 km
Roseate tern	Breeding	x	✓	21 km

Note 1. The lesser crested tern is not listed as threatened or migratory under the EPBC Act

Table 5-11: Habitat Critical areas within the operational area and EMBA

Value / Sensitivity	Operational Area	EMBA	Closest distance to Operational Area
Flatback turtle	✓ (internesting)	✓	-
Hawksbill turtles	✓ (internesting)	✓	-
Green turtles	✓ (internesting)	✓	-
Loggerhead turtles	x	✓	65 km

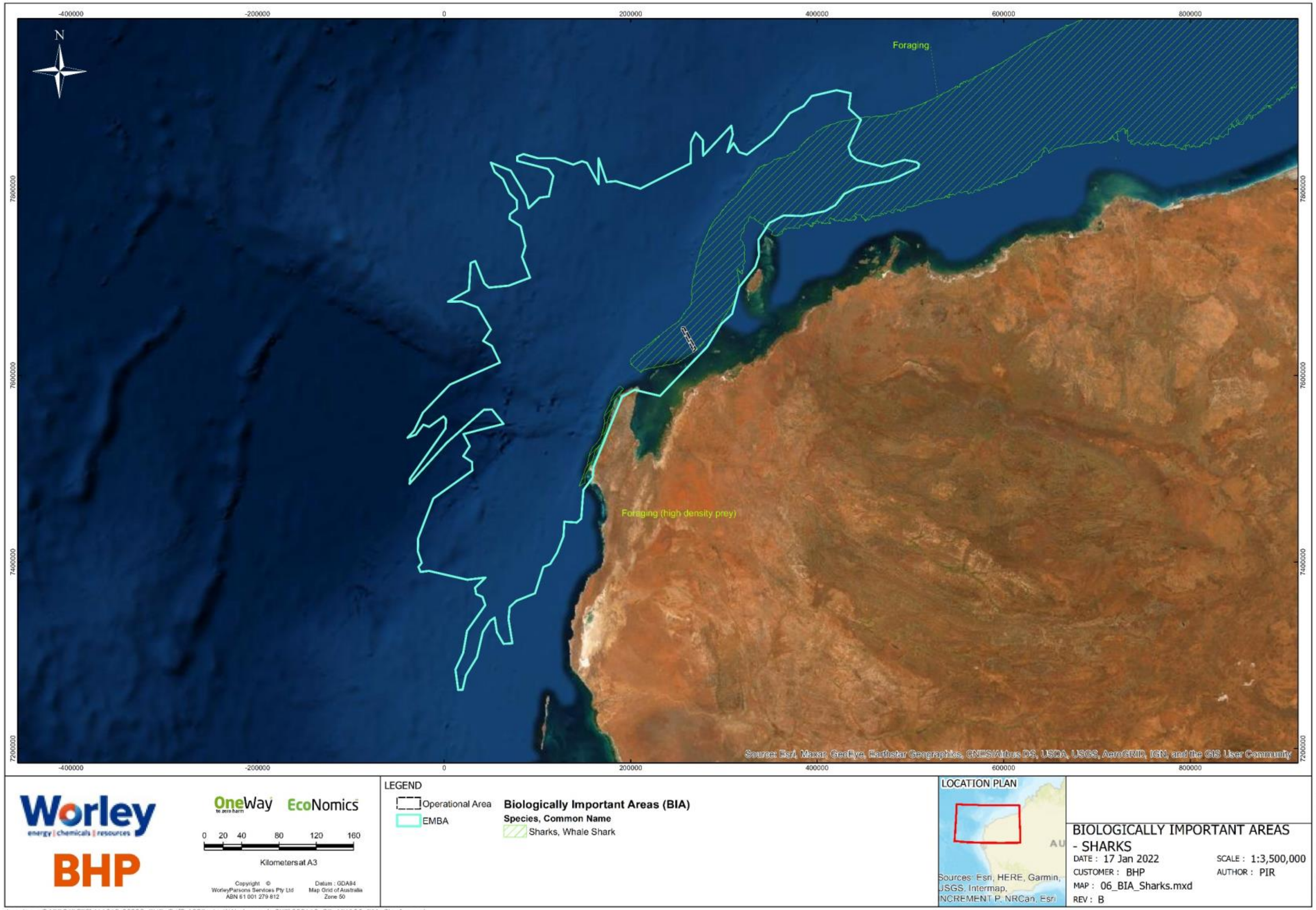


Figure 5-6: Fish and Sharks Biologically Important Areas within the Operational Area and EMBA

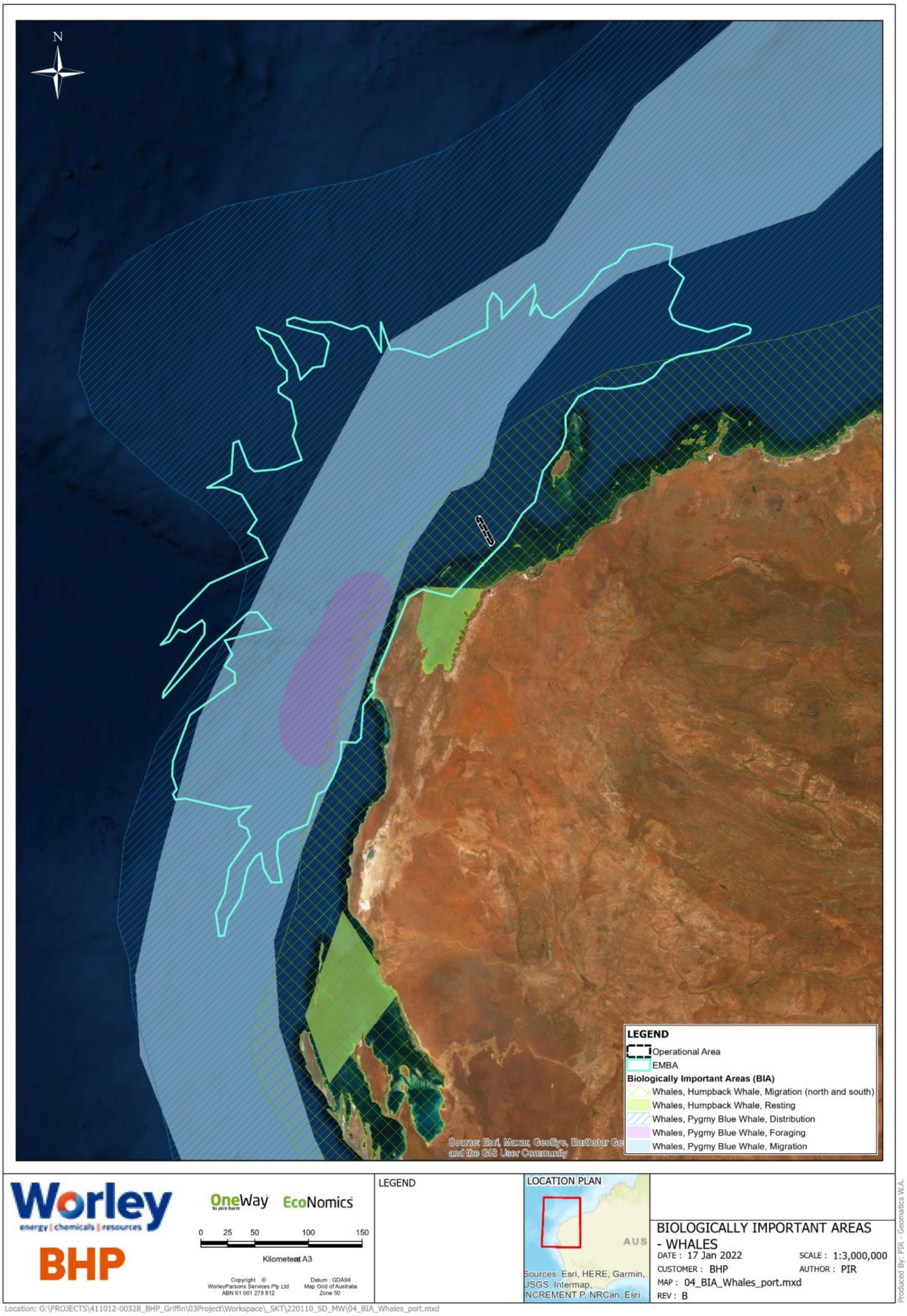


Figure 5-7: Whale Migration Biologically Important Areas within the Operational Area and EMBA

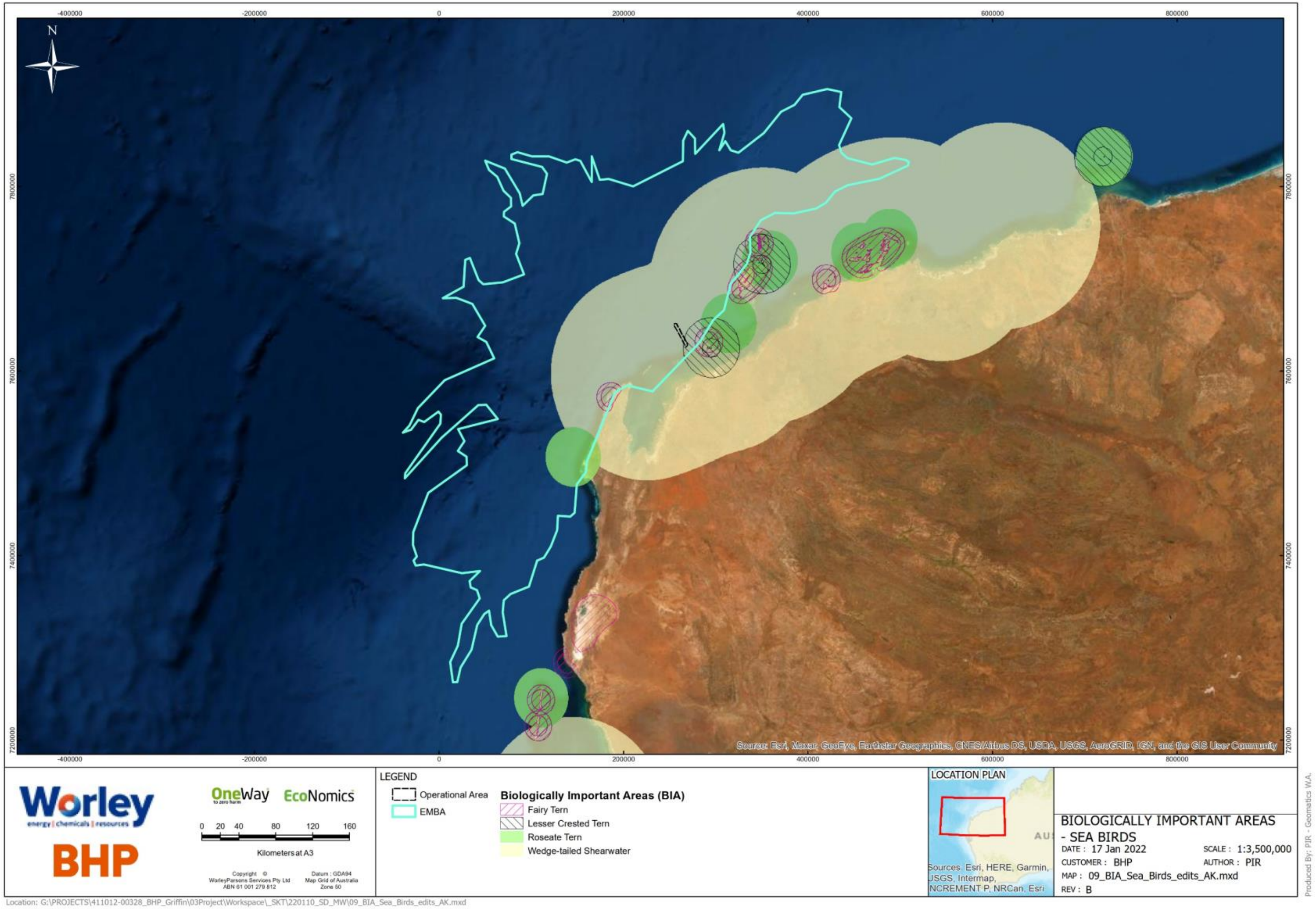


Figure 5-8: Seabird Biologically Important Areas within the Operational Area and EMBA

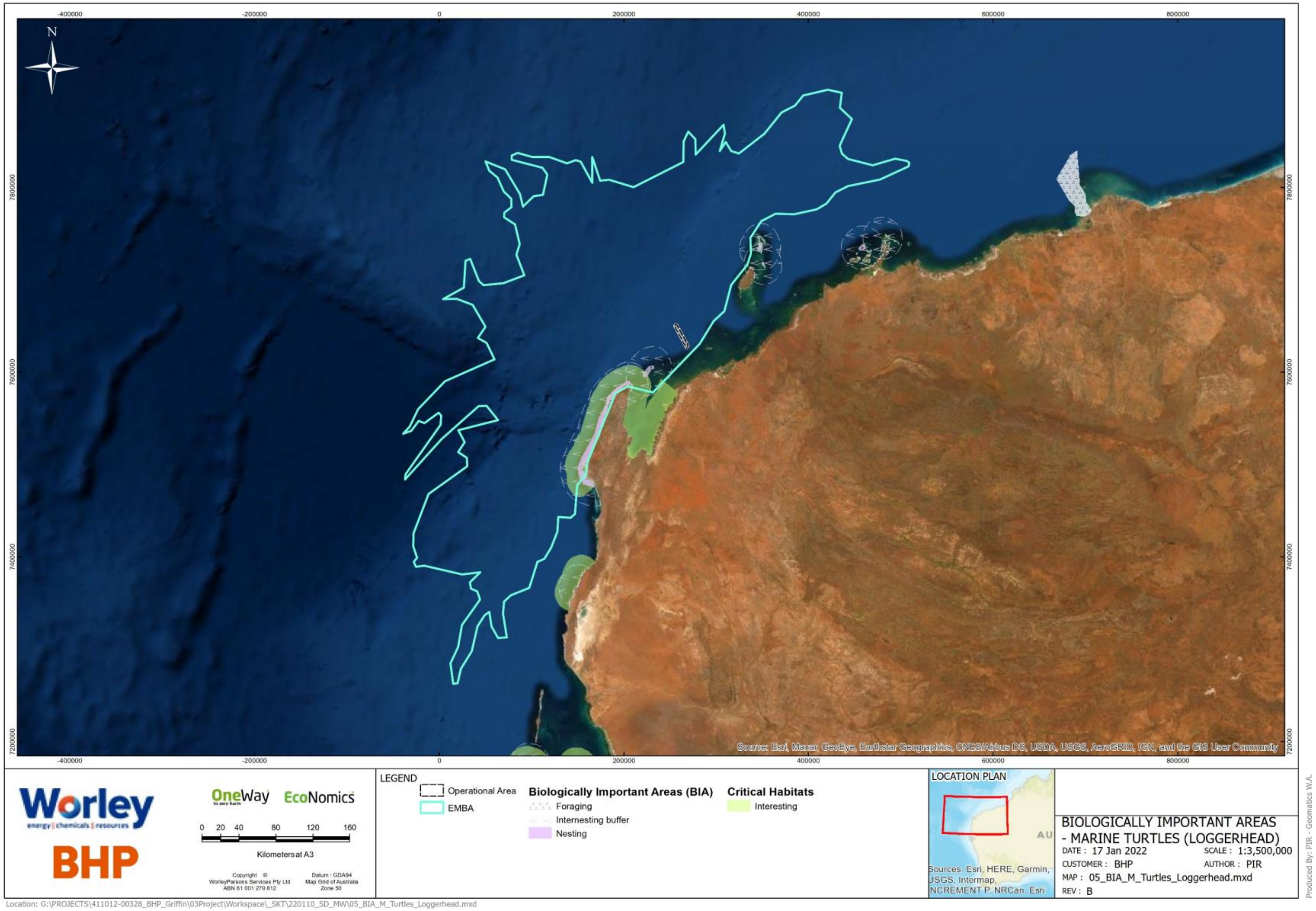


Figure 5-9: Loggerhead Turtle Biologically Important Areas and Critical Habitats within the Operational Area and EMBA

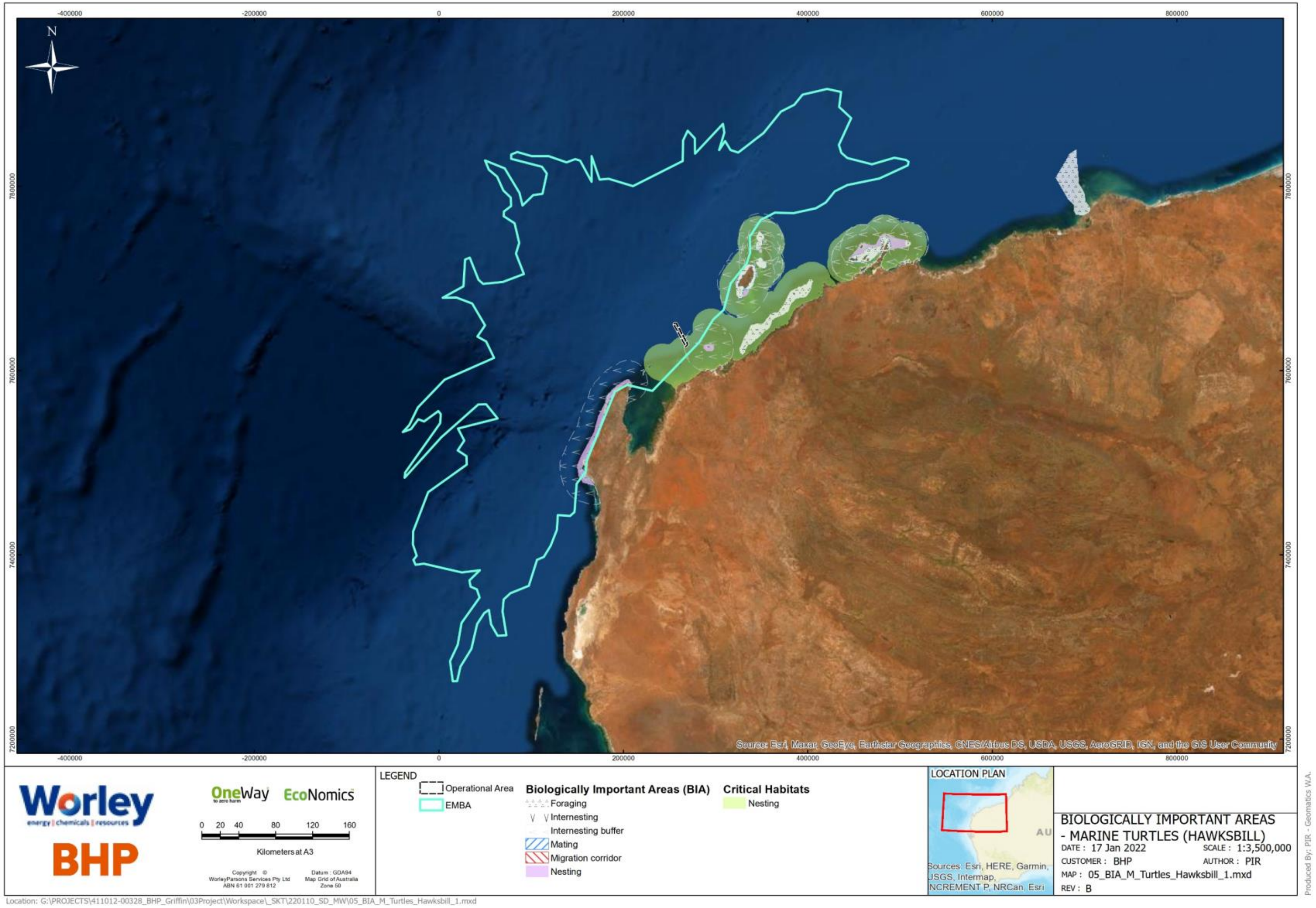


Figure 5-10: Hawksbill Turtle Biologically Important Areas and Critical Habitats within the Operational Area and EMBA

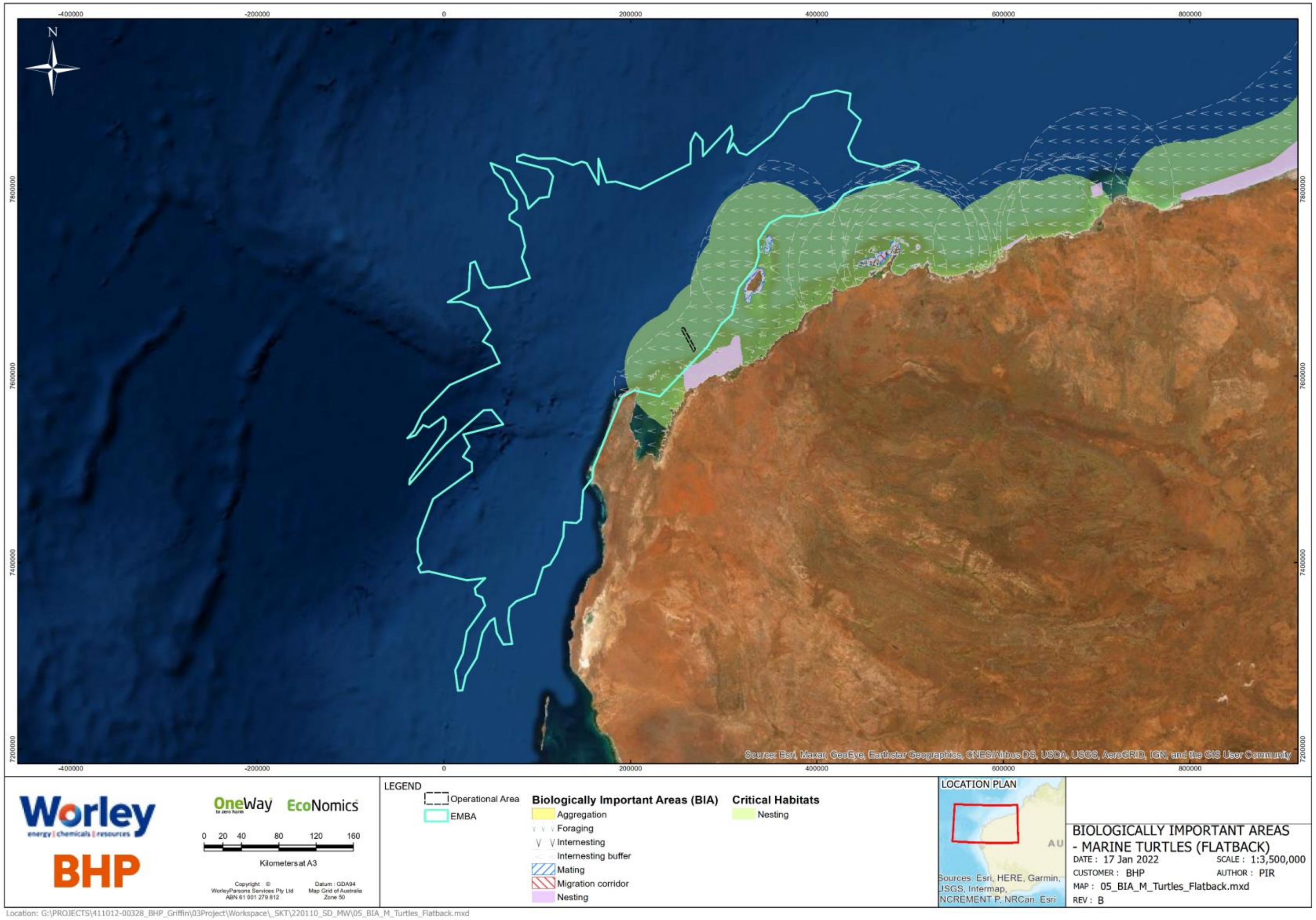


Figure 5-11: Flatback Turtle Biologically Important Areas and Critical Habitats within the Operational Area and EMBA

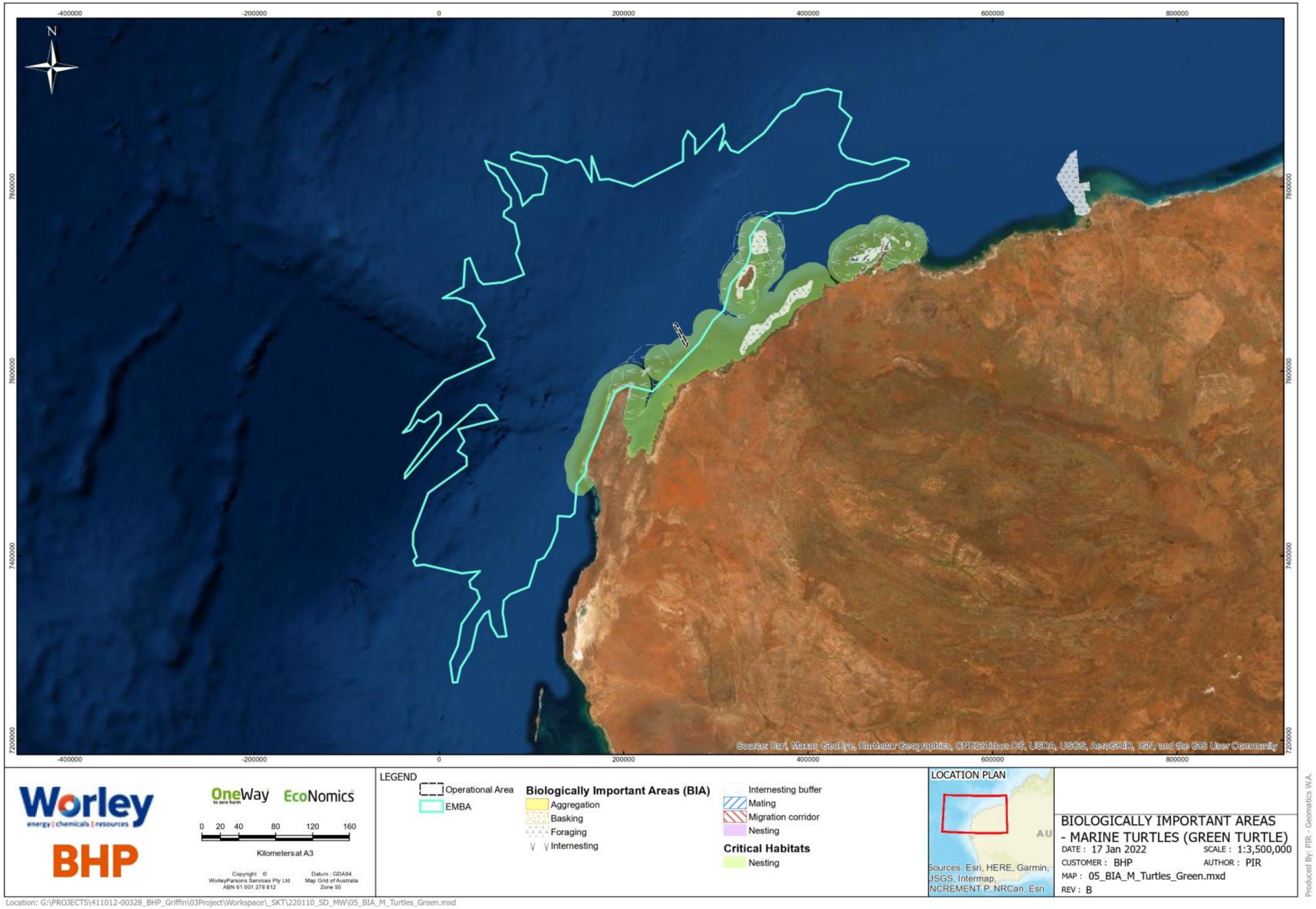


Figure 5-12: Green Turtle Biologically Important Areas and Critical Habitats within the Operational Area and EMBA

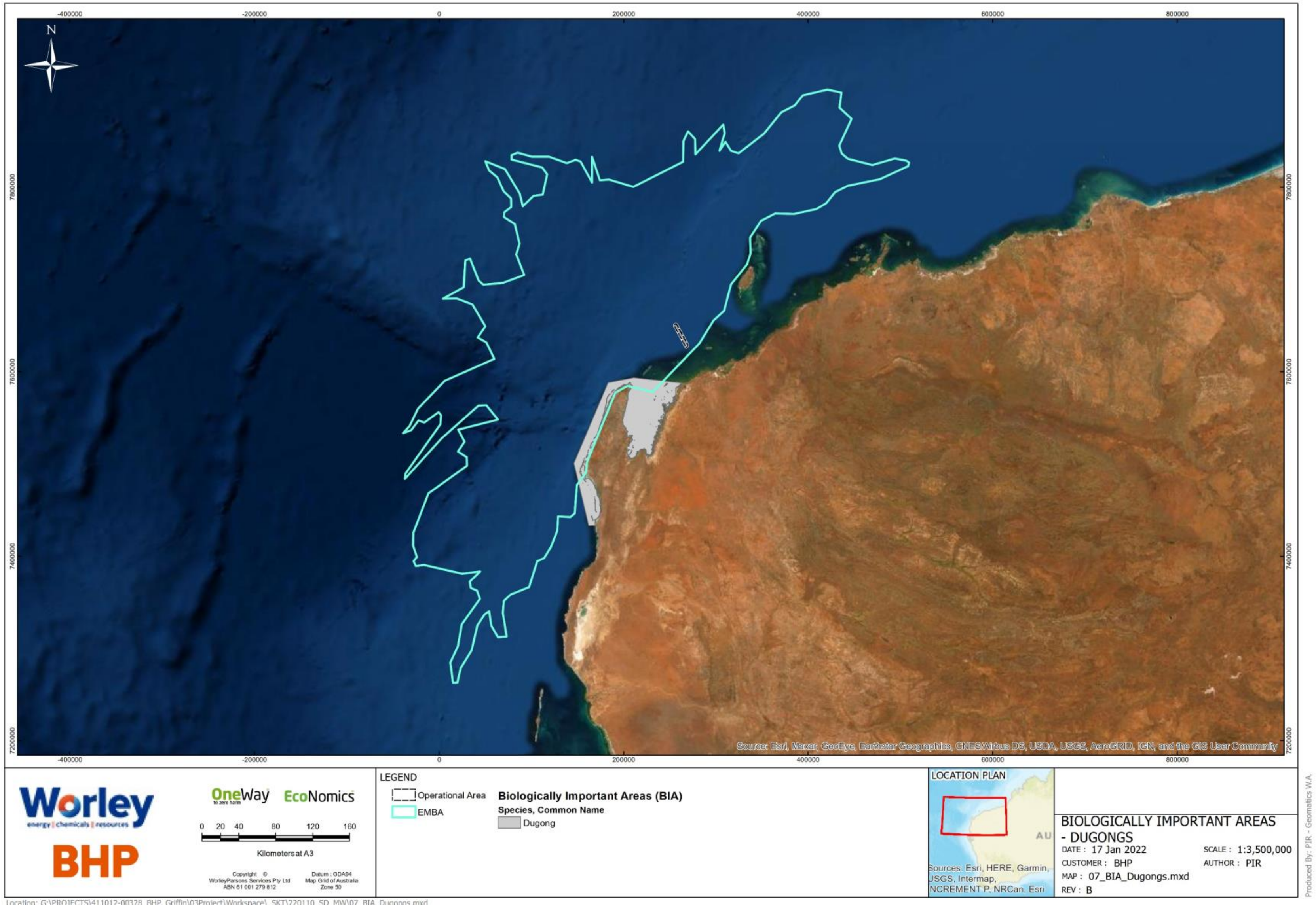


Figure 5-13: Dugong Biologically Important Areas within the Operational Area and EMBA

5.6.3 Species Recovery Plans, Conservation Advice and Threat Abatement Plans

BHP considered recent updates to recovery plans, conservation management plans, threat abatement plans or approved conservation advice in place for EPBC Act-listed threatened species that may potentially occur or use habitat within the EMBA (Table 5-12).

Recovery plans set out the research and management actions necessary to stop the decline of and support the recovery of listed threatened species. In addition, threat abatement plans provide for the research, management and any other actions necessary to reduce the impact of a listed key threatening process on native species and ecological communities. The Minister decides whether a threat abatement plan is required for key threatening processes listed under Section 183 of the EPBC Act. Table 5-12 provides information about the specific requirements of the relevant conservation advice, species recovery plans and threat abatement plans that applies to the petroleum activities, and demonstrates how current management requirements have been taken into account while preparing the EP. Through implementing relevant control measures, performance outcomes and performance standards, potential risks and impacts of the petroleum activities are managed to ALARP and acceptable levels.

Table 5-12 summarises the actions relevant to the petroleum activity, with more information about the specific requirements of the relevant plans of management (including Conservation Advice and Conservation Management Plans) applicable to the petroleum activity and demonstrates where management requirements have been addressed.

Table 5-12: Recovery Plans and Actions Relevant to the Petroleum activity

Name	Recovery Plan/Conservation Advice/Management Plan	Threats/strategies identified as relevant to the activity	Addressed in EP Section
Cetaceans			
Blue whale	Conservation Management Plan for the Blue Whale 2015 to 2025 (2015)	Noise interference	Section 8.3
		Habitat modification	Section 8.6
		Vessel disturbance	Section 9.3
		Marine debris	Section 9.6
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (2018)	Marine debris	Section 9.6
Fin whale	Approved Conservation Advice for *Balaenoptera physalus* (fin whale) (2015)	Anthropogenic noise and acoustic disturbance	Section 8.3
		Pollution (persistent toxic pollutants)	Section 9.2, 9.5
		Vessel strike	Section 9.3
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (2018)	Marine debris	Section 9.6
Sei whale	Approved Conservation Advice for *Balaenoptera borealis* (sei whale) (2015)	Anthropogenic noise and acoustic disturbance	Section 8.3
		Habitat degradation including pollution (persistent toxic pollutants)	Section 8.6, 9.2, 9.5
		Marine debris	Section 9.6
		Vessel strike	Section 9.3
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (2018)	Marine debris	Section 9.6
Humpback whale	Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale) (2015)	Noise interference	Section 8.3
		Marine debris	Section 9.6
		Vessel strike	Section 9.3
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (2018)	Marine debris	Section 9.6
Southern right whale	Conservation Management Plan for the Southern Right Whale 2011 to 2021 (2012)	Habitat modification	Section 8.6
		Vessel disturbance	Section 9.3
		Noise interference	Section 8.3
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (2018)	Marine debris	Section 9.6

Name	Recovery Plan/Conservation Advice/Management Plan	Threats/strategies identified as relevant to the activity	Addressed in EP Section
Marine Reptiles			
Short-nosed seasnake	Commonwealth Conservation Advice on *Aipysurus apraefrontalis* (short-nosed seasnake) (2011)	Degradation of reef habitat	Section 9.2
Loggerhead turtle	Recovery plan for marine turtles in Australia 2017 to 2027 (2017)	Noise interference	Section 8.3
		Marine debris	Section 9.6
		Chemical and terrestrial discharge	Section 8.7, 8.5
		Vessel disturbance	Section 9.3
		Loss of habitat and/or habitat modification	Section 8.6, 9.2, 9.5
		Light pollution	Section 8.2
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia’s coasts and oceans (2018)	Marine debris	Section 9.6
Green turtle	Recovery plan for marine turtles in Australia 2017 to 2027 (2017)	Noise interference	Section 8.3
		Chemical and terrestrial discharge	Section 8.7, 8.5
		Marine debris	Section 9.6
		Vessel disturbance	Section 9.3
		Light pollution	Section 8.2
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia’s coasts and oceans (2018)	Marine debris	Section 9.6
Leatherback turtle, leathery turtle	Commonwealth Conservation Advice on *Dermochelys coriacea* (2008) Recovery plan for marine turtles in Australia 2017 to 2027 (2017)	Boat strike	Section 9.3
		Changes to breeding sites	Section 9.2
		Marine debris	Section 9.6
		Noise interference	Section 8.3
		Chemical and terrestrial discharge	Section 8.7, 8.5
		Loss of habitat	Section 8.6, 9.2
		Vessel disturbance	Section 9.3
		Light pollution	Section 8.2
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia’s coasts and oceans (2018)	Marine debris	Section 9.6
Hawksbill turtle	Recovery plan for marine turtles in Australia 2017 to 2027 (2017)	Noise interference	Section 8.3
		Chemical and terrestrial discharge	Section 8.7, 8.5
		Marine debris	Section 9.6
		Loss of habitat	Section 8.6, 9.2

Name	Recovery Plan/Conservation Advice/Management Plan	Threats/strategies identified as relevant to the activity	Addressed in EP Section
		Vessel disturbance	Section 9.3
		Light pollution	Section 8.2
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (2018)	Marine debris	Section 9.6
Flatback turtle	Recovery plan for marine turtles in Australia 2017 to 2027 (2017)	Noise interference	Section 8.3
		Chemical and terrestrial discharge	Section 8.7, 8.5
		Marine debris	Section 9.6
		Loss of habitat	Section 8.6, 9.2
		Vessel disturbance	Section 9.3
		Light pollution	Section 8.2
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (2018)	Marine debris	Section 9.6
Fish and Sharks			
Whale shark	Approved Conservation Advice for *Rhincodon typus* (whale shark) (2015)	Marine debris	Section 9.6
	Whale shark management with particular reference to Ningaloo Marine Park, Wildlife Management Program no. 57 (2013)	Boat strike from large vessel	Section 9.3
Grey nurse shark (west coast population)	Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) (2014)	Ecosystem effects as a result of habitat modification and pollution effects	Section 9.2
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (2018)	Marine debris	Section 9.6
White shark	Recovery Plan for the White Shark (*Carcharodon carcharias*) (2013)	Ecosystem effects as a result of habitat modification	Section 9.2
Dwarf sawfish	Commonwealth Conservation Advice on *Pristis clavata* (dwarf sawfish) (2009)	Habitat degradation and modification	Section 8.6, 9.2
	Sawfish and River Sharks Multispecies Recovery Plan (2015)		
Green sawfish	Commonwealth Conservation Advice on *Pristis zijsron* (green sawfish) (2008)	Habitat degradation and modification	Section 8.6, 9.2
	Sawfish and River Sharks Multispecies Recovery Plan (2015)		
Birds			
Red knot	Approved Conservation Advice for *Calidris canutus* (red knot) (2016)	Habitat loss and degradation	Section 8.6, 9.2
		Pollution/contamination impacts	Section 9.2
Southern giant-petrel	National recovery plan for threatened albatrosses and giant petrels 2011 to 2016 (2011)	Marine pollution	Section 9.2

Name	Recovery Plan/Conservation Advice/Management Plan	Threats/strategies identified as relevant to the activity	Addressed in EP Section
	Background paper, population status and threats to albatrosses and giant petrels listed as threatened under the EPBC Act 1999 (2011)		
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (2018)		
Curlew sandpiper	Approved Conservation Advice for *Calidris ferruginea* (curlew sandpiper) (2015)	Habitat loss and degradation from pollution	Section 9.2
Eastern curlew	Approved Conservation Advice for *Numenius madagascariensis* (eastern curlew) (2015)	Habitat loss and degradation from pollution	Section 9.2
Northern Siberian bar tailed godwit	Approved Conservation Advice for *Limosa lapponica menzbieri* (bar-tailed godwit northern Siberian) (2016)	Habitat loss and degradation	Section 9.2
		Pollution/contamination impacts	Section 9.2
Australian fairy tern	Commonwealth Conservation Advice on *Sternula nereis nereis* (fairy tern) (2011)	Oil spills	Section 9.2
Campbell albatross	National recovery plan for threatened albatrosses and giant petrels 2011 to 2016 (2011)	Marine pollution	Section 9.2
Shy albatross	National recovery plan for threatened albatrosses and giant petrels 2011 to 2016 (2011)	Marine pollution	Section 9.2
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (2018)		
White-capped albatross	National recovery plan for threatened albatrosses and giant petrels 2011 to 2016 (2011)	Marine pollution	Section 9.2
	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (2018)		

5.7 Socio-economic

Socio-economic activities that may occur within the operational area and EMBA include commercial fishing, oil and gas exploration and production, and to a lesser extent, recreational fishing and tourism as summarised below.

More detailed descriptions of socio-economic considerations are provided in Appendix D, Section 2.10.

5.7.1 Commercial Fisheries

The Griffin field subsea infrastructure has created a large artificial reef system in an otherwise fine sand and mud habitat with sparse benthic populations typical of the continental slope and shelf. ROV footage from infrastructure surveys conducted in the Griffin field and anecdotal evidence from commercial and recreational fishers in the region confirm that the Griffin subsea infrastructure attracts a diverse population of fish, including many species of economic (commercial and recreational) importance (GHD, 2015). Bond et al (2017) also observed a number of commercial species along the GEP (Section 5.4.3).

Commercial fishers in the region have differing opinions on the presence of the Griffin Field infrastructure (GHD, 2015). Fishers that use trap or line equipment are generally positive about its presence and support the concept that the Griffin GEP provides enhancement of the fish populations in the area. A commercial fisher commented that a diverse range of fish have been found on the Griffin infrastructure (including the GEP), presumed to be resident populations, with typical catch including red emperor, trevallies, saddle tail snapper, moses snapper, sea bream, goldband snapper and mangrove jack. Dominant and established species associated with the infrastructure are red emperor, coral trout, crimson snapper and some large cod species (GHD, 2015).

Table 5-13 identifies the Commonwealth and State commercial fisheries overlapping the operational area and EMBA and provides an assessment of the potential interaction based on the nature of the fishery and historic DPIRD catch data.

Table 5-13: Commonwealth and State Commercial Fisheries Overlapping the Operational Area and Potential for Interaction with the Petroleum Activity

Fishery name	Operational Area	EMBA	Interaction potential with the Petroleum Activity	
Commonwealth fishery				
Western Tuna and Billfish	✓	✓	No	In 2020 there were three active fishing vessels. Fishing effort has concentrated off south-west Western Australia, with occasional activity off South Australia (Patterson et al, 2021). Whilst there is an overlap with the fishery management area, there is no potential for interaction given the current distribution of fishing effort.
Western Skipjack Tuna	✓	✓	No	Historically, effort in the Western Skipjack Tuna has been low and was 885 t in 2007–08. There has been no fishing in the since 2008–09 (Patterson et al, 2021). Whilst the operational area and EMBA overlaps with the fishery management area, there is no potential for interaction given the current distribution of fishing effort.
Southern Bluefin Tuna Fishery	✓	✓	No	Fishing effort for the Southern Bluefin Tuna Fishery occurs in the Great Australian Bight and north east of Eden in New South Wales (Patterson et al, 2021). Whilst the EMBA and operational area overlap with the fishery management area, there is no potential for interaction given the current distribution of fishing effort. The EMBA overlaps the Southern Bluefin Tuna spawning ground.
Western Deepwater Trawl Fishery	X	✓	No	The Western Deepwater Trawl Fishery operates in Commonwealth waters off the coast of Western Australia. Effort in recent years has been localised in the area offshore and slightly south of Shark Bay. Catch in the 2019–20 season was 8 tonnes. No catch was reported in 2018–19 (Patterson et al, 2021). Whilst the EMBA overlaps with the fishery management area, there is no potential for interaction given the current distribution of fishing effort.
North West Slope Trawl	X	✓	No	The North West Slope Trawl Fishery operates off north-western Australia, roughly between the 200 m isobath and the outer boundary of the Australian Fishing Zone. The North West Slope Trawl Fishery has predominantly been a scampi fishery using demersal trawl gear. In 2020 there were six active fishing vessels (Patterson et al, 2021). Whilst the EMBA overlaps with the fishery management area, there is no potential for interaction given the current distribution and known depth of fishing effort.
State fishery				
Pilbara Line Fishery	✓	✓	Yes	The Pilbara Line Fishery encompasses all of the ‘Pilbara waters’, extending from a line commencing at the intersection of 21°56’S latitude and the boundary of the Australian Fishing Zone and north to longitude 120°E (Newman et al., 2014). There are no stated depth limits of the fishery. The fishing vessels primarily target goldband snapper. Records show there has been up to six active Pilbara Line Fishery vessels that operate annually within the 10 NM blocks that cover the operational area. These vessels have operated there within the past four years (DPIRD, 2021). Given the known Pilbara Line Fishery fishing effort, it is possible that vessels may be operating within the vicinity of the operational area. Fish Assemblages associated with the Griffin GEP and adjacent seafloor have been studied by Bond et al (2017), GEP was characterised by the presence of commercially important species, such as *Nemipterus spp*. (threadfin bream), *Pristipomoides multidens* (goldband snapper), *Argyrops spinifer* (frypan snapper), *Carangoides caeruleopinnatus* (onion trevally) and *Lutjanus malabaricus* (saddletail snapper). Eighty-eight fish species have been observed at Griffin field, most of which have recreational and commercial value, including 8-10 of each of the *Lutjanidae* (tropical snappers) and *Epinephalidae* (groupers), as well as jacks and dhufish (UTS Decommissioning Ecology Group, 2020).
Pilbara Trap Managed Fishery	✓	✓	Yes	The Pilbara Trap Managed Fishery covers the area from Exmouth northwards and eastwards to the 120° line of longitude, and offshore as far as the 200 m isobath. The fishery targets high value species such as *Lutjanus sebae*

Fishery name	Operational Area	EMBA	Interaction potential with the Petroleum Activity	
				(red emperor) and *Pristipomoides multidens* (goldband snapper), which have been observed by Bond et al (2017) along the GEP. Records show there were less than three Pilbara Trap Managed Fishery vessels operating annually within the10 NM blocks that cover the operational area. These vessels have operated there within the past four years, however no catch has been recorded (DPIRD, 2021). Given the known Pilbara Line Fishery fishing effort, it is possible that vessels may be operating within the vicinity of the operational area.
Exmouth Gulf Prawn Managed Fishery	X	✓	No	This fishery uses twin gear otter trawls to target western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*P. eculentus*), endeavour prawns (*Metapenaeus spp.)* and banana prawns (*P. merguiensis*). This fishery operates in the sheltered waters of the Exmouth Gulf, 30 km to the south of the operational area. Fishing effort is likely within the EMBA only.
Pilbara Trawl Managed Fishery	✓	✓	No	The Pilbara Trawl Managed Fishery is divided into two zones and waters inside of the 50 m isobath are permanently closed to fish trawling. The operational area is located within Schedule 2 (Zone 1), which has been closed to fish trawling since 1998 (DPIRD, 2021). Only if this fishery was to reopen would there be any potential for interaction.
Mackerel Managed Fishery	✓	✓	No	The Mackerel Managed Fishery targets Spanish mackerel (*Scomberomorus commerson*) using near-surface trawling gear from small vessels in coastal areas around reefs, shoals and headlands. The commercial fishery extends from Geraldton to the Northern Territory border. Records show there were less than three Mackerel Managed Fishery vessels operating annually within the 10 NM blocks that cover the operational area. These vessels have operated there within the past four years, however no catch has been recorded (DPIRD, 2021). No interaction is expected given the known fishing effort.
Onslow Prawn Managed Fishery	✓	✓	No	The Onslow Prawn Managed Fishery encompasses a portion of the continental shelf off the Pilbara. The fishery targets a range of penaeids (primarily king prawns) which typically inhabit soft sediments <45 m water depth. Fishing is carried out using trawl gear over unconsolidated sediments (sand and mud). Records show there were less than three Onslow Prawn Managed Fishery vessels operating annually within the10 NM blocks that cover the operational area. These vessels have operated there within the past four years, however no catch has been recorded (DPIRD, 2021). Water depths in the operational area are not conducive for this fishery, no interaction is expected.
Marine Aquarium Fish Managed Fishery	✓	✓	No	The Marine Aquarium Managed Fishery operates within Western Australian waters. The fishery is primarily a dive-based fishery that uses hand-held nets to capture the desired target species and is restricted to safe diving depths (typically < 30 m). The fishery is typically active from Esperance to Broome, with popular areas including the coastal waters of the Cape Leeuwin/Cape Naturaliste region, Dampier and Exmouth. The fishery has not been active in the operational area within the last four years (DPIRD, 2021). Water depths in the operational area are not conducive for this fishery.
Specimen Shell Managed Fishery	✓	✓	No	The Specimen Shell Managed Fishery can be conducted anywhere within Western Australia waters and targets the collection of specimen shells for display, collection, cataloguing and sale. The Specimen Shell Managed Fishery encompasses the entire WA coastline, but effort is concentrated in areas adjacent to the largest population centres such as: Broome, Karratha, Shark Bay, Mandurah, Exmouth, Capes area, Albany and Perth. The fishery has not been active in the Operational Area within the last four years (DPIRD, 2021). Water depths in the Operational Area are typically not conducive for this fishery
Pearl Oyster Managed Fishery	✓	✓	No	The Western Australian Pearl Oyster Fishery is the only remaining significant wild-stock fishery for pearl oysters in the world. Pearl oysters (*Pinctada maxima*) are collected by divers in shallow coastal waters (>23 m) along the North West Shelf and Kimberley, which are mainly for use in the culture of pearls (Hart et al., 2018).

Fishery name	Operational Area	EMBA	Interaction potential with the Petroleum Activity	
				The fishery has not been active in the operational area within the last four years (DPIRD, 2021). Water depths in the operational area are not conducive for this fishery.
Abalone	✓	✓	No	The Western Australian abalone fishery includes all coastal waters from the Western Australian and South Australian border to the Western Australian and Northern Territory border. The fishery is concentrated on the south coast (greenlip and brownlip abalone) and the west coast (Roe's abalone). Abalone are harvested by divers, limiting the fishery to shallow waters (typically < 30 m). The fishery has not been active in the operational area within the last four years (DPIRD, 2021). Water depths in the operational area are not conducive for this fishery.
Pilbara Crab Fishery	✓	✓	No	Blue swimmer crabs are targeted by the Pilbara Crab Managed Fishery using hourglass traps, primarily within inshore waters around Nickol Bay and Dampier. The fishery has not been active in the operational area within the last four years (DPIRD, 2021). Water depths in the operational area are not conducive for this fishery.
West Coast Deep Sea Crustacean	✓	✓	No	The West Coast Deep Sea Crustacean Fishery is a 'pot' fishery using baited pots operated in a long-line formation in the shelf edge waters (>150 m) of the West Coast and Gascoyne Bioregions. The fishery primarily targets crystal crabs. The fishery has not been active in the operational area within the last four years (DPIRD, 2021). Water depths in the operational area are not conducive for this fishery.
South West Coast Salmon	✓	✓	No	The commercial salmon fishery use beach seine net to catch fish. There are two commercial salmon fisheries operating in Western Australia they include, the South Coast Salmon Managed Fishery (SCSMF) and South West Coast Salmon Managed Fishery (SWCSMF). There are currently 18 SCSMF licenses, and six SWCSMF Licences. The fishery has not been active in the operational area within the last four years (DPIRD, 2021). Water depths in the operational area are not conducive for this fishery.

5.7.2 Traditional Fisheries

There are not expected to be any traditional fisheries that operate within the operational area. Traditional fisheries are typically restricted to coastal waters and/or areas with suitable fishing structures such as reefs, therefore it is possible traditional fisheries may utilise the coastal waters of the EMBA. Appendix D, Section 2.10.6 provides further information on traditional fisheries.

5.7.3 Tourism and Recreation

Recreational fishing and tourism along the GEP has been noted during consultation with the Ashburton/Onslow fishing communities. The Griffin Field Commercial Fish Assessment (GHD, 2015) assessed the likelihood of recreational fishers utilizing the field. Anecdotal evidence from a prominent game fishing club in the North West region made reference to the fact that the numbers of larger fishing boats is on the increase, enabling game and recreational fishing further offshore (GHD, 2015).

Appendix D, Section 2.10.7 provides detail on recreational fishing and tourism within the EMBA.

5.7.4 Oil and Gas Activities

The NWS is Australia's most prolific oil and gas production area, largely responsible for WA accounting for 66% of the country's oil production, 76% of the country's condensate production and 37% of the country's gas production in 2013 (APPEA, 2014).

Oil and gas activities close to the operational area include:

- BHP's Pyrenees Development (Pyrenees Venture floating production, storage and offloading vessel (FPSO)) within WA-42-L
- BHP Macedon Development in production licence WA-42-L
- Woodside's Vincent Development (Maersk Ngujima-Yin FPSO) in production licence WA-38-L
- Santos' Ningaloo Vision Development (Ningaloo Vision FPSO) in production licence WA-35-L

Other oil and gas activities in the region include production areas located on Barrow, Thevenard and Varanus islands.

5.7.5 Commercial Shipping

Under the *Commonwealth Navigation Act 2012*, all vessels operating in Australian waters are required to report their location on a daily basis to the Rescue Coordination Centre in Canberra. This Australian Ship Reporting System is an integral part of the Australian Maritime Search and Rescue system and is operated by Australian Maritime Safety Authority (AMSA) through the Rescue Coordination Centre.

There are no recognised shipping routes in or near the operational area, with the nearest shipping fairway designated by AMSA located over 80 km to the north-west (Figure 5-14).

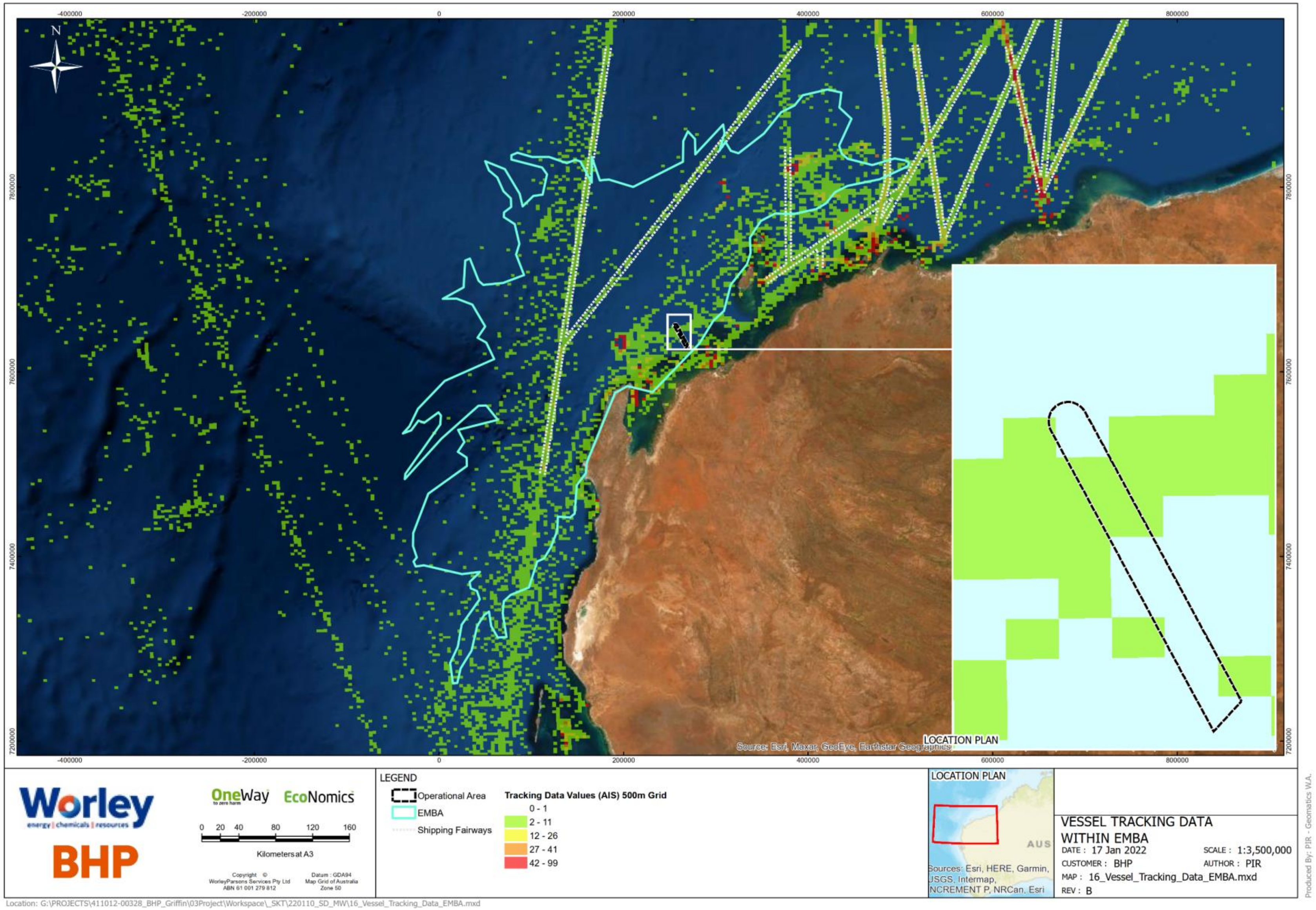


Figure 5-14: Commercial Shipping Traffic in the Vicinity of the Operational Area

5.7.6 Defence

Military exercise areas are located at Exmouth associated with Royal Australian Air Force Base Learmonth, approximately 149 km to the south west of the operational area. The operational area is within the North Western Training Area and military restricted airspace (R8541A) a designated defence exercise area which encompasses waters and airspace off the North West Cape (Figure 5-15). When activated by a ‘Notice to Airmen’, the restricted airspace can operate down to sea level.

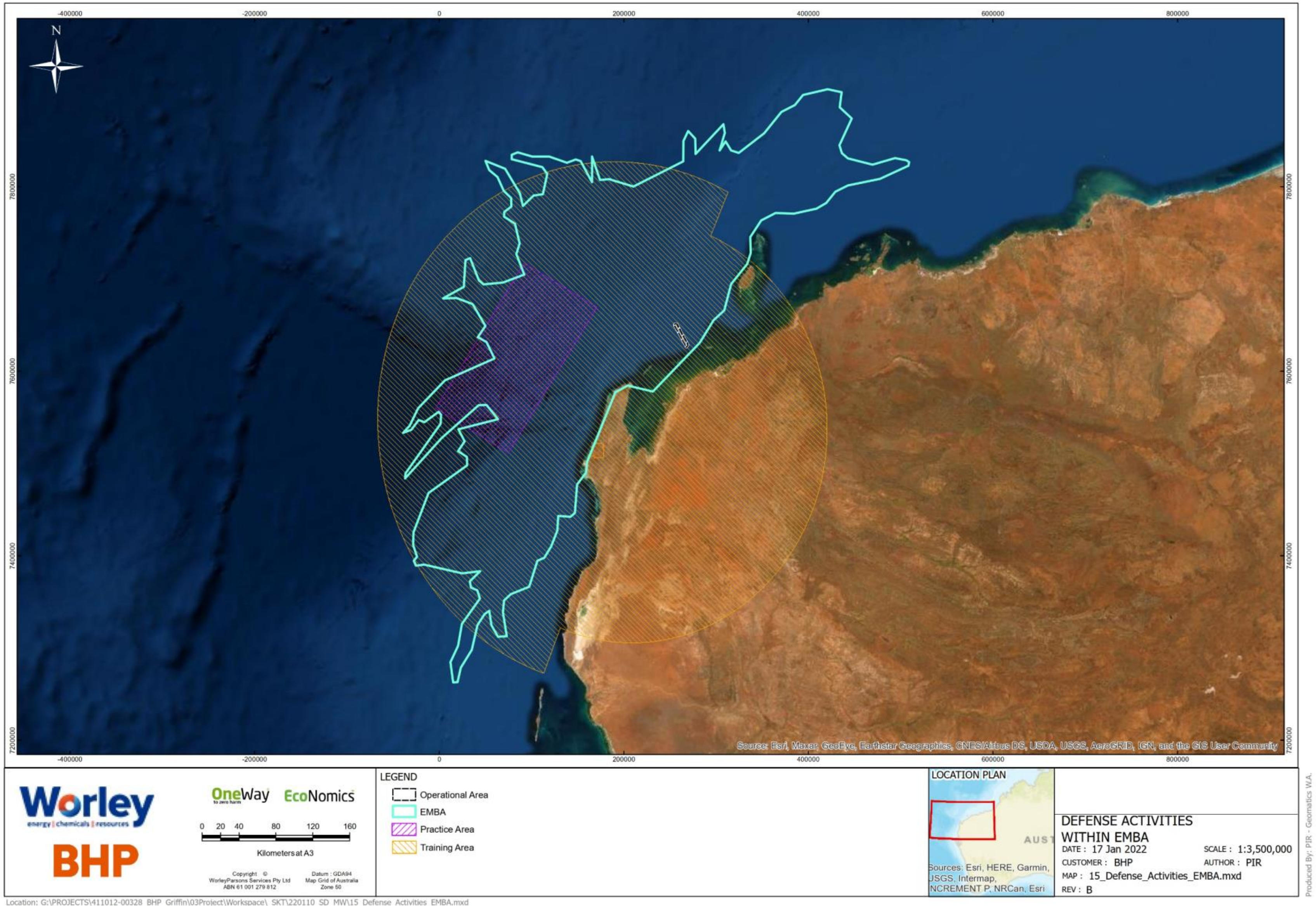


Figure 5-15: Defence Activities in the Vicinity of the Operational Area and EMBA

6 Stakeholder Engagement

In accordance with requirements of Regulations 11A and 14(9) of the Environment Regulations, BHP has consulted with relevant and interested stakeholders during the preparation of this EP.

BHP's approach to stakeholder consultation aims to demonstrate to relevant persons that the environmental impacts and risks of an activity are being appropriately managed. BHP is committed to ongoing engagement and consultation with stakeholders during all project stages.

BHP has consulted with relevant stakeholders regarding this petroleum activity, including sharing information with stakeholders and responding directly to enquiries. Information provided included details of all remaining decommissioning activities, with stakeholders advised that these would be covered by three separate EPs across Commonwealth and State regulatory jurisdictions.

Stakeholders consulted specific to the activities covered in this EP commenced in January 2022, with consultation activities including:

- Griffin Decommissioning Environment Plan Stakeholder Information Fact Sheet distributed to relevant stakeholders in November 2021;
- Exmouth Community Reference Group (CRG) meeting held in October 2021.

BHP has considered all stakeholder feedback and assessed the merits of responses received. The process adopted to assess any objections and claims is outlined in Section 5.2.5. A summary of BHP's responses is provided in Table 6-2.

BHP has also considered feedback from previous consultation activities for decommissioning of the Griffin Field, as well as for a public Comparative Assessment process undertaken by BHP in 2021.

BHP considers that consultation with relevant stakeholders has been adequate to inform the development of this EP. BHP has a process for ongoing stakeholder engagement and any concerns raised by stakeholders after the EP submission will be considered and addressed.

6.1 Stakeholder Engagement Process

5.2.1 Stakeholder Identification

Regulation 11A(1) of the Environment Regulations states that in the course of preparing an environment plan, or revision to an environment plan, the titleholder must consult with each of the following categories of relevant persons:

(a) each Department or agency of the Commonwealth to which the activities to be carried out under the environment plan, may be relevant;

(b) each Department or agency of a State or the Northern Territory to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant;

(c) the Department of the responsible State Minister, or the responsible Northern Territory Minister;

(d) a person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the environment plan, or the revision of the environment plan;

(e) any other person or organisation that the titleholder considers relevant.

Relevant persons for the proposed petroleum activity were identified based on BHP's existing relationships and relevant persons identified in previous EP consultations, together with desktop stakeholder identification and analysis. BHP has engaged with key stakeholders through the EP preparation including:

- Commonwealth and State departments and agencies;
- Local Government;
    - Commercial fishery licence holders and their representative associations within both Commonwealth and State managed fisheries that overlap the Operational Area;
    - Non-governmental organisations.

As part of BHP's general stakeholder identification process, the Department of Primary Industries and Regional Development (DPIRD) current State of Fisheries Report and FishCube data (refer Section 5.7.1) was reviewed to understand catch effort, fishing method and water depths of those managed fisheries with boundaries that overlap the operational area, to determine if the fishery was to be considered a relevant stakeholder to be consulted. This assessment is included in Section 5.7.1 of this EP.

5.2.2 Community Consultation History

BHP has also consulted wider community interests for this EP, principally through the Exmouth and Onslow CRGs, which were established to facilitate consultation in relation to BHP's multiple assets offshore North West Cape, Western Australia. The CRG forums aim for proactive and regular interaction to promote open and inclusive communication with stakeholders with an interest in BHP's current and planned activities. Current membership of each CRG includes representatives from local government, Exmouth and Onslow-based State and Commonwealth Government Departments, local industry, tourism, Indigenous and community interests.

Meetings are held regularly (typically quarterly), and participants are given an update summary of BHP's current petroleum and upcoming activities and invited to raise any concerns or issues. Meeting agendas are prepared and circulated in advance of meetings, minutes are recorded, and feedback sought from stakeholders. The BHP Corporate Affairs' toll-free 1800 number and email address are made available to stakeholders.

The latest Exmouth CRG meeting was held on 4 October 2021 and included an overview of BHP's proposed Griffin activities. An Exmouth CRG meeting was scheduled for March 2022, but has been cancelled due to COVID. Both Exmouth and Onslow CRG members were emailed a copy of the Griffin Decommissioning Environment Plan Stakeholder Information Fact Sheet (Appendix J).

In addition to CRG consultation, targeted consultation has been undertaken for the EP as outlined in Section 6.2.3, with identified stakeholders provided information about the proposed activities and given adequate opportunity to evaluate and convey how it may impact on functions, interests and activities. The consultation process also provided opportunity for additional stakeholders identified during the consultation process to be contacted, with a commitment to assess any new concerns or claims as part of ongoing consultation.

5.2.3 Identified stakeholders

Identified stakeholders and an assessment of their relevance under the Environment Regulations for the purposes of consultation for this petroleum activity are listed in Table 6-1.

Table 6-1: Stakeholders engaged with for the proposed activity

Stakeholder	Relevant to Activity	Rationale
Commonwealth Government Department or Agency		
Australian Border Force	Yes	Maintain the integrity of Australia's internal borders including customs and immigration
Australian Fisheries Management Authority (AFMA)	Yes	AFMA is the Commonwealth government agency responsible for the efficient management and sustainable use of Commonwealth fish resources from three nautical miles out to the extent of the Australian Fishing Zone.
Australian Hydrographic Office (AHO)	Yes	The AHO is Commonwealth government agency responsible for the publication and distribution of nautical charts and other information related for the safety of ships

Stakeholder	Relevant to Activity	Rationale
		navigating in Australian waters including the distribution of Notice to Mariners.
Australian Maritime Safety Authority (AMSA)	Yes	AMSA is Australia's national agency responsible for maritime safety and navigation, and is Australia's national agency responsible for marine pollution response in Commonwealth waters..
Department of Agriculture, Water and the Environment (DAWE) – Fisheries	Yes	Department's Fisheries Branch has primary policy responsibility for promoting the biological, economic and social sustainability of Australian fisheries. The DAWE (Fisheries) is the relevant agency where the activity has the potential to negatively impact fishing operations and/or fishing habitats in Commonwealth waters.
Department of Agriculture, Water and the Environment (DAWE) – Sea Dumping Permit	Yes	The Sea Dumping Act and associated sea dumping permits are administered by the DAWE. Preliminary discussions with DAWE indicate the GEP is exempt from the requirements of a Sea Dumping Permit, as a pipeline that conveyed a petroleum product to shore. Written confirmation from DAWE has been sought.
Department of Agriculture, Water and the Environment (DAWE) – Biosecurity (vessels, aircraft and personnel)	Yes	Department's Biosecurity Branch has inspection and reporting requirements to ensure that all conveyances (vessels, installations and aircraft) arriving in Australian territory comply with international health regulations and that any biosecurity risk is managed.
Department of Defence (DoD)	Yes	The department is the responsible agency for the defence of Australia and its national interests. DoD is a relevant agency where the proposed activity may impact operational requirements; encroach on known training areas and/or restricted airspace, or when nautical products or other maritime safety information is required to be updated.
Department of Industry, Science, Energy and Resources	Yes	The Department is responsible for consolidating the Government's efforts to drive economic growth, productivity, and competitiveness by bringing together industry, energy, resources and science. The Department is required to be consulted under Regulation 11A(1) of the Environment Regulations.
Director of National Parks (DNP)	Yes	The DNP is the statutory authority responsible for the administration and management of the Australian Marine Parks under the EPBC Act.
WA Government Department or Agency		
Department of Biodiversity, Conservation and Attractions (DBCA)	Yes	The Department is a relevant State agency responsible for the management of State marine parks and reserves and protected marine fauna and flora.
Department of Mines, Industry Regulation and Safety (DMIRS)	Yes	Department responsible for the management of offshore petroleum in the adjacent State waters. The Department is

Stakeholder	Relevant to Activity	Rationale
		required to be consulted under Regulation 11A(1) of the Environment Regulations
Department of Primary Industries and Regional Development (DPIRD)	Yes	DPIRD is responsible for managed WA State fisheries. The operational area intersects with State managed fisheries.
Department of Transport (DoT)	Yes	The Department is the control agency for marine pollution emergencies in State waters.
Ningaloo Coast World Heritage Advisory Committee (NCWHAC)	Yes	The NCWHAC provides advice to the Australian and Western Australian Governments on the protection, conservation and management of the values of the Ningaloo World Heritage Area.
Industry Representative Organisations		
Australian Petroleum Production and Exploration Association (APPEA)	Yes	APPEA is the peak national body representing Australia's oil and gas exploration and production industry.
Fishing Bodies / Industry Representative Organisations		
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	Yes	ASBTIA is the peak body representing the Australian Southern Bluefin Tuna industry.
Commonwealth Fisheries Association (CFA)	Yes	Represents the interests of commercial fishing industry in Commonwealth-regulated fisheries, including Skipjack Tuna Fisheries
Marine Tourism WA	Yes	Represents the interests of charter boat operators in Western Australia.
Pearl Producers Association (PPA)	Yes	PPA is the peak industry representative body for the Australian pearl oyster (*Pinctada maxima)* pearling industry licensees in WA.
Recfishwest	Yes	Recfishwest is the peak body representing recreational fishers in WA.
Tuna Australia	Yes	Tuna Australia is the peak body representing the Western Tuna and Billfish Fishery.
Western Australian Fishing Industry Council (WAFIC)	Yes	WAFIC is the peak industry body representing the interests of the WA commercial fishing, pearling and aquaculture sector.
Commonwealth Fisheries		
Commercial fisheries with boundaries overlapping or close to the planned petroleum operational area and with licence holders' activities or interests that may be affected by the planned petroleum activity.		
Western Tuna and Billfish	No	Refer Table 5-13
Western Skipjack Tuna	No	Refer Table 5-13
Southern Bluefin Tuna	No	Refer Table 5-13
Commercial fisheries with boundaries overlapping or close to the planned petroleum operational area, but licence holders' activities or interests are not expected to be affected by the planned petroleum activity.		
North West Slope Trawl	No	Refer Table 5-13
Western Deepwater Trawl	No	Refer Table 5-13
State Fisheries		
Commercial fisheries with boundaries overlapping or close to the planned petroleum operational area and with licence holders' activities or interests that may be affected by the planned petroleum activity.		
Pilbara Demersal Scalefish Fishery:	Yes	Based on a review of DPIRD current State of Fisheries Report and FishCube data, the

Stakeholder	Relevant to Activity	Rationale
• *Pilbara Line Fishery* • *Pilbara Trap Managed Fishery*		fisheries boundaries overlap the operational area, and the fishery has been active in recent years (refer Table 5-13).
Mackerel Managed Fishery	Yes	Based on a review of DPIRD current State of Fisheries Report and FishCube data, the fisheries boundaries overlap the operational area and the fishery has been active within the past four years (refer Table 5-13).
Commercial fisheries with boundaries overlapping or close to the planned petroleum operational area, but licence holders' activities or interests are not expected to be affected by the planned petroleum activity.		
Pilbara Trawl Managed Fishery	No	Based on a review of DPIRD current State of Fisheries Report and FishCube data, the fishery boundaries overlap the proposed operational area and the fisheries have not been active in recent years (refer Table 5-13). Licence holders have not been consulted during the development of the EP; however, fishery's interest considered in the development of the EP. DPIRD to be informed in the event of an unplanned emergency oil pollution event.
Onslow Prawn Managed Fishery	No	
Specimen Shell Managed	No	
Marine Aquarium Fish Managed Fishery	No	
Specimen Shell Managed Fishery	No	
Pearl Oyster Managed Fishery	No	
Pearl Oyster Managed Fishery	No	
Abalone	No	
Pilbara Crab Fishery	No	
West Coast Deep Sea Crustacean	No	
Neighbouring Operators		
Nil	N/A	No adjacent titles
Other Stakeholders		
Local Government • *Shire of Ashburton* • *Shire of Exmouth*	Yes	Represents the interests of local community members relevant to the progressive decommissioning of the Griffin facilities.
Community Reference Groups • *Exmouth Community Reference Group* • *Onslow Community Reference Group*	Yes	Representatives from local government, locally-based State and Commonwealth Government Departments, local industry, tourism, and organisations with Indigenous, conservation and community interests.
Indigenous • *Buurabalayji Thalanyji Aboriginal Corporation (BTAC)*	Yes	Represents the interests of native title claimants in the regions relevant to the progressive decommissioning of the Griffin facilities.
Industry • *Exmouth Chamber of Commerce and Industry* • *Onslow Chamber of Commerce and Industry*	Yes	Represents the interests of businesses in the regions relevant to the progressive decommissioning of the Griffin facilities.
Fishing clubs • *King Bay Fishing Club (Dampier)* • *Nickol Bay Fishing Club (Dampier)* • *Ashburton Anglers (Onslow)* • *Exmouth game Fishing Club (Exmouth)*	Yes	Represents the interests of recreational fishing club members in the regions relevant to the progressive decommissioning of the Griffin facilities.
Charter Boat / Marine Tourism Operators • *Dampier* • *Onslow*	Yes	May undertake marine tourism activities in proximity of the planned activities.

Stakeholder	Relevant to Activity	Rationale
• *Exmouth*		
Cape Conservation Group	Yes	Exmouth-based community and volunteer conservation group with an interest in conservation of the North West Cape.
Australian Maritime Oil Spill Centre (AMOSC)	Yes	Industry-funded organisation to coordinate and support marine pollution response.
Centre of Decommissioning Australia (CODA)	Yes	Established by the National Energy Resources Australia (NERA), an independent science organisation funded by the Australian Government in conjunction with industry.

5.2.4 Stakeholder Consultation Activities

BHP's consultation for this EP included the wide distribution of a general Fact Sheet (Appendix J) and follow up email correspondence. The information provided included the timing and duration of the activity, the mitigation measures for relevant impacts and risks, BHP's policies and experience, and contact details to facilitate providing feedback to BHP.

Additional materials have been provided to some government, industry and regional community members as part of BHPs ongoing involvement of stakeholders in the proposed decommissioning of the Griffin facilities, including a Comparative Assessment to inform decision making on the preferred decommissioning option.

Recent stakeholder engagement and consultation activities informing this EP include:

- Comparative Assessment Expression of Interest issued to stakeholders and advertisement in regional media in April 2021.
- Comparative Assessment Workshop in Exmouth, Western Australia on 16 June 2021.
- Exmouth CRG meeting on 4 November 2021
- Email communication on 31 January 2022 to relevant stakeholders, providing information on the deviation scopes and invitation for comment
- Consideration of all responses from stakeholders received prior to submission of the EP, providing additional information where requested.

All stakeholder engagement records are maintained by BHP Corporate Affairs.

5.2.5 Assessment of Stakeholder Objections and Claims

A summary of the stakeholder consultation undertaken for this EP, including responses received, BHP's assessment of all comments received and how each of the responses has been addressed in the EP is provided in Table 6-2. Full transcripts between BHP and stakeholders are provided in a confidential submission to NOPSEMA.

No objections or significant concerns were raised by stakeholders during consultation in the preparation of this EP. Some stakeholders expressed support for leaving equipment *in situ*, provided equipment had been cleaned of contaminants.

Table 6-2: Stakeholder consultation summary

Organisation	Summary of Stakeholder and Titleholder Correspondence, and Any Objections and Claims Made	Assessment of Stakeholder Objections and Claims
Commonwealth Departments / Agencies		
Australian Border Force (ABF)	ABF was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022.	No response has been received by Australian Border Force at the time of submission of the EP. BHP will address any comments from this stakeholder should they arise in the future.
Australian Fisheries Management Authority(AFMA)	AFMA was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. AFMA responded on 3 March 2022 and provided the following advice: 1. Due to limited resources AFMA is unable to comment on individual proposals, however, it is important to continue consulting with all fishers who have entitlements to fish within the proposed area. 2. AFMA advised fishers could be consulted through the relevant fishing industry associations or directly with fishers who hold entitlements in the area. 3. AFMA acknowledged BHPs advice that it would be consulting the relevant industry associations and requested BHP also consult with the Western Australia Fishing Industry Council (WAFIC) with regards to the North West Slope Trawl and Western Deepwater Trawl Fisheries, and the Australian Southern Bluefin Tuna Industry Association (ASBTIA) with regards to the Western Skipjack Tuna Fishery. BHP responded on 3 March 2022 acknowledging advice provided to Commonwealth fishery licence holders.	BHP has consulted relevant representative organisations on behalf of licence holders for the proposed activity. BHP has also consulted WAFIC for the proposed activity. BHP considers it has addressed the stakeholder's feedback and no further consultation is required.
Australian Hydrographic Office (AHO)	AHO was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. AHS replied on 1 February 2022 with the following response: 1. Please accept this email as acknowledgement that your email has been received by the AHO. The data you have supplied will now be registered, assessed, prioritised and validated in preparation for updating our Navigational Charting products. These adhere to International and Australian Charting Specifications and standards. These standards may result in some data generalisation or filtering due to the scale of existing charts, proximity to other features, and the level of risk a reported feature presents to mariners.	No action required, noting feedback provided by AMSA on 7 February 2022 requesting BHP to notify the AHO no less than four weeks before operations, with details relevant to the operations in order for the AHO promulgate the appropriate Notice to Mariners. Section 8.1 relates to the physical presence of vessels and infrastructure. Table 12-3 includes reporting and notification requirements including those to AHO. BHP considers it has addressed the stakeholder's feedback and no further consultation is required.
Australian Maritime Safety Authority (AMSA)	AMSA was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. AMSA responded on 7 February 2022 providing the following requests: 1. Please have the main vessel/s notify AMSA's Joint Rescue Coordination Centre (JRCC) for promulgation of radio-navigation warnings 24-48 hours before operations commence. AMSA's JRCC will require the vessel details (including name, call sign and Maritime Mobile Service Identity (MMSI)), satellite communications details (including INMARSAT-C and satellite telephone), area of operation, requested clearance from other vessels and need to be advised when operations start and end. 2. The Australian Hydrographic Office must be contacted through datacentre@hydro.gov.au no less than four working weeks before operations commence for the promulgation of related notices to mariners. AMSA also had the following queries on BHP's activities: 3. Does the outcome of the decommissioning result in an ongoing exclusion zone around the abandonment area and, if so, the total size of that area? 4. Does BHP's assessment of the environment also include other users of the area, ie the social and economic aspects such as shipping? BHP responded on 3 March 2022 addressing AMSAs expectations with respect to maritime safety information: 1. Notify AMSA's Joint Rescue Coordination Centre (JRCC) at least 24-48 hours before operations commence, in order to promulgate radio-navigation warnings. Notify JRCC when operations start and end.\ 2. Notify the AHO no less than four weeks before operations, with details relevant to the operations in order for the AHO promulgate the appropriate Notice to Mariners. BHP also advised it would provide updates to AHO and the JRCC on progress and any changes to intended operations, as well as ensure the appropriate exhibition of appropriate lights and shapes and will • Comply with the International Rules for Preventing Collisions at Sea • Ensure vessel navigation status is set correctly in the ship's AIS unit BHP provided the following responses with respect to exclusion zones and EP socio/economic assessment: 3. There is presently a 500-metre exclusion zone and a five nautical mile cautionary zone around the riser turret mooring. These exclusion zones will remain in place until decommissioning activities are complete and petroleum titles surrendered. The RTM and GEP may remain on navigational charts, with this requirement to be established with AHO at the appropriate time. 4. The Environment Plan for proposed activities includes an assessment of a range of environmental and social impacts within the Operational Area, as well as the environment that may be affected (EMBA) in the unlikely event of the worst-case hydrocarbon spill scenario identified as relevant to the activity. These socio-economic aspects include commercial fishing, traditional fishing, tourism and recreation, oil and gas activities, commercial shipping and defence. These assessments	BHP notes AMSA's feedback on Maritime Safety Information and will: 1. Notify AMSA's Joint Rescue Coordination Centre (JRCC) at least 24-48 hours before operations commence, in order to promulgate radio-navigation warnings. 2. Notify the AHO no less than four weeks before operations, with details relevant to the operations in order for the AHO promulgate the appropriate Notice to Mariners. BHP responded to AMSA with respect to its questions on: 3. Exclusion zones 4. EP socio/economic assessment Section 8.1 relates to the physical presence of vessels and infrastructure. Figure 5-14 includes vessel traffic plotting. Table 12-3 includes reporting and notification requirements including those to AHO and AMSA. BHP considers it has addressed the stakeholder's feedback and no further consultation is required.

Organisation	Summary of Stakeholder and Titleholder Correspondence, and Any Objections and Claims Made	Assessment of Stakeholder Objections and Claims
	have been supported by consultation with stakeholders relevant to these activities and include relevant government departments, representative organisations, commercial fishing licence holders and marine tourism operators. With respect to marine traffic, there are no recognised shipping routes in or near the Operational Area, with the nearest shipping fairway designated by AMSA located over 80 km to the north-west. We would be happy to provide further details on these assessments if you have interest.	
Department of Agriculture, Water and the Environment (DAWE) – Biosecurity (vessels, aircraft and personnel)	DAWE was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022.	No response has been received by DAWE at the time of submission of the EP. BHP has addressed matters relevant to DAWE's interests in the following section of the EP: Section 9.4 relates to risks and management of Introduction of Invasive Marine Species. No further consultation is required.
Department of Agriculture, Water and the Environment (DAWE) – Fisheries	DAWE was provided the Griffin Decommissioning Environment Plans Fact Sheet by email on 31 January 2022.	No response has been received by DAWE at the time of submission of the EP. BHP has addressed matters relevant to DAWE's interests in the following section of the EP: Section 8.1 relates to the physical presence of vessels and infrastructure and includes impacts to fisheries No further consultation is required.
Department of Defence (DoD)	DoD was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022.	No response has been received by DoD at the time of submission of the EP. BHP notes DoD's feedback from previous consultation on Griffin decommissioning activities as the Operational Area is within the North West Exercise Area. BHP also notes DoD's feedback from previous consultation on Griffin decommissioning activities with respect to the potential presence of unexploded ordinances. As per previous consultation, DoD requires notification a minimum of five weeks prior to the commencement of activities, as well as provision of notification to AHO for promulgation of Notices to Mariners. Table 12-3 includes reporting and notification requirements including those to DoD and AHO. Figure 5-15 presents the defence activities in relation to the operational area. No further consultation is required.
Director of National Parks (DNP)	DNP was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. DNP responded on 16 February 2022 seeking clarification on activities to be managed under the EP. DNP also requested a list of equipment specifically being assessed to be abandoned *in situ* under this EP including a list of what is covered by 'selected equipment' and confirm whether the Riser Turret Mooring abandonment will be covered by a future EP. BHP responded on 21 February 2022, advising it had undertaken a single consultation activity with relevant stakeholders for the remaining scope of decommissioning of the Griffin Field and associated infrastructure, which includes the following activities: • Removing residual mercury contamination within the Gas Export Pipeline (GEP) • Abandoning the GEP *in situ* following verification of successful mercury removal and surveying • Abandoning *in situ* selected equipment in the Griffin Field • Constructing, operating and rehabilitating a temporary pumping and liquid storage area (onshore Western Australia). BHP also provided a list of equipment proposed to be left *in situ* in the Griffin Field. DNP responded on 25 February 2022 with the following response: 1. Based on the information sheet provided, we note that the planned activities do not overlap any Australian Marine Parks. You have noted that the operational area is approximately 59 km, 69 km, and 78 km from Ningaloo, Montebello, and Gascoyne marine parks respectively. Therefore, there are no authorisation requirements from the DNP. 2. Given the proximity to the Marine Parks however, activities undertaken may affect the values present in this Marine Park. Based on the map provided, we note that the following biologically important areas (BIAs) are present in the title area and parts of the operational area: • Turtle internesting buffer – flatback turtle • Seabird breeding – wedge-tailed shearwater • Foraging – whale shark • Migration – humpback whale • Distribution – pygmy blue whale	BHP considers it has addressed the stakeholder's feedback and no further consultation is required. BHP has also addressed matters relevant to DNP's interests in the following sections of the EP: BIAs have been presented in Section 5.6.2. Australian Marine Parks have been presented in Section 5.5.4. Table 12-3 includes reporting and notification requirements including those to DNP regarding Australian Marine Parks.

Organisation	Summary of Stakeholder and Titleholder Correspondence, and Any Objections and Claims Made	Assessment of Stakeholder Objections and Claims
	3. We also note that the Key Ecological Feature (KEF) of the Ningaloo Coast World Heritage Area is located nearby to the operational site. These BIAs and the KEF are identified values of the Ningaloo, Montebello and Gascoyne Marine Parks and it is expected that activities that could affect these BIAs are managed accordingly and factored into risk assessments. 4. To enable our consideration of the proposed activity and to identify any claims and objections we may have, we are seeking further detail in regards to the equipment expected to be left *in situ*. Please provide documentation relating to the assessment of options for the decommissioning of the equipment proposed to be left *in situ*, in particular the Riser Turret mooring, and the associated identification of risks to the environment across short, medium and long-term horizons. 5. Please note also that a Sea Dumping permit may be required for leaving equipment *in situ*. The responsible area's contact details can be found on the Department of Agriculture, Water and the Environment's website. Please be aware that engaging with this area of the Department is separate to the Director of National Parks. 6. To assist in the preparation of an EP for petroleum activities that may affect Australian marine parks, NOPSEMA has worked closely with Parks Australia to develop and publish a guidance note that outlines what titleholders need to consider and evaluate. In preparing the EP, you should consider the Australian marine parks and their representativeness. In the context of the management plan objectives and values, you should ensure that the EP: • identifies and manages all impacts and risks on Australian marine park values (including ecosystem values) to an acceptable level and has considered all options to avoid or reduce them to as low as reasonably practicable. • clearly demonstrates that the activity will not be inconsistent with the management plan. 7. The North-west Marine Parks Network Management Plan 2018 (management plan) came into effect on 1 July 2018 and provides further information on values for Ningaloo, Montebello, and Gascoyne marine parks. Australian marine park values are broadly defined into four categories: natural (including ecosystems), cultural, heritage and socio-economic. Information on the values for the marine parks is also located on the Australian Marine Parks Science Atlas. 8. Emergency responses: The DNP should be made aware of oil/gas pollution incidences which occur within a marine park or are likely to impact on a marine park as soon as possible. Notification should be provided to the 24-hour Marine Compliance Duty Officer on 0419 293 465. The notification should include: • titleholder details • time and location of the incident (including name of marine park likely to be affected) • proposed response arrangements as per the Oil Pollution Emergency Plan (e.g. dispersant, containment, etc.) • confirmation of providing access to relevant monitoring and evaluation reports when available; and • contact details for the response coordinator. Note that the DNP may request daily or weekly Situation Reports, depending on the scale and severity of the pollution incident. BHP responded on 3 March 2022 with the following response: 1. Acknowledging DNP's confirmation that the proposed activities do not overlap an Australian Marine Park and that no authorisations were required from the DNP. 2. BHP noted DNP's comments on the presence of BIA's confirmed those BIAs that had been identified and assessed in the EP were: • Turtle internesting buffer – flatback turtle • Seabird breeding – wedge-tailed shearwater • Foraging – whale shark • Migration – humpback whale • Distribution – pygmy blue whale 3. The operational area overlaps one key ecological feature (KEF), the Ancient coastline at 125 m depth contour. 4. BHP provided a summary of infrastructure proposed to be left *in situ*, assessment options and assessment criteria. Of the feasible decommissioning options, BHP's preferred option is removal of contaminants (where applicable) and abandonment *in situ*. BHP confirmed that the options represent the best safety outcomes and preserve the environment that has developed on and around the equipment, minimising disturbance to other users. 5. BHP confirmed it is progressing is progressing discussions with DAWE on the implications for sea dumping permissions for infrastructure proposed to be left *in situ*. 6. BHP noted DNP's provision of its guidance note for the preparation EPs for activities that may impact Australian marine parks and that the EP should: • identify and manage all impacts and risks on Australian marine park values (including ecosystem values) to an acceptable level and consider all options to avoid or reduce them to as low as reasonably practicable • demonstrate that the activity will not be inconsistent with the North-west Marine Parks Network Management Plan 2018. 7. BHP advised DNP it did not anticipate that planned activities will impact the nearest marine parks (Ningaloo, Montebello and Gascoyne marine parks), given their distance from Production Licences WA-10-L and WA-12-L. BHP also confirmed that it had referenced the North-west Marine Parks Network Management Plan 2018 in the planning the EP, as well as the Australian Marine Parks Science Atlas as a source of information on the values for the marine parks. 8. Emergency responses: BHP noted DNPs expectations for notification in the event of a marine pollution occurring within a marine park or is likely to impact on a marine park, and had included DNP contact details in its stakeholder notification matrix in Section 12 of the EP.	
Department of Industry, Science, Energy and Resources (DISER)	DISER was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. DNP	No response has been received at the time of submission of the EP. BHP will address any comments from this stakeholder should they arise in the future.
State Government Departments		

Organisation	Summary of Stakeholder and Titleholder Correspondence, and Any Objections and Claims Made	Assessment of Stakeholder Objections and Claims
Department of Biodiversity, Conservation and Attractions (DBCA)	DBCA was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. DBCA was sent a reminder email on 14 February 2022 with an invitation to provide feedback. DBCA responded on 15 February 2022 and advised it had no comments on proposed activities in relation to its responsibilities under the *Conservation and Land Management Act 1984* and *Biodiversity Conservation Act 2016*.	BHP considers it has addressed the stakeholder's feedback and no further consultation is required.
Department of Mines, Industry Regulation and Safety (DMIRS)	DMIRS was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. DMIRS responded 23 February 2022 advising it would assess the notification and would respond within a target assessment timeframe of 30 calendar days. DMIRS responded on 28 February 2022 with the following response: 1. DMIRS acknowledged that the proposed activity will be assessed under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 and regulated by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA). 2. DMIRS had reviewed the consultation information and did not require further information at this stage 3. DMIRS requested pre-start and cessation of activity notifications 4. DMIRS requested that BHP ensure the EP include: a. Information about the reporting of environmental incidents that could potentially impact on any land or water in State jurisdiction. b. DMIRS contact details for any required notifications or reports. 5. Proposed petroleum activities in State lands and waters will be assessed by DMIRS following submission of an associated Environment Plan. BHP responded on 6 December 2021 with the following response: 1. BHP noted DMIRS acknowledgement that the EP would be assessed by NOPSEMA 2. BHP noted DMIRS required no further information 3. BHP confirmed it would notify DMIRS prior to and following the cessation of activities 4. BHP confirmed the EP would include information about the reporting of environmental incidents that could potentially impact on any land or water in State jurisdiction, including requested contact details for DMIRS. 5. BHP notes that feedback on State waters EPs are outside the scope of this EP.	DMIRS notes DMIRS request for pre-start and cessation of activity notifications. Table 12-3 includes reporting and notification requirements including those to DMIRS. The petroleum activities OPEP (Appendix E) includes notifications required should a spill impact State waters.
Department of Primary Industries and Regional Development (DPIRD)	DPIRD was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022.	No response has been received by DPIRD at the time of submission of the EP. BHP has addressed matters relevant to DPIRDs interests in the following section of the EP: The petroleum activities OPEP (Appendix E) includes notifications required should a spill impact State waters. No further consultation is required.
Department of Transport (DoT)	DoT was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. DoT responded on 31 January 2022 acknowledging receipt of BHP's advice. DoT responded on 7 February 2022 with the following response: 1. If there is a risk of a spill impacting State waters from the activity, please ensure that the Department of Transport is consulted as outlined in the Department of Transport Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (July 2020). BHP provided DoT with a copy of the Griffin Decommissioning OPEP on 17 January 2022. Correspondence with DoT regarding the OPEP is provided in the Griffin Decommissioning and Field Management Environment Plan (GV-HSE-E00014). DoT responded on 17 March 2022, confirming receipt of the updated OPEP. The DoT confirmed that is was satisfied that the changes made to the OPEP had addressed all comments raised by DoT. The DoT requested BHP keep it updated on any future changes made to the EP or OPEP and to send final plans through once accepted by NOPSEMA	The petroleum activities OPEP (Appendix E) includes notifications required should a spill impact State waters. No further consultation is required.
Ningaloo Coast World Heritage Advisory Committee (NCWHAC)	NCWHAC was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022.	No response has been received at the time of submission of the EP. BHP will address any comments from this stakeholder should they arise in the future.
Fishing Bodies / Industry Representative Organisations		
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	ASBTIA was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. ASBTIA was sent a reminder email on 14 February 2022 with an invitation to provide feedback.	No response has been received from ASBTIA at the time of submission of the EP. Section 8.1 relates to the physical presence of vessels and infrastructure and includes impacts to fisheries. BHP will address any comments from this stakeholder should they arise in the future.
Commonwealth Fisheries Association (CFA)	CFA was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. CFA was sent a reminder email on 14 February 2022 with an invitation to provide feedback.	No response has been received from CFA at the time of submission of the EP. BHP will address any comments from this stakeholder should they arise in the future.
Marine Tourism WA	MTWA was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. MTWA was sent a reminder email on 14 February 2022 with an invitation to provide feedback.	No response has been received from Marine Tourism WA at the time of submission of the EP. BHP will address any comments from this stakeholder should they arise in the future.

Organisation	Summary of Stakeholder and Titleholder Correspondence, and Any Objections and Claims Made	Assessment of Stakeholder Objections and Claims
Pearl Producers Association (PPA)	PPA was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. PPA was sent a reminder email on 14 February 2022 with an invitation to provide feedback.	No response has been received from PPA at the time of submission of the EP. Section 8.1 relates to the physical presence of vessels and infrastructure and includes impacts to fisheries. BHP will address any comments from this stakeholder should they arise in the future.
Recfishwest	Recfishwest was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. Recfishwest responded on 23 February and providing the following feedback: 1. Recfishwest provided an overview of recreational fishing activities in the Gascoyne and Pilbara regions, noting its importance to regional communities and economies. 2. Recfishwest provided comment on opportunities for healthy and resilient marine ecosystems through the creation and retention of key marine habitats from artificial reefs. Recfishwest also provided information on its experience in how marine infrastructure can benefit the environment, fishing experiences and communities. 3. Recfishwest advised while it supported retaining marine infrastructure on the principle that these structures provide important ecosystem services and overall environmental benefit, its support for such projects were dependent on five reefing principles. Recfishwest added that it did not object with the steps being taken by BHP to address concerns that the recreational fishing sector might have. 4. Recfishwest also added that abandoned infrastructure should be augmented with purpose-built concrete artificial reef modules, particularly in the section commencing in line with Ashburton Island to Commonwealth waters. This would ensure minimum productive volume required for ecological productivity of the marine communities associated with the equipment. In addition, it would increase the social and economic benefits to the local communities of Exmouth and Onslow through increased fishing opportunities. 5. Recfishwest requested further updates on the progress on these decommissioning activities, so it can make sure its constituents are well aware of any planned activities that are due to take place in the area. 6. Additionally, Recfishwest requested to be consulted on any upcoming offshore decommissioning activities, irrespective of the distance from shore and that all charts are updated, so recreational fishers can locate the structure. BHP responded on 2 March 2022 and provided the following response: 1. BHP noted the information provided on recreational fishing in the Gascoyne/Pilbara, including its contribution to economic and social well-being of regional communities. 2. BHP also noted Recfishwest's comments on the proximity of the Griffin Field to fishing grounds, as well as opportunities for artificial reefs or alternative decommissioning strategies that can be achieved from the decommissioning of oil and gas infrastructure, in turn creating healthy and resilient marine ecosystems through the creation and retention of key marine habitats. BHP advised it had considered a number of decommissioning options for the Griffin Field, and sought feedback from a broad range of stakeholders through an independently facilitated Comparative Assessment process in 2021 as part of decision-making for the proposed end-state of the Griffin Field. BHP advised it had since progressively engaged stakeholders on our plans for decommissioning by way of meetings with regional communities, and stakeholders with interests in commercial and recreational fishing, and marine tourism. These discussions also include consultation activities for Environment Plan approvals to undertake specific activities, including the provision of information to Exmouth, Onslow and Dampier-based fishing clubs. 3. BHP noted Recfishwest's positon on its expectations for supporting reefing opportunities, including its five key principles, and that Recfishwest does not object with the steps being taken by BHP to address concerns that the recreational fishing sector might have with respect to environmental safety and benefits. 4. BHP acknowledged that Recfishwest's preference for structure augmentation. BHP advised it approaches decommissioning on a case-by-case basis. On this occasion, augmentation was not progressed as an option for the pipeline due to its length and complexity of regulatory permissioning. 5. BHP noted Recfishwest's request to receive further updates on the progress on these decommissioning activities, so its constituents are aware of planned activities that are due to take place in the area. 6. BHP also noted Recfishwest's request to be consulted on future offshore decommissioning activities and that the location of infrastructure left in situ will be maintained on nautical charts.	BHP notes Recfishwest's feedback that it did not object to proposed activities and its requests to keep updated on decommissioning of the Griffin Field. BHP will update Recfishwest on the progress of decommissioning activities, so its constituents are aware of planned activities that are due to take place in the area. BHP will continue to consult Recfishwest on future offshore decommissioning activities and the location of infrastructure left in situ. BHP also notes Recfishwest's general comments on economic and community benefits of recreational fishing, opportunities and principles for artificial reefing, its preference for augmentation and request to be consulted on other BHP decommissioning activities. Section 8.1 relates to the physical presence of vessels and infrastructure and includes impacts to fisheries.
Tuna Australia	Tuna Australia was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. Tuna Australia was sent a reminder email on 14 February 2022 with an invitation to provide feedback. Tuna Australia responded on 21 February 2022, advising it had no objections proposed activities, as its members did not currently fishing in the areas identified in the activity overview.	BHPs notes advice and from Tuna Australia and no further consultation is required. Section 8.1 relates to the physical presence of vessels and infrastructure and includes impacts to fisheries.
Western Australian Fishing Industry Council (WAFIC)	WAFIC was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. WAFIC responded on 10 February and requested the following information, following receipt of which WAFIC would provide a formal response: • Images of the proposed infrastructure that is expected to remain *in situ* • The estimated final footprint, including what navigational safety are expected following decommissioning activities. • Confirmation if any plastic type material is proposed to be left *in situ*	BHP has responded to WAFIC's request for information and considers it has addressed the stakeholder's feedback. BHP will continue to consult with WAFIC on the proposed decommissioning. Section 8.1 relates to the physical presence of vessels and infrastructure and includes impacts to fisheries.

Organisation	Summary of Stakeholder and Titleholder Correspondence, and Any Objections and Claims Made	Assessment of Stakeholder Objections and Claims
	BHP responded on 16 February 2022 by way of a phone call and an email with a presentation covering the proposed decommissioning activities and requested a meeting. WAFIC responded on 3 March 2022 requesting an assessment of fisheries interaction for proposed activities. BHP responded on 4 March 2022, providing an assessment of the likelihood of fisher interaction (Commonwealth and State-managed fisheries) in the Operational Area and the Environment that May be Affected (EMBA) for Griffin decommissioning activities.	
Commercial Fisheries – State Managed		
• Onslow Prawn Managed Fishery • Pilbara Fish Trawl Interim Managed Fishery • Pilbara Line Fishery • Pilbara Trap Managed Fishery • Mackerel Managed Fishery	Licence holders were provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by letter/email on 31 January 2022. Licence holders were sent a reminder letter/email on 14 February 2022 with an invitation to provide feedback. Licence holders in the Mackerel Managed Fishery were provided with Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by letter/email on 18 March 2022.	No response has been received from State managed fishery licence holders at the time of submission of the EP. Section 8.1 relates to the physical presence of vessels and infrastructure and includes impacts to fisheries. BHP will address any comments from this stakeholder should they arise in the future.
Other stakeholders		
Local Government • Shire of Ashburton (SoA) • Shire of Exmouth (SoE)	SoA and SoE were provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. SoA responded on 2 February 2022 advising that BHPs consultation email had been forwarded to the Shire's Waste Team for response, noting that the Shire's C4 land site was a primary opportunity for managing waste streams. SoA was sent a reminder email on 4 March 2022 with an invitation for the Waste Team to provide feedback.	BHP notes initial feedback and will address any comments from SoA or SoE should they arise in the future.
Community Reference Groups (CRGs) • Exmouth Community Reference Group • Onslow Community Reference Group	The latest Exmouth CRG meeting was held on 4 October 2021 and included an overview of BHP's proposed Griffin activities. An Exmouth CRG meeting was scheduled for March 2022, but has been cancelled due to COVID. Exmouth and Onslow CRGs were provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022.	No response has been received from the Exmouth and Onslow CRGs at the time of submission of the EP. BHP will address any comments from this stakeholder should they arise in the future.
Indigenous • Buurabalayji Thalanyji Aboriginal Corporation (BTAC)	BTAC was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 3 March 2022.	No response has been received from BTAC at the time of submission of the EP. BHP will address any comments from this stakeholder should they arise in the future.
Industry • Exmouth Chamber of Commerce and Industry (ECCI) • Onslow Chamber of Commerce and Industry (OCCI)	ECCI and OCCI were provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022.	No response has been received from the ECCI or OCCI at the time of submission of the EP. BHP will address any comments from this stakeholder should they arise in the future
Fishing clubs • King Bay Fishing Club (Dampier) • Nickol Bay Fishing Club (Dampier) • Ashburton Anglers (Onslow) • Exmouth game Fishing Club (Exmouth)	Dampier, Onslow and Exmouth-based fishing clubs were provided the Griffin Decommissioning Environment Plans Fact Sheet by email on 31 January 2022. Ashburton Anglers responded on 11 February 2022 endorsing BHP's proposal to: 1. Remove contaminants and leave the GEP *in situ*. 2. Remove contaminants and leave as much of the Griffin Field infrastructure as possible. Ashburton Anglers also noted this feedback was consistent with its original feedback at the start of the decommissioning process. BHP responded to Ashburton Anglers on 23 February 2022, noting its feedback. Dampier and Exmouth-based fishing clubs were sent a reminder email on 14 February 2022 with an invitation to provide feedback.	BHP notes feedback from Ashburton Anglers and considers it has addressed the stakeholder's feedback and no further consultation is required. BHP will address any comments from Dampier and Exmouth fishing clubs should they arise in the future.
Charter Boat / Marine Tourism Operators • Dampier • Onslow • Exmouth	Dampier, Onslow and Exmouth-based charter boat / marine tourism operators were provided the Griffin Decommissioning Environment Plans Fact Sheet by email on 31 January 2022. Dampier, Onslow and Exmouth-based charter boat / marine tourism operators were sent a reminder email on 14 February 2022 with an invitation to provide feedback. • A Dampier-based operator advised that areas BHP mentioned do not interfere with its operations and have no objection on what you BHP is proposing. BHP acknowledged the stakeholder's feedback on 3 March 2022.	No response has been received from State managed fishery licence holders at the time of submission of the EP. Section 8.1 relates to the physical presence of vessels and infrastructure and includes impacts to fisheries. BHP will address any comments from this stakeholder should they arise in the future.
Cape Conservation Group (CCG)	The CCG was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022.	No response has been received from CCG at the time of submission of the EP. BHP will address any comments from this stakeholder should they arise in the future.

Organisation	Summary of Stakeholder and Titleholder Correspondence, and Any Objections and Claims Made	Assessment of Stakeholder Objections and Claims
Australian Maritime Oil Spill Centre (AMOSC)	AMOSC was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022. BHP provided AMOSC with a copy of the Griffin Decommissioning OPEP by email on 17 January 2022. Correspondence with AMOSC regarding the OPEP is provided in the Griffin Decommissioning and Field Management Environment Plan (GV-HSE-E00014). AMOSC responded by email on 18 January 2022 acknowledging receipt of the OPEP and that its records would be updated.	No response has been received from AMOSC at the time of submission of the EP. BHP will address any comments from this stakeholder should they arise in the future. No further consultation is required with respect to the OPEP.
Centre of Decommissioning Australia (CODA)	CODA was provided the Griffin Decommissioning Environment Plans Fact Sheet (Appendix J) by email on 31 January 2022.	No response has been received from CODA at the time of submission of the EP. BHP will address any comments from this stakeholder should they arise in the future.

6.2 Ongoing Consultation

Stakeholder consultation will be ongoing, and BHP will work with stakeholders to address any future concerns if they arise throughout the validity of this EP. Should any new stakeholders be identified, they will be added to the stakeholder database and included in all future correspondence as required.

BHP's commitments to ongoing consultation include:

- Continued quarterly Exmouth and Onslow CRG meetings.
- Responding in a timely manner to all stakeholder and community contact regarding the proposed Griffin decommissioning activities.
- Stakeholders who raise objections and claims following EP submission will be responded to directly, and should any concerns raised have not already been addressed in the EP, these will be assessed in the same manner as all risks identified by BHP.

7 BHP Environmental Risk Management Framework

BHP has established a risk management governance framework with supporting processes and performance requirements that provide an overarching and consistent approach for identifying, assessing, and managing risks. BHP Policies have been formulated to comply with the intent of the Risk Management Policy and are consistent with the AS/ISO 31000-2009 Risk Management Principles and Guidance.

An integrated risk assessment and impact process is used to identify the most appropriate management strategy and relevant controls to reduce impacts and risks from planned (routine and non-routine) activities and unplanned (accidents/incidents) events to ALARP and acceptable levels (Figure 7-1). The process includes incorporating historic stakeholder and legal and environmental monitoring data for the relevant environmental impacts.

7.1 Evaluation of Impacts and Risks

The primary objective of the impact and risk assessment is to demonstrate that the identified impacts and risks associated with the petroleum activity (Section 3) are reduced to ALARP and are of an acceptable level to BHP. An environment hazard identification (ENVID) workshop was conducted in January 2022 to support the impact and risk assessment and involved participants from the BHP HSE, projects and engineering departments and specialist environmental consultants.

The impact and risk assessment process is illustrated in Figure 7-1 and considers planned (routine and non-routine) activities, unplanned (accidents/incidents) events and emergency conditions. The process includes:

- confirming the sources of hazards for the planned activities and unplanned events
- identifying environmental impact and risk receptors
- analysing environmental impact and risk receptors
- identifying potential controls to reduce the impacts and risks
- allocating a likelihood rating for all unplanned events
- allocating a severity rating for all planned activities and unplanned events
- accepting controls through an ALARP process
- assessing final acceptability of the risks and impacts using the BHP acceptability criteria.

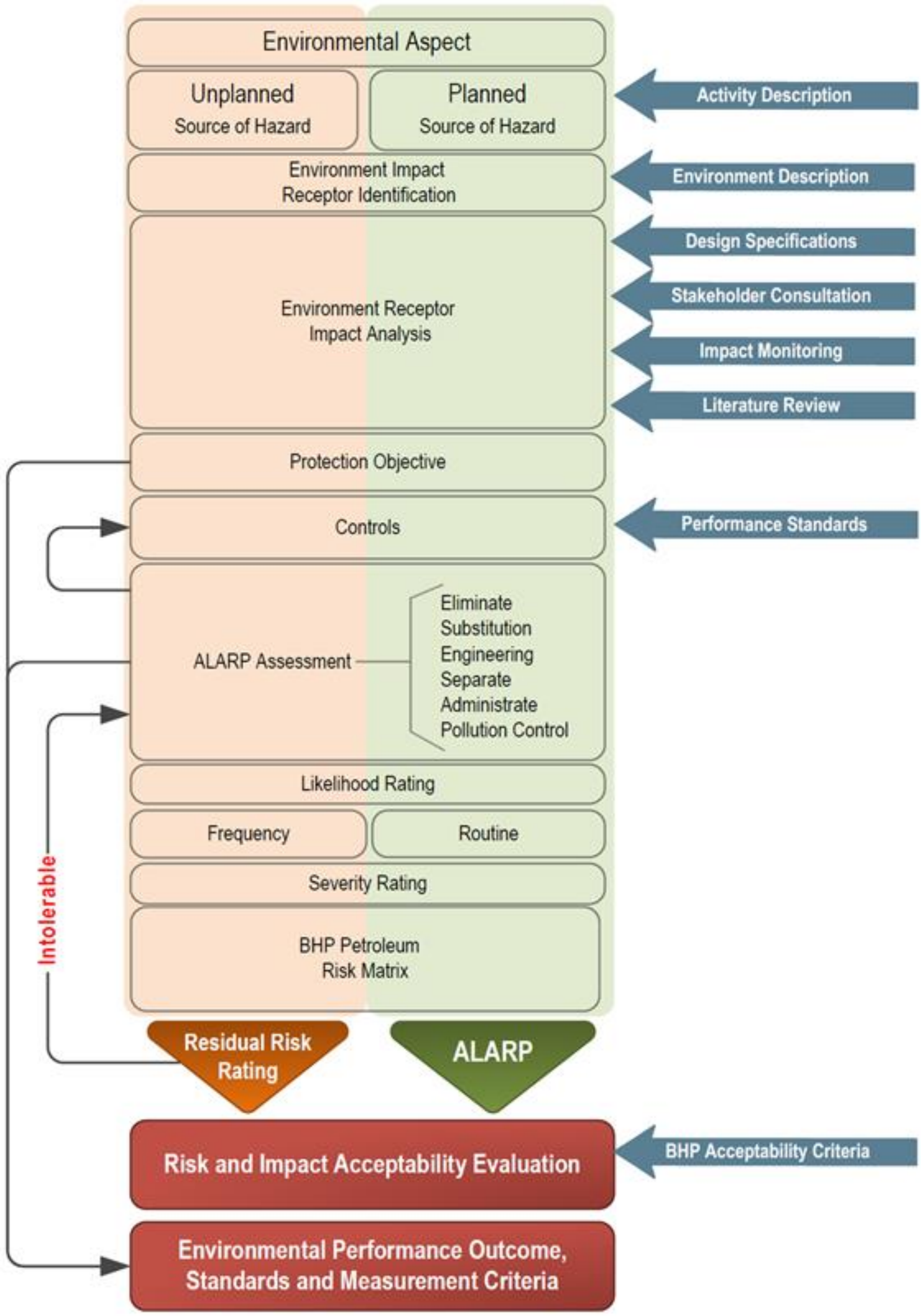


Figure 7-1: Environment Plan Integrated Impact and Risk Assessment Process

7.1.1 Decision Context

Consistent with the United Kingdom Offshore Operators Association Framework for Risk-Related Decision Support (Oil & Gas UK, 2014), BHP has applied decision criteria to determine whether impacts and risks created during the petroleum activity constitute 'lower-order' or 'higher-order' impacts and risks, and subsequently how each are managed to ALARP (Section 7.2) and acceptable levels (Section 7.3). This approach implies a level of proportionality wherein the principles of decision-making applied to each particular hazard are proportionate to the acceptability of environmental risk of that hazard.

<u>BHP considers lower-order (or 'Type A') impacts or risks as those that:</u>

- are well understood
- are derived from standard, non-complex, or routine operations familiar to BHP
- there are clearly defined regulatory, corporate or industry (good practice) controls to manage the impact or risk
- have no concerns or objections from relevant stakeholders
- have a 'severity level' for planned operations (impacts) and unplanned events (risks) that does not exceed '2' based upon the BHP severity level definition (Figure 7-3)
- have a 'likelihood' for unplanned events that is either 'unlikely' or 'highly unlikely' based upon the BHP likelihood definitions (Figure 7-4).

<u>BHP considers higher-order (or 'Type B') impacts or risks as those that:</u>

- are not well understood or there is some uncertainty
- are derived from complex operations not routinely performed by BHP
- have regulatory, corporate or industry (good practice) controls that require additional definition or validation
- have had some concerns or objections raised by relevant stakeholders
- have a 'severity level' for planned operations (impacts) and unplanned events (risks) that is '3' based upon the BHP severity level definition (Figure 7-3)
- have a 'likelihood' for unplanned events that is considered 'probable' to 'highly likely' based upon the BHP likelihood definitions (Figure 7-4).

<u>BHP considers highest-order (or 'Type C') impacts or risks as those that:</u>

- are not understood or there is a high degree of uncertainty
- are derived from operations not previously performed by BHP
- have corporate or industry (good practice) controls that either do not exist or are insufficient to manage impacts or risks
- have had multiple concerns or objections raised by relevant stakeholders or lobby groups
- have a 'severity level' for planned operations (impacts) and unplanned events (risks) that is equal to or exceeds '4' based upon the BHP severity level definition (Figure 7-3)
- have a 'likelihood' for unplanned events that is considered 'probable' to 'highly likely' based upon the BHP likelihood definitions (Figure 7-4).

The decision-making principles described above are consistent with the precautionary principle (as defined in the EPBC Act) and provide assurance that the environmental impacts and risks are reduced to ALARP and of an acceptable level.

7.1.2 Environmental Impact Analysis

The environmental impact analysis is based on the environmental receptors identified in Section 5. Impact and risk descriptions are developed in an initial screening process that identifies the specific receptor that may be impacted. Quantitative or qualitative definition of the impact and risk may be completed to ensure an understanding of and to confirm the severity of the risk and impact.

7.1.3 Planned Activity Assessment

All planned activities were assessed as being a routine impact and defined as such in the ENVID. The description and degree of impact formed the basis for the severity rating applied, with a quantitative assessment of impact conducted where possible to ensure the impact was well understood and clearly categorised on the severity table. Where this was not possible, a robust qualitative assessment was completed and the severity rating assigned during the ENVID process in accordance with the BHP HSE Risk Matrix, which is consistent with the BHP Our Requirements Risk Management Severity Table (Figure 7-3), taking into account any of the mitigative controls assigned. Given routine operations are planned, and impacts are mitigated by applying control measures, likelihood or residual risk ratings were not applied.

7.1.4 Unplanned Event Risk Assessment

Risk ranking of an unplanned event is the product of the consequence of an event (the severity) and the likelihood of that event occurring.

Likelihood and potential severity ratings were assigned in accordance with the BHP HSE Risk Matrix PHSE-03-PO1 (Figure 7-2), which allowed the risk of individual events to be categorised in a methodical and structured process. This was completed based upon judgement by the ENVID assessment team, with detailed potential impact descriptions used to ensure a robust and comprehensive decision.

The likelihood rating was based on the frequency of the source of hazard occurring with all preventative controls taken into consideration.

The potential severity rating was determined based on the potential impact that may occur once the source of hazard had occurred, considering any mitigative controls in place to reduce the impact.

Likelihood	Severity Level				
	1	2	3	4	5
Highly Likely	30	90	300	900	3000
Likely	10	30	100	300	1000
Probable	3	9	30	90	300
Unlikely	1	3	10	30	100
Highly Unlikely	0.3	0.9	3	9	30

Figure 7-2: BHP Risk Matrix

Severity Page #11	Descriptor	Severity Factor
5	6 or more fatalities or 6 or more life shortening illnesses; or Severe impact to the environment and where recovery of ecosystem function takes 10 years or more; or Severe impact on community lasting more than 12 months or a substantiated human rights violation impacting 6 or more people; or Severe impact on company reputation, investment attractiveness, legal rights or compliance, social value proposition or ability to access opportunities at a global level; or US$2 billion or more[2].	1000
4	1-5 fatalities or 1-5 life shortening illnesses; or Serious impact to the environment, where recovery of ecosystem function takes between 3 and up to 10 years; or Serious impact on community lasting 6-12 months or a substantiated human rights violation impacting 1-5 persons; or Serious impact on company reputation, investment attractiveness, legal rights or compliance, social value proposition or ability to access opportunities at a national level; or Between US$250 million and up to US$2 billion[2].	300
3	Life altering or long term/permanent disabling injury or illness to one or more persons; or Substantial impact to the environment, where recovery of ecosystem function takes between 1 and up to 3 years; or Substantial impact on community lasting 2-6 months; or Substantial impact on company reputation, legal rights or compliance, social value proposition, or ability to access opportunities at a sub national level (state, territory, province); or Between US$50 million and up to US$250 million[2].	100
2	Non-life altering or short-term disabling injury or illness to one or more persons; or Measureable but limited impact to the environment, where recovery of ecosystem function takes less than 1 year; or Measureable but limited community impact lasting less than one month; or Measureable but limited impact on company reputation, legal rights or compliance, or social value proposition at a local level (region, city, town); or Between US$2 million and up to US$50 million[2].	30
1	Low level impact resulting in first aid only; or Minor, temporary impact to the environment, where the ecosystem recovers with little intervention; or Minor, temporary community impact that recovers with little intervention; or Minor, temporary impact on company reputation, legal rights or compliance, or social value proposition; or Less than US$2 million[2].	10

Figure 7-3: BHP Severity Level Definitions

Uncertainty	Frequency	Likelihood factor
Highly Likely	Likely to occur within a 1 year period.	**3**
Likely	Likely to occur within a 1 - 5 year period.	**1**
Probable	Likely to occur within a 5 - 20 year period.	**0.3**
Unlikely	Likely to occur within a 20 - 50 year period.	**0.1**
Highly Unlikely	Not likely to occur within a 50 year period.	**0.03**

Figure 7-4: BHP Likelihood Definitions

7.2 Demonstration of As Low As Reasonably Practicable

Regulation 10A(b) of the Environment Regulations requires demonstration that the environmental impacts and risks of the activity will be reduced to ALARP.

7.2.1 Planned Activity and Unplanned Event As Low As Reasonably Practicable Evaluation

This section details the process for demonstrating ALARP for both planned routine operations and unplanned events.

Demonstrating ALARP for lower-order (‘Type A’) impacts or risks

When an impact or risk has been evaluated as ‘lower-order’ based upon the Decision Context detailed in Section 7.1.1, and identified regulatory, corporate and industry good practice controls are implemented, BHP considers the impact or risk to be managed to ALARP and no further detailed engineering evaluation of controls is required. The application of feasible and readily implementable alternate, additional or improved controls may be adopted opportunistically when demonstrated to further reduce potential environmental impacts or risks.

Demonstrating ALARP for higher-order (‘Type B’) impacts or risks

When an impact or risk has been evaluated as higher order based upon the Decision Context detailed in Section 7.1.1, in addition to relevant regulatory, corporate and industry good practice controls being implemented, alternate, additional or improved controls should be proposed and evaluated according to their feasibility, reasonableness and practicability to implement to further reduce the potential for impacts and risks associated with the petroleum activity. BHP applies a cost and benefit analysis when evaluating additional controls and applies those that are both feasible and where the cost (safety, time, effort and financial) are not grossly disproportionate to the potential reduction in environmental impact or risk afforded by the control.

Demonstrating ALARP for highest-order (‘Type C’) impacts or risks

When an impact or risk has been evaluated as highest-order based upon the Decision Context detailed in Section 7.1.1, alternate, additional or improved controls over and above relevant regulatory, corporate and industry good practice must be proposed and evaluated based upon a precautionary approach, ensuring any and all feasible controls that have the potential to reduce environmental impacts and risks are implemented, when safe to do so and irrespective of the additional effort, time or financial cost associated with implementing the control.

When evaluating additional controls for ‘Type B’ and ‘Type C’ impacts and risks, BHP has applied the hierarchy of controls as defined below and illustrated in Figure 7-5:

- Eliminate – Remove the source preventing the impact; in other words, eliminate the hazard.
- Substitution – Replace the source preventing the impact.
- Engineer – Introduce engineering controls to prevent or control the source having an impact.

- Separate – Separate the source from the receptor preventing impact.
- Administrate – Procedures, competency and training implemented to minimise the source causing an impact.
- Pollution Control – Implement a pollution control system to reduce the impact.
- Contingency Planning – Mitigate control reducing the impact.
- Monitor – Program or system used to monitor the impact over time.

The general preference is to accept controls that are ranked in the Tier 1 categories of Eliminate, Substitute, Engineer and Separate as these controls provide a preventive means of reducing the likelihood of the hazard occurring over and above Tier 2 controls.

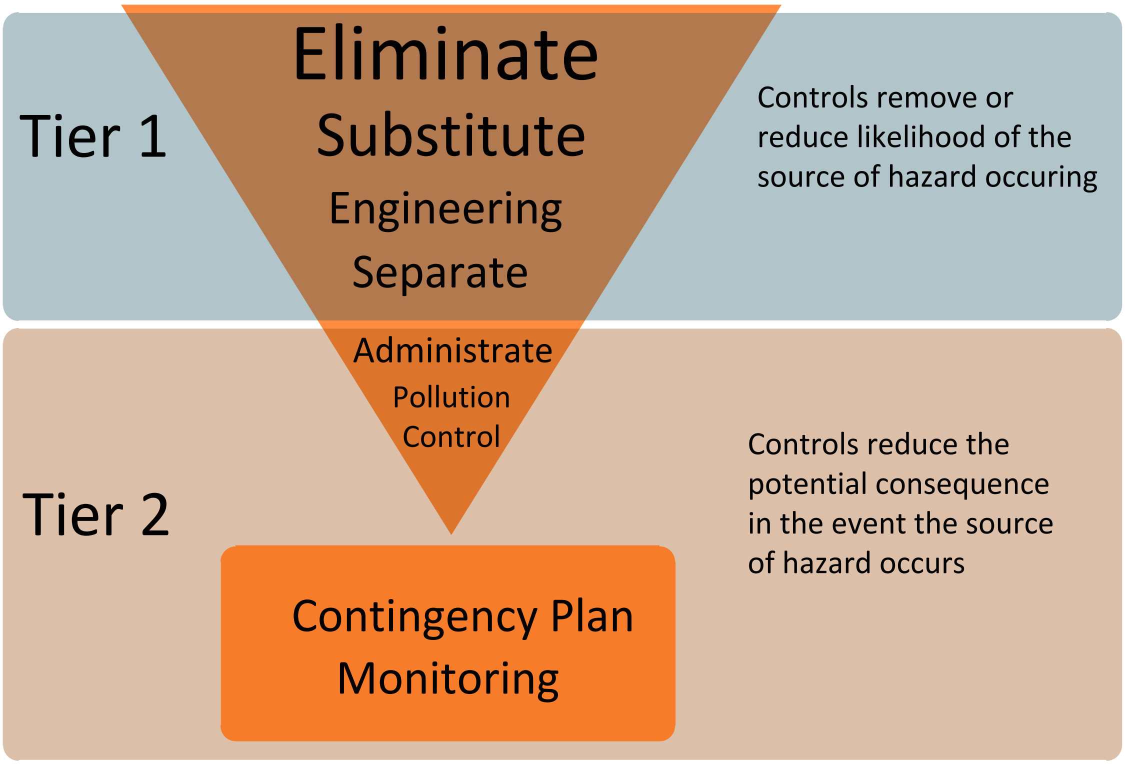


Figure 7-5: Hierarchy of Control Framework

7.2.2 Spill Response Strategy Effectiveness and As Low As Reasonably Practicable Evaluation

In developing the environmental performance standards that apply to each response strategy, BHP has considered the level of performance that is reasonable to achieve for each control measure and the 'effectiveness' of the control measures.

The effectiveness of the control measures is assessed by considering:

- availability: the status of availability to BHP
- functionality: a measure of functional performance
- reliability: the probability that the control will function correctly
- survivability: the potential of the control measure to survive an incident
- independence/compatibility: the degree of reliance on other systems and/ or controls, in order to perform its function.

These criteria follow the definitions in NOPSEMA's Control Measures and Performance Standards Guidance Note (NOPSEMA, 2020a), with ranking provided in Table 7-1.

Table 7-1: Criteria for Ranking Spill Response Effectiveness

Evaluation Criteria	Response Effectiveness Ranking	
	Low	High
Availability	BHP does not have equipment and resources on standby, or contracts, arrangements, and Memorandums of Understanding in place for providing equipment and resources. BHP has internal processes and procedures in place to expedite timely provision of equipment and resources.	BHP has equipment and resources on standby, or contracts, arrangements or Memorandums of Understanding in place for providing equipment and resources.
Functionality	Implementation of the control measure does not greatly reduce the risk and impact.	Implementation of the control measure has material difference in reducing the risk and impact.
Reliability	The control measure is not reliable (for example, has not been tried and tested in Australian waters) or low assurance can be given to its success rate and effectiveness.	The control measure is reliable (for example, has been tried and tested in Australian waters) or high assurance can be given to its success rate and effectiveness.
Survivability	The control measure has a low operating timeframe and will need to be replaced regularly throughout its operation period in order to maintain its effectiveness.	The control has a high operating timeframe and will not need to be replaced regularly throughout its operation period in order to maintain its effectiveness.
Independence/ Compatibility	The control relies on other control measures being in place or the control measure is incompatible with other control measures in place.	The control does not depend on other control measures being in place or the control measure can be implemented in unison with other control measures.

Each control was then evaluated, considering the environmental benefit gained from implementation compared with its practicability (in other words, control effectiveness, cost, response capacity and implementation time) to determine if the control was either:

- accept and implement, or
- reject.

This traffic light system is used in the ALARP demonstration tables where the 'do nothing' option is rejected, along with a scalable option that generally involves mobilising spill response resources and equipment to site and on standby. Accepted controls in all the ALARP demonstration tables indicate those that would be implemented as part of the response.

Applying principles similar to those presented within the United Kingdom Offshore Operators Association Framework for Risk Related Decision Support (Oil & Gas UK, 2014), as described in Section 7.1.1 of this EP, BHP has adopted the following criteria for determining spill response strategy preparedness that present a lower-order risk compared to those that present a higher-order risk:

- A spill response strategy is determined to present a lower-order risk where all controls have been ranked as 'high' according to the criteria for ranking spill response effectiveness (These criteria follow the definitions in NOPSEMA's Control Measures and Performance Standards Guidance Note (NOPSEMA, 2020a), with ranking provided in Table 7-1 and additional controls would unlikely reduce potential environmental impacts and risks further. As such, BHP has considered 'Type A' spill response strategies to be managed to ALARP.
- A spill response strategy is determined to present a higher-order risk where one or more controls have been ranked as 'low' according to the criteria for ranking spill response effectiveness (Table 6.1) and additional controls would likely reduce potential environmental impacts and risks further. As such, alternate, additional, or improved controls should be proposed in an attempt to increase their effectiveness ranking to 'high'. Where improved controls have been identified but are not readily available, an improvement plan has been developed to meet the oil spill response need before performing the activity.

BHP's ALARP assessment for resourcing for each spill response strategy is presented within Appendix H.

7.3 Demonstration of Acceptability

Regulation 10A(c) of the Environment Regulations requires demonstration that the environmental impacts and risks of the activity will be of an acceptable (tolerable) level.

The demonstration of acceptability is completed independently of the ALARP evaluation described above. However, as with the demonstration of ALARP, the demonstration of acceptability detailed below applies the decision-making principles described in Section 7.1.1, ensuring consistency with the precautionary principle when considering the acceptable levels of impact and risk caused by the activity.

Demonstrating acceptability for lower-order (‘Type A’) and higher-order (‘Type B’) impacts or risks

When an impact or risk has been evaluated as ‘lower-order’ or ‘higher-order’ based upon the Decision Context detailed in Section 7.1.1, acceptability of the impact or risk is evaluated based upon the following criteria:

- Relevant regulatory, corporate and industry good practice controls have been identified and implemented, including consideration of relevant actions prescribed in recovery plans and approved conservation.
- The activity does not contravene any relevant Plan of Management for a World Heritage place, National Heritage place or Ramsar wetland identified within the EMBA.
- Any alternate, additional or improved controls adopted via the detailed engineering risk assessment have been or will be implemented to manage potential impacts and risks to ALARP.
- There are either no objections or claims made by relevant stakeholders for the aspect of the activity being assessed, or any objections or claims received from relevant stakeholders are assessed for merit and controls adopted to address the objections or claims where merited.
- Where industry good practice cannot be adopted, professional judgement made by subject matter experts have been used to evaluate the acceptability of potential environmental impact or risk based upon adoption of alternate, additional or improved controls identified during detailed engineering risk assessment.
- Consideration of relevant actions prescribed in listed species recovery plans, conservation advice and threat abatement plans have informed the development of control measures.
- The application of adopted controls clearly indicates the aspect-specific EPOs can be achieved.
- The proposed impact is consistent with the principles of Ecologically Sustainable Development (ESD) (as defined in Section 3A of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)), including:
  - Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations (the ‘integration principle’)
  - If there are threat of serious or irreversible damage lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (the ‘precautionary principle’)
  - The principle of intergenerational equity- that the present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (the ‘intergenerational principle’)
  - The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making (‘the biodiversity principle’).

Demonstrating acceptability for highest-order (‘Type C’) impacts or risks

When an impact or risk has been evaluated as ‘highest-order’ based upon the Decision Context detailed in Section 7.1.1, the potential environmental impact or risk can only be deemed acceptable once the criteria for ‘Type B’ demonstration of acceptability detailed above has been met and:

- any alternate, additional or improved controls adopted via implementing a precautionary approach can demonstrate residual impacts have been lowered, such that a severity level of ‘4’ becomes ‘unlikely’ or the severity level of ‘5’ becomes ‘highly unlikely’ based upon the BHP Risk Matrix (Figure 7-2).

7.4 Environmental Performance Outcomes, Environmental Performance Standards and Measurement Criteria

Regulation 10A(d) of the Environment Regulations requires the EP provides appropriate EPOs, environmental performance standards (EPSs) and measurement criteria (MC).

An objective of the EP is to ensure all activities are performed in accordance with appropriate EPSs, thus ensuring EPOs are achieved. This requires (among other things) appropriate measurement criteria for demonstrating the EPSs have been met as defined within the EP.

Establishing EPOs and EPSs involves a process of taking into account legal requirements and the environmental risks (described in the risk assessment presented in Sections 8 and 9), and considering available control options (Sections 8 and 9), and the views of interested parties (Section 6). The resulting outcomes and standards must be measurable where practicable and consistent with the BHP Charter.

7.4.1 Environmental Performance Outcomes

EPOs are developed to ensure protection of the environment from the impact or risk and to ensure ongoing performance and measurability of the controls. These were developed using the below criteria:

- Be specific to the source of the hazard.
- Indicate how the environmental impact will be managed (for example, minimise or prevent).
- Contain a statement of measurable performance (where applicable).
- Contain a timeframe for action (where applicable).
- Be consistent with legislative and HSE requirements.

7.4.2 Environmental Performance Standards

An EPS is a statement of performance required from a control measure (a system, an item of equipment, a procedure or functional responsibility (person)), which is used as a basis for managing environmental impact and risk, for the duration of the activity.

There is a specific link between the EPOs, the EPSs and control measures; each EPO has one or more standards defining the performance requirement that needs to be met by a control measure to meet the EPO.

EPSs detailed within this EP are specific, measurable and achievable.

7.4.3 Environmental Measurement Criteria

MCs have been assigned for each EPS as a means of validating that each EPO and EPS will be or has been met throughout the duration of the petroleum activity, thus continually reducing environmental impacts and risks to ALARP and acceptable levels.

All MCs are designed to be inspected or audited via compliance assurance activities and enable a traceable record of performance to be maintained.

EPOs, EPSs and MCs, both in relation to planned activities and unplanned events, have been detailed throughout Sections 8 and 9.

EPOs, EPSs and MCs relating to oil spill response preparedness and effectiveness of the response strategy are detailed within the petroleum activity OPEP (GV-HSE-ER-0011) (Appendix E).

EPOs, EPSs and MCs relating to Incident Management Team (IMT) capability and competency are detailed within the APU Incident Management Team Capability Assessment (AOHSE-ER-0071).

8 Environmental Risk Assessment and Evaluation: Planned Activities

The purpose of this section is to address the requirements of Regulations 13(5) and 13(6) of the Environment Regulations by assessing and evaluating all the identified impacts and risks associated with the petroleum activity and associated control measures that will be applied to reduce the impacts and risks to an ALARP and an acceptable level.

Table 8-1 summarises the impact analysis for the aspects associated with the planned activities. A comprehensive risk and impact assessment for each of the planned activities, and subsequent control measures proposed by BHP to reduce the impacts and risks to ALARP and acceptable levels, are detailed in the subsections.

Table 8-1: Summary of the Environmental Impact Analysis for Planned Activities

	Activity	Environmental								Socio-Economic				Risk Assessment & Evaluation			
		Marine Mammals	Marine Turtles	Fish	Seabirds/ Shorebirds	Seabed	Water Quality	Marine Protected Areas	Key Ecological Features	Commercial Fisheries	Shipping Activities	Tourism / Recreation	Air Quality	Severity Factor	Likelihood Factor	Residual Risk	Acceptability
Planned Activities																	
8.1	**Physical Presence – interaction with other users**																
	Presence of project vessels during petroleum activity (including contingent GEP removal)									x	x	x		30	N/A	-	Tolerable
	Presence of GEP (decommissioning *in situ*)										x	x		10	N/A	-	Tolerable
8.2	**Project Vessel Light Emissions**																
	Artificial light from project vessels	x	x		x									10	N/A	-	Tolerable
8.3	**Project Vessel Noise Emissions**																
	Generation of underwater noise from the project vessels during normal operations	x	x	x										30	N/A	-	Tolerable
	Generation of noise from cutting equipment	x	x	x										10	N/A		Tolerable
	Generation of noise from acoustic survey equipment, including MBES and SSS from ROV used for surveying GEP	x	x	x										10	N/A		Tolerable
8.4	**Project Vessel Atmospheric Emissions**																
	Vessel engines, generators and mobile and fixed plant and equipment												x	10	N/A	-	Tolerable
8.5	**Routine Project Vessel Discharges**																
	Routine planned discharge of sewage, grey water, putrescible (food), desalination brine, cooling water, and deck and bilge water to the marine environment from the project vessels						x							10	N/A	-	Tolerable
8.6	**Seabed Disturbance from GEP**																
	Long term physical presence of the GEP on the seabed					x								10	N/A	-	Tolerable
	Contingent removal of GEP					x	x							10	N/A	-	Tolerable
8.7	**Subsea Discharges from GEP Breakdown**																
	Discharges from steel during the breakdown of GEP					x								10	N/A	-	Tolerable
	Discharges from concrete during the breakdown of GEP					x								10	N/A	-	Tolerable

Activity		Environmental								Socio-Economic				Risk Assessment & Evaluation			
		Marine Mammals	Marine Turtles	Fish	Seabirds/ Shorebirds	Seabed	Water Quality	Marine Protected Areas	Key Ecological Features	Commercial Fisheries	Shipping Activities	Tourism / Recreation	Air Quality	Severity Factor	Likelihood Factor	Residual Risk	Acceptability
	Discharges from plastics (within the coating) during the breakdown of GEP					x	x							10	N/A	-	Tolerable
	Discharges of Mercury during the breakdown of GEP					x								10	N/A	-	Tolerable
	Discharges from GEP cutting					x	x							10	N/A	-	Tolerable
8.8	**Waste Generation**																
	Waste (hazardous and non-hazardous) generated during vessel activities													10	N/A	-	Tolerable
	Mercury decontamination chemicals													10	N/A	-	Tolerable
	GEP recovered as waste (contingent GEP removal)													10	N/A	-	Tolerable

8.1 Physical Presence – Interaction with Other Users (Planned and Unplanned)

8.1.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Hazard	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Physical Presence – Interaction with other users	Presence of project vessels during petroleum activity (including contingent GEP removal)	Interaction with or displacement of other marine users (such as commercial shipping, commercial fishing or other third-party vessels).	30	N/A	-	Type A Low Order Impact	Tolerable
	Presence of GEP (decommissioning *in situ*)	Interaction with or displacement of other marine users (such as commercial shipping, commercial fishing or other third-party vessels).	10	N/A	-	Type A Low Order Impact	Tolerable

8.1.2 Source of Hazard

Project Vessels

Project vessels will be on station within the operational area for the duration of the mercury removal activities, as-left survey and contingency GEP removal.

A temporary 500 m exclusion zone will be maintained around the project vessels during operations. Marine users are requested to avoid this area during the activity to ensure the safety of the project vessels and third-party vessels.

Typically, two project vessels will be in the operational area at the PLEM location during mercury preparation (Section 4.6) and removal activities (Section 4.7) for a period of approximately 2 to 4 months. Typically, one general support vessel will be performing the as-left survey (Section 4.9) in the operational area for a period of approximately 2 to 4 weeks. Typically, a maximum of two vessels (CSV or pipelay and a support vessel) will be in the operational area for the GEP removal activities for a period of up to 170 days for a cut and recover method and 2 months for a s-lay recovery method.

The physical presence of the project vessels in the operational area and associated 500 m radius exclusion zone has the potential to cause interference with or displacement of other marine users, including commercial shipping and commercial fishing.

GEP Decommissioning *In situ*

The long-term physical presence the GEP on the seabed, presents the possibility of unplanned interactions with other marine users, including commercial shipping and commercial fishing. The worst-case event is determined to be a commercial fishing vessel snagging fishing equipment on the GEP. Should snagging incidents occur with oil and gas infrastructure such as the GEP, it may result in disruption to fishing operations and financial loss (through loss of catch and damage to fishing equipment). Vessel damage or loss has occurred in less than 0.5% of snagging events and one vessel capsize in the UK between 1989 and 2016 (Rouse, 2020), however capsize is likely the result of attempts to release the snag.

Trawl fishery vessels are equipped with navigational equipment such as echo sounders and Geographical Positioning System (GPS) plotters, which enables them to detect and avoid infrastructure on the seabed. Therefore, makes the snagging events highly unlikely. Historical fishing vessel incident data from the AMSA

Monthly Domestic Vessel Incident Reporting Database (2018-2021) and the Australian Transport Safety Bureau (ATSB) Marine Safety Investigation reports, show there were no reported fishing vessel incidents related to offshore oil and gas infrastructure in Australia. Internationally, production infrastructure has been involved in 4% of incidents over the same period (Rouse, 2020). The likelihood of interactions between trawl equipment and oil and gas infrastructure has been reducing over time as a result of an increase in communication between the oil and gas industry and improvement in fishery GPS equipment (Rouse, 2020).

As described in Section 4.5, from the Commonwealth / State waters boundary for 3 km, the GEP was trenched and has naturally backfilled. Three rock bolts are present at the Commonwealth / State waters boundary. From 3 km onwards to the PLEM, no secondary stabilisation measures were implemented and while previously unburied, the self-burial process has already begun to occur with the observation of freespans and localised GEP lowering into the seabed. An example of GEP burial at a location 5 km from the Commonwealth / State waters boundary, taken from the 2017 ROV survey is presented in Figure 8-1.

Where exposed, the GEP is expected to progressively self-bury along the GEP in predominantly sandy sediment (BHP, 2017b). Burial will occur through the initiation of scour underneath the GEP at discrete locations. The initial self-burial process has already begun to occur with the observation of freespans and localised GEP lowering into the seabed. This freespanning and lowering, as result of localised scouring of the seabed, will continue until a state of equilibrium is reached. This is estimated to take between 70 and 100 years (Atteris, 2019a). The GEP is expected to partially bury (60% - 90% of the outside diameter) along most sandy sections of the route (Atteris, 2019a). The GEP can be expected to lower into the seabed to 85% outside diameter on average (Atteris, 2019a).

The GEP will not self-bury along the rock bolts; however, sand may bury this area due to regional scour / sand deposition processes, as has been observed at rock bolt locations of the GEP within State waters (Figure 8-2).

Local scour around the GEP will only occur whilst the GEP structure is intact and providing a disruption to the flow of water. It will stop occurring once the GEP degrades and loses its shape or once the GEP is buried and no longer protruding above the seabed.

Generally pipelines tend not to self-bury completely over their length (burial up to 100% of the pipelines outside diameter). The self-burial process accelerates once a pipeline is filled with seawater (i.e. the submerged weight has increased). Pipelines only lower to the depth of the scour hole in addition to some penetration due to self-weight. The maximum depth of a scour hole below a pipeline is rarely greater than the pipeline's outside diameter although there are exceptions to this especially if the pipeline is covered in marine growth. Marine fauna activity in areas of spanning has been known to cause scour hole depths significantly greater than pipeline outside diameter.

The GEP is Commonwealth waters is considered stable in a 100 year return period event (Atteris, 2014) (refer Section 4.5).

Figure 8-1: Partial GEP Burial 5 km from the Commonwealth / State waters boundary

Figure 8-2: GEP Burial in Rock Bolted Area - Example

8.1.3 Environmental Impact Assessment

Commercial Fishing

<u>GEP presence</u>

As detailed in Section 5.4.3, the GEP in Commonwealth waters is characterised by the presence of commercially important species and abundances of larger-bodied, commercially important species such as: *P. multidens* (goldband snapper), *Lutjanus malabaricus* (saddletail snapper) and *Lutjanus russelli* (Moses’ snapper) among others. The most ubiquitous species on and off-pipeline at depth are listed in Table 5-6, Section 5.4.3. Five out of the 10 species occurring on the GEP are commercial species. The most commonly occurring species being *P. multidens* (goldband snapper), an important commercially targeted species in this region and targeted by line and trap fisheries.

The abundance distribution of all commercial species is displayed as a heat map (using latitude and longitude only) in Figure 5-3, Section 5.4.3. Plots suggest a higher abundance of commercial species on the GEP than off. Commercial fish were, on average, larger at greater depth and the value of species on the GEP appears higher than that off-pipeline (Bond et al, 2017). Anecdotally, trap fisheries appear to benefit from pipelines in the region with reports of increased catches adjacent to pipelines (Bond et al. 2018). In an environment that has previously been stripped of much of its complex benthic habitat structure, the GEP could have a role to play in supporting and maintaining the recovery of invertebrate habitats and previously exploited fish species. It is evident that the Griffin pipeline holds high numbers of commercially valuable fish species, however further investigation is needed to ascertain the extent to which commercial fishers target pipelines such as the Griffin GEP (Bond et al., 2018).

Whilst the GEP is currently providing a hard substrate for commercial fish species, this may decrease over time as the GEP buries and degrades, which is estimated to take between 70 and 100 years (Atteris, 2019a). The lack of hard substrate as a result of the breakdown and burial of the GEP is likely to reduce the level of commercial fish species at the location. However, it is unlikely the GEP is providing a significant reef structure that provides commercial fisheries a commercial valuable source of catch.

No trawling vessels are utilising the operational area presently (Section 5.7.1). Given the fisheries over the operational area and lack of trawling effort (the operational area is located within Schedule 2 (Zone 1) of the Pilbara trawl fishery, which has been closed to fish trawling since 1998) (Section 5.7.1), the GEP is currently not a hazard to commercial fishing vessels through snagging events.

Interaction of the GEP with any future commercial trawling fisheries prior to self-burial is highly unlikely, based on the navigational equipment on board the vessels to navigate the GEP, historical information on vessel incidents related to oil and gas infrastructure in Australia (refer Section 8.1.2) and likely improvements in GPS fishing equipment in the future. The impact to commercial fishing activity from the presence of the GEP on the seabed is considered minor, for the period until it self-buries, which is estimated to take between 70 and 100 years (Atteris, 2019a).

<u>Project vessels</u>

In the unlikely event that high levels of commercial fishing vessels are present during the petroleum activity, temporary displacement of fishing vessels could occur due to the 500 m exclusion zone around the project vessels for the duration of the petroleum activity (refer Section 4.3 for activity durations). Whilst multiple project vessels may be utilised, the operational area is a minor area relative to the size of the fisheries and it is anticipated that any disruption to fishing operations from displacement from fishing ground / area would be minor. It should also be noted that the operational area is not within an area of high shipping and commercial fisheries are anticipated to be able to utilise the area nearby with minimal disruptions.

BHP have consulted with fishing industry bodies, WAFIC and individual fishing licence holders (see Section 6). During consultation no concerns were raised by fishing licence holders. Consultation is ongoing with WAFIC (refer Table 6-2).

Commercial Shipping

<u>GEP presence</u>

The GEP left on the seabed is not expected to interact with shipping, given the water depth of the operational area. This has been confirmed by consultation with AMSA who raised no comments or concerns during consultation.

<u>Project vessels</u>

There are no recognised shipping routes in or near the operational area, with the nearest shipping fairway designated by AMSA located more than 80 km to the northwest of the operational area (Figure 5-14). Analysis of shipping traffic data indicates commercial vessels do use the general area, with most vessels associated with the oil and gas industry. While not mandatory, the use of the shipping fairways is strongly recommended by AMSA and the International Regulations for Preventing Collisions at Sea 1972 applies to all vessels navigating within or outside the shipping fairways. In the unlikely event commercial shipping vessels are present in or near the operational area, temporary displacement of the commercial shipping vessels would relate to the 500 m exclusion zone around the project vessels for the duration of the petroleum activity (refer Section 4.3 for activity durations). Any impact is anticipated to be temporary and minor.

Defence

The operational area is within the North Western Training Area and military restricted airspace (R8541A), a designated defence exercise area which encompasses waters and airspace off the North West Cape (Figure 5-15). Given the nature of the petroleum activity, interaction with the Defence airspace is not anticipated. As requested by during the stakeholder consultation (Section 6), DoD will be notified a minimum of five weeks prior to the commencement of project vessel activities.

Another operator conducting a petroleum activity in the local area, concurrently or sequentially, may lead to displacement of fishing vessels due to cumulative vessel presence. However, given the low levels of fishing effort at the field location, the low levels of other vessel use (e.g. shipping) and the small spatial extent of the operational area, impacts and displacement of other users from presence of cumulative vessels is considered temporary and minor.

The GEP left on the seabed is not expected to interact with shipping, given the water depth of the operational area. This has been confirmed by consultation with AMSA who raised no comments or concerns during consultation.

8.1.4 Demonstration of As Low As Reasonably Practicable

The ALARP process performed for the environmental aspect is summarised in Table 8-2. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained, and final acceptance or justification if the control was rejected.

Table 8-2: Physical Presence – As Low As Reasonably Practicable Assessment Summary

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standards
Engineer	Navigation (including lighting, compass/radar), bridge and communication equipment will comply with appropriate marine navigation and vessel safety requirements in compliance with Marine Order 21 (safety and emergency arrangements)	Accept	Legislative requirements to be followed which reduces the risk of third-party vessel interactions due to ensuring safety requirements are fulfilled and other marine users are aware of the presence of the project vessels. The control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 8.1.1**
Administrate	Notification of details (such as location, duration of activities) of the petroleum activity to AMSA and AHO	Accept	Notifications provide other marine users with information regarding activities and will include details of relevant project vessels and activity timing. Allows other users to be aware of project vessel presence. Controls based on BHP requirements must be accepted. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 8.1.2** **PS 8.1.3**
	Navigational charting of infrastructure	Accept	Legislative requirements to be followed which reduces the risk of third-party vessel interactions. GEP charting on AHO Nautical Charts allows other users to be aware of its presence. Vessels must navigate with particular caution to reduce the risk. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 8.1.4**
	Consultation with relevant stakeholders	Accept	Controls based on BHP requirements must be accepted. Control ensures other users are informed and aware of the	**PS 8.1.5**

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standards
			petroleum activity, thereby reducing the likelihood of interference. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	
	Establish and maintain a Community Engagement Program by regular meetings with the Community Reference Group (CRG)	Accept	Controls based on BHP requirements must be accepted. Control ensures other users are informed and aware of the petroleum activity, thereby reducing the likelihood of interference. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 8.1.6**
	Notification to DoD a minimum of five weeks prior to the commencement of project vessel activities	Accept	Notifications provide other marine users with information regarding activities and will include details of relevant project vessels and activity timing. Allows DoD to be aware of project vessel presence. Controls based on BHP requirements must be accepted. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 8.1.7**
	Notification to fishers prior to conduct of activities and on cessation of activities.	Reject	Control measures already in place for the notification of AMSA and AHO that trigger a 'Notice to Mariners' and AUSCOAST warnings. This ensures information is available to make other marine users aware of the presence and timing of the activities.	**-**
	Reduce the exclusion zone around the vessels	Reject	Reduces the area of displacement of other marine users; however, the exclusion zone is a legislative requirement and cannot be reduced, therefore the control is not feasible.	**-**
Eliminate	Eliminate use of project vessels	Reject	The use of project vessels is required to conduct the petroleum activity. Control not feasible.	**-**
	Removal of GEP	Reject	Section 3 determined that leaving the GEP *in situ* provides equal or better environmental outcomes compared to complete removal. The removal of the GEP has been included as a contingent activity. Section 4.8 includes the GEP removal philosophy.	-

ALARP Summary

The risk assessment and evaluation has identified a range of controls (Table 8-2) that, when implemented, are considered to manage the impacts of the physical presence of the project vessels and GEP decommissioning *in situ* on other marine users to ALARP.

BHP considers the control measures described above are appropriate to reduce the potential for interaction with other marine users associated with the physical presence of the project vessels and the GEP decommissioning *in situ*. Additional reasonable control measures were identified in Table 8-2 to further reduce impacts, but rejected since the associated cost or sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

8.1.5 Demonstration of Acceptability

Given the adopted controls, the physical presence of the project vessels and GEP decommissioned *in situ* will not result in potential impacts greater than temporary and minor displacement of other marine users, such as commercial shipping and fisheries. Further opportunities to reduce the impacts have been investigated in Table 8-2.

The adopted controls are considered good oil-field practice/industry best practice. No concerns or objections regarding the physical presence of the project vessels and GEP decommissioned *in situ* have been raised by relevant stakeholders. The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act) (Table 8-3). BHP has considered information contained in recovery plans and threat abatement plans (Section 10). The environmental impacts meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the impact to be managed to an acceptable level.

The following subsections provide further detail on the determination of acceptability for the physical presence of the GEP.

Principles of ESD Assessment

As outlined in Section 3A of the EPBC Act, the titleholder needs to ensure that the activity is undertaken in a manner not inconsistent with the ESD (refer Table 8-3)

Table 8-3 Assessment of Impact Against the Principals of ESD

Principals of ESD	Assessment
Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations (the integration principle)	The impact assessment has assessed both the long-term and short-term, environmental, and social aspects associated with leaving the GEP *in situ*. In the short term the GEP is providing habitat for a number of commercial fish species and is likely to continue to do so until the GEP is buried. However even then it may continue to support commercial fish species, noting Bond et al., 2018 identified higher volume of commercial fish species even over the buried sections of the GEP. The GEP is currently not a hazard to trawling vessels. Over the longer term the GEP is expected to bury, and the trawling hazard be reduced, should trawling resume in the operational area.
If there are threat of serious or irreversible damage lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (the 'precautionary principle')	The impact assessment has been supported by a number of fish assessment studies as detailed in Table 5-4, scientific literature and stakeholder feedback. The degradation of the GEP has been assessed by Atteris, 2019a.
The principle of intergenerational equity- that the present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (the 'intergenerational principle')	Leaving the GEP *in situ* has the potential to provide habitat for fish in a predominately soft substrate environment, and increase the abundance of fish including commercially retained species. This provides an enhanced benefit to future generations in the medium-term before degradation of the GEP occurs.
The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making ('the biodiversity principle')	The impact assessment (Section 8.1.3) has assessed both biological diversity and ecological integrity. The CEIA (Section 3) includes both biological diversity and ecological integrity in the decommissioning decision making. The CEIA demonstrates the abandonment *in situ* alternative will result in equal or better environmental outcomes compared to full removal, which is required by NOPSEMA's *Section 572 Maintenance and Removal of Property* policy (NOPSEMA, 2020b)

Acceptability against Article 192 of the United Nations Convention on the Law of the Sea 1982 (UNCLOS)

A general obligation of Article 192 of the UNCLOS is to protect and preserve the marine environment. International Maritime Organization (IMO) resolution A.672 (1989) recognises that the general requirement is base case of removal with the objective of protecting and preserving the marine environment. Further details are provided in paragraph 3.9 of the resolution describing that equipment left *in situ* should not move under environmental loading.

The GEP is Commonwealth waters is considered stable in a 100 year return period event (Atteris, 2014) (refer Section 4.5). Freespans may occur along the GEP and lower the GEP into the seabed and some small lateral movement of the GEP is expected as it degraded. As described in Section 8.6.2, where exposed, the GEP is expected to progressively self-bury in sandy sediment. Burial will occur through the initiation of scour underneath the GEP at discrete locations. The GEP is expected to partially bury (60% - 90% of its outside diameter) along most sandy sections of the route (Atteris, 2019a). The GEP can be expected to lower into the seabed to 85% outside diameter on average (Atteris, 2019a). As the GEP buries it will be subject to less hydrodynamic forces and loading pressures, therefore should not move under environmental loading pressures.

8.1.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Environmental Performance Outcome	Performance Standard	Measurement Criteria
No unplanned interactions between the project vessel and other marine users	**PS 8.1.1** Project vessel compliance with *Navigation Act 2012*; International Convention of the Safety of Life at Sea (SOLAS) 1974; Marine Order 30: Prevention of Collisions, Issue 8; Marine Order 21, Issue 8 (Safety of Navigation and Emergency Procedures); and International Convention of Standards of Training, Certification and Watch-keeping for Seafarers (STCW95), which specifies: • navigation (including lighting, compass/radar), bridge and communication equipment will comply with appropriate marine navigation and vessel safety requirements • Automatic Identification System (AIS) is fitted and maintained in accordance with Regulation 19-1 of Chapter V of SOLAS • crew performing vessel bridge-watch will be qualified in accordance with International Convention of STCW95, AMSA Marine Order Part 3: Seagoing Qualifications or certified training equivalent • maintenance of navigation equipment in efficient working order (compass/radar).	Vessel audit and inspection records demonstrate compliance with standard maritime orders and equipment requirements.
	PS 8.1.2 The AMSA Rescue Coordination Centre (RCC) (as part of marine safety division) will be notified of the petroleum activity four weeks before mobilisation to ensure navigation AUSCOAST warnings can be issued and kept up to date.	Records demonstrate AMSA RCC was notified at least four weeks before commencement of the petroleum activity to enable the 'Notice to Mariners' to be published.
	PS 8.1.3 The AHO is notified at least four weeks before commencing the petroleum activity so they can then issue a Notice to Mariners.	Records demonstrate AHO were notified at least four weeks before commencement of the petroleum activity to enable the 'Notice to Mariners' to be published.
	PS 8.1.4 GEP is charted on AHS Nautical Charts.	AHS Nautical Charts show GEP.
	PS 8.1.5 BHP consultation with relevant stakeholders to advise them of the petroleum activity.	Stakeholder communication recorded in database demonstrating assessment of stakeholder feedback received and BHP's response.
	PS 8.1.6 WA APU Community Stakeholder Management Plan: The CRG is advised and updated of the petroleum activity and timing.	Meeting minute records maintained of CRG meetings, which includes summary of proposed petroleum activity.

Environmental Performance Outcome	Performance Standard	Measurement Criteria
	PS 7.1.7 Notification to DoD a minimum of five weeks prior to the commencement of project vessel activities to advise them of the petroleum activity.	Records demonstrate DoD was notified at least five weeks before commencement of the petroleum activity.

8.2 Project Vessel Light Emissions

8.2.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Project vessel light emissions	Artificial light from project vessels	Light emissions (light spill and glow) from external lighting on the project vessels causing alterations to normal marine fauna behaviour.	10	N/A	-	Type A Low Order Impact	Tolerable

8.2.2 Source of Hazard

Project vessels will routinely use external lighting to navigate and conduct safe operations at night throughout the petroleum activity. External lighting on the project vessels will generate light glow and direct illumination of surrounding surface waters. Most external lighting is directed towards working areas such as the main decks, although spot lighting may also be used as needed, such as ROV deployment and subsea infrastructure retrieval. Lighting on project vessels is required for safety and navigational purposes and cannot be eliminated.

External lighting for deck operations typically consists of bright white (metal halide, halogen, fluorescent) lights and Light Emitting Diode (LED). Lighting is designed to ensure adequate illumination for safe working conditions. Typical light intensity values are five to ten lux for walkways, 50 lux for working areas and around 100 lux for high-intensity light areas. Light intensity diminishes with inverse of distance squared (I received = I/r^2). The distance at which direct light and sky glow may be visible from the source depends on the vessel lighting and environmental conditions. As a guide, Figure 8-3 presents a simple calculation of diminishment of received light with distance, assuming 100 lamps on a vessel of low, medium and high intensity, each acting additively. It can be seen that light received is diminished to about the equivalent of light that would be received from a full moon within about 200 m from the vessel, and to that of a moonless clear night within about 1500 m for low-intensity lights and 3000 m for high-intensity lights. While a useful guide, these calculations are conducted in lux, a photometric unit which is weighted to the wavelength sensitivity of the human eye, and may underestimate light intensity across the whole light spectrum which is visible to other species.

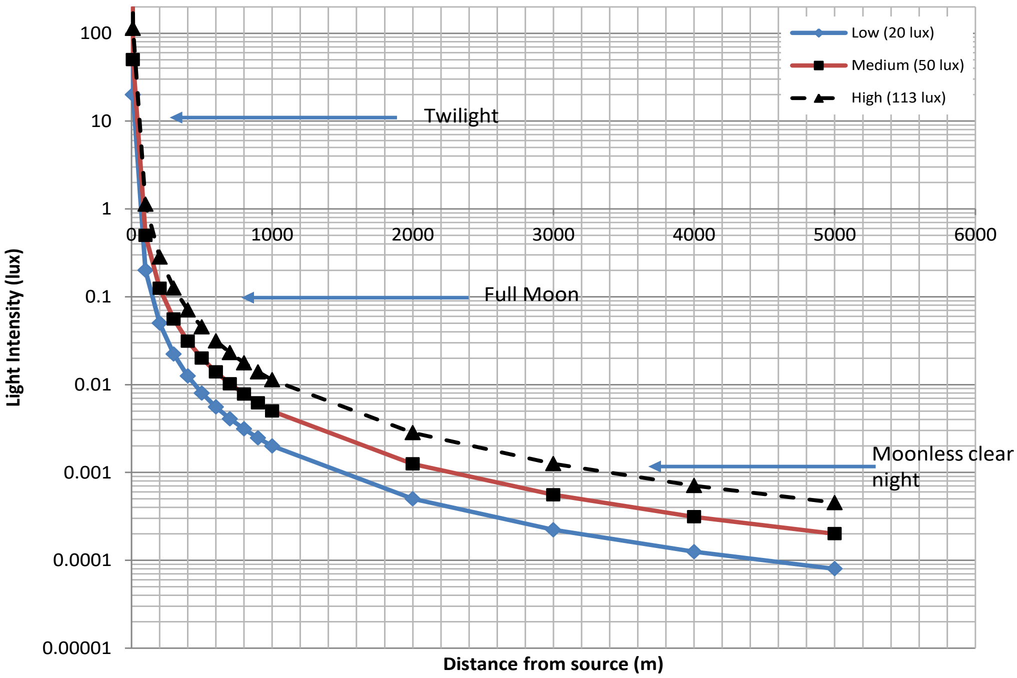


Figure 8-3: Diminishment of Light with Distance from Source, Assuming 100 Lamps of Low, Medium and High Intensity

8.2.3 Environmental Impact Assessment

Receptors that have important habitat within a 20 km buffer of the operational area are considered for the impact assessment within this section, based on recommendations of the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (NLPG) (DoEE, 2020). The 20 km threshold provides a precautionary limit based on observed effects of sky glow on marine turtle hatchlings demonstrated to occur at 15 to 18 km and fledgling seabirds grounded in response to artificial light 15 km away (DoEE, 2020).

The fauna within and immediately adjacent to the operational area are predominantly pelagic fish and zooplankton, with a low abundance of transient species such as marine turtles, whale sharks, cetaceans and migratory shorebirds and seabirds. Artificial lighting has the potential to affect marine fauna that use visual cues for orientation, navigation or other purposes, resulting in behavioural responses that can alter foraging and breeding activity. The species with greatest sensitivity to light are marine turtles, seabirds and fish.

Potential impacts to marine fauna from artificial lighting may include:

- disorientation, attraction or repulsion to the light
- disruption to natural behaviour patterns and cycles
- indirect impacts such as increased predation risks through attraction of predators.

These potential impacts depend on:

- the wavelength and intensity of the lighting, and the extent to which the light spills into important wildlife habitat (such as foraging, breeding and nesting)
- the timing of light spill relative to the timing of habitat use by marine fauna sensitive to lighting effects
- the physiological sensitivity and resilience of the fauna populations that are at risk of potential effects.

Fish and Zooplankton

Fish and zooplankton may be directly or indirectly attracted to light. Experiments using light traps have found that some fish and zooplankton species are attracted to light sources (Meekan et al., 2001), with traps drawing catches from up to 90 m (Milicich et al., 1992). Lindquist et al. (2005) concluded from a study that light fields around oil and gas activities resulted in an enhanced abundance of clupeids (herring and sardines) and engraulids (anchovies), both of which are known to be highly photopositive.

The concentration of organisms attracted to light results in an increase in food source for predatory species and marine predators are known to aggregate at the edges of artificial light halos. Shaw et al. (2002), in a similar light study, noted that juvenile tunas (Scombridae) and jacks (Carangidae), which are highly predatory, may have been preying upon concentrations of zooplankton attracted to the light fields around oil and gas activities. This could potentially lead to increased predation rates compared to unlit areas.

Light spill from the project vessels onto the surrounding surface waters, particularly during night-time activities, is likely to result in aggregations of fish around the project vessels as they are attracted to the light and increased food availability. However, the operational area does not contain any significant feeding, breeding or aggregation areas for important fish species. The potential for increased predation activity and impact to fish and zooplankton is anticipated to be temporary and minor.

Seabirds and Migratory Shorebirds

Studies conducted between 1992 and 2002 in the North Sea confirmed artificial light was the reason seabirds were attracted to and accumulated around illuminated offshore infrastructure (Marquenie et al., 2008) and lighting can attract seabirds from large catchment areas (Wiese et al., 2001). Availability of roosting refuge at sea and increased food availability may be the most important reasons why seabirds are attracted to offshore oil and gas infrastructure (Wiese et al., 2001). Seabirds may either be attracted by the light source itself or indirectly, as structures in deep-water environments tend to attract marine life at all trophic levels, creating food sources and shelter for seabirds (Surman, 2002; Wiese et al., 2001). The light from vessels may also provide enhanced capability for seabirds to forage at night (Burke et al., 2005). Studies in the North Sea indicate migratory birds are attracted to lights on offshore platforms when travelling within a radius of 3 to 5 km from the light source (Marquenie et al., 2008). Beyond this distance, it is assumed light source strengths were not sufficient to attract birds away from their preferred migration route.

Negative potential impacts to seabirds and migratory shorebirds attracted by artificial lighting can include disorientation causing collision, entrapment, stranding, grounding and interference with navigation (being drawn off course from usual migration routes) (DoEE, 2020). These behavioural responses may cause injury or death. Seabird mortalities from collisions have been found to be correlated to conditions of poor visibility (cloud, fog or rain) and proximity to nearby seabird colonies (Black, 2005). The operational area overlaps with the wedge-tailed shearwater and lesser crested tern BIAs (breeding) (Section 5.6.2). The nearest colony of wedged-tailed shearwaters is Thevenard Island, approximately 50 km to the south of the operational area, where the planned mercury removal activities (Section 4.5.3) are proposed (e.g. the PLEM), far enough that fledglings would not be at risk from light emissions. The as-left survey and contingent removal of GEP of the GEP may occur within 20 km of Thevenard Island. Fledgling seabirds can be affected by lights up to 15 km away (DoEE, 2020), therefore these activities are not considered to impact fledging wedged-tailed shearwaters at Thevenard Island. Foraging wedged-tailed shearwaters are less vulnerable to light attraction compared to fledglings, but they may forage out to location of the operational area. Breeding wedged-tailed shearwaters could be attracted to the project vessels during the as-left survey and contingent GEP removal within 20 km of Thevenard Island. These activities at such proximity to the Thevenard Island will be for a period of days and be conducted from a single general support vessel. Given the short term nature of the as-left survey and contingent GEP removal activities in proximity to Thevenard Island and the scale of lighting, impacts to wedged-tailed shearwaters at Thevenard Island are anticipated to be temporary and minor. It is however recognised that some attraction may occur should the as-left survey and contingent GEP removal activities take place during wedged-tailed shearwaters breeding (Sept – April) within 20 km of Thevenard Island.

During the petroleum activity, it is possible a small number of seabirds and migratory shorebirds may be attracted to the project vessels within the operational area. However, as this is not expected to result in impacts to birds beyond a temporary change in behaviour, any impact is anticipated to be temporary and minor. Any collision between the birds and project vessels as a result of the attraction are highly unlikely due to the lack of aggregation areas for birds over the operational area and slow-moving project vessels.

Marine Turtles

The attraction of marine turtles to light has been well documented. Adult marine turtles may avoid nesting on beaches that are brightly light (Witherington, 1992; Price et al., 2018) and adult and hatchling turtles can be disorientated and unable to find the ocean in the presence of direct light or sky glow (Witherington, 1992; Lorne & Salmon, 2007; Thums et al., 2016; Price et al., 2018).

Five marine turtle species were identified as potentially occurring in the operational area (Table 5-9). The operational area overlaps nesting habitat critical to the survival of flatback, green and hawksbill turtles, as well as flatback and hawksbill internesting buffer BIAs (Section 5.6.2).

Hatchlings

Hatchlings entering the ocean use a survival strategy to disperse from the predator rich nearshore habitats to reach deeper waters where they develop into juveniles. An internal compass set while crawling down the beach, together with wave cues, are used to reliably guide them offshore (Lohmann & Lohmann, 1992; Stapput & Wiltschko, 2005; Wilson et al., submitted).

In the absence of wave cues however, swimming hatchlings have been shown to orient towards light cues and in some cases, wave cues were overridden by light cues (Thums et al., 2013, 2016). Consequently, there is potential for hatchlings at sea to be attracted to light emissions if they are carried by currents. In this event individual hatchlings would remain entrapped in light for short periods (Wilson et al., 2018; Thums et al., 2010). During that time, there is the potential for:

- increased energy expenditure as hatchlings swim against currents towards light sources with potential effects to individual fitness
- increased risk of predation while silhouetted in areas of light spill.

Planned mercury removal activity scopes at the PLEM are located 80 km from the nearest marine turtle nesting site and therefore exceed the buffer set by the NLPG (DoEE, 2020). Sky glow and light spill from project vessels conducting mercury preparation and removal activity scopes will therefore not reach any nesting beach. However, the nearest marine turtle nesting site (Thevenard Island) is within 20 km from the operational area at the GEP State/Commonwealth waters boundary, where the as-left survey activities and contingent GEP removal activities will take place. These activities will be at a location within 20 km of Thevenard Island for a period of 3-5 days. Given the short term nature of these activities in proximity to Thevenard Island and the scale of lighting, impacts to hatchlings at Thevenard Island are anticipated to be temporary and minor. In the event that hatchlings at Thevenard Island are disorientated by vessel lighting they are unlikely to be disorientated away from the ocean. No consequence at the population level is anticipated.

Any impacts to hatchling turtles from artificial light will be limited to possible short-term behavioural impacts during hours of darkness only, with no lasting effect to the species population.

Adults

Although individuals performing behaviours such as internesting, migration, mating (adults) or foraging (adults and pelagic juveniles) may occur within the operational area, marine turtles do not use light cues to guide these behaviours. There is currently no evidence to suggest internesting, mating, foraging or migrating turtles are impacted by light from offshore vessels.

Spending most of their lives in the ocean, adult female marine turtles nest above the high-tide mark on sandy tropical and subtropical beaches, predominantly at night (Witherington & Martin, 2003). They rely on visual cues to select nesting beaches and orient on land. Artificial lighting on or near beaches has been shown to disrupt nesting behaviour. Lighting may affect the location where turtles emerge onto the beach, the success of nest construction, whether the nesting attempts are abandoned, and even the directness of paths as adult females return to the sea (Witherington & Martin, 2003).

Five marine turtle species were identified as potentially occurring in the operational area (Table 5-9). The operational area overlaps internesting habitat critical to the survival of flatback turtles, which is also an internesting buffer BIA (Section 5.6.2). It is possible individual turtles may be encountered traversing the operational area during the mercury preparation and removal activities at the PLEM; however, considering the water depths of the operational area (around 130 m) and distance to nesting beaches (more than 80 km from the Muiron Islands; and 80 km from North West Cape), large numbers of internesting adults are not expected. Behavioural impacts to marine turtles from light emissions from the project vessels are anticipated to be temporary and minor.

The nearest marine turtle nesting site (Thevenard Island) is within 20 km of the operational area at the GEP State/Commonwealth waters boundary, where the as-left survey activities and contingent GEP removal will take place along the GEP. The as-left survey and contingent GEP removal will be at a location within 20 km of Thevenard Island for a period of 3-5 days. Given the short term nature of the as-left survey and contingent GEP removal activities in proximity to Thevenard Island and the scale of lighting, impacts to nesting adults at

Thevenard Island are anticipated to be temporary and minor, limited to possible short-term behavioural impacts to a small number of nesting turtles. No consequences are anticipated at the population level.

Species Recovery Plans, Approved Conservation Advice and Threat Abatement Plans

BHP has considered information contained in recovery plans and threat abatement plans (Section 10). This includes the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017) as well as the recently published NLPG (DoEE, 2020).

The overarching objective of the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017) is to reduce detrimental impacts on Australian populations of marine turtles and hence promote their recovery in the wild. Marine turtles are long-lived, slow to mature and are subject to multiple threats. Light pollution is identified as a high-risk threat in the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017). Minimising light pollution, such that artificial light within or adjacent to habitat critical to the survival of marine turtles, is managed so marine turtles are not displaced from these habitats (Commonwealth of Australia, 2017). As there are no safe alternatives to using artificial lighting on the project vessels, and as lighting will be restricted to that required to provide safe working and navigational requirements, it is considered minimised to ALARP. In summary, BHP considers the proposed activity is not inconsistent with the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017) (refer Section 10).

8.2.4 Demonstration of As Low As Reasonably Practicable

The ALARP process performed for the environmental aspect is summarised in Table 8-4. This process was completed as outlined in Section 6.1.2 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 8-4: Light Emissions – As Low As Reasonably Practicable Assessment Summary

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
Eliminate	Eliminate use of vessels.	Reject	Vessels are required to conduct the petroleum activity. Control not feasible.	-
	Limit or exclude night-time operations during mercury preparation and removal activity.	Reject	Would increase the duration of the activity (almost double), thereby increasing other hazards and impacts such as air emissions, waste generation, physical presence and vessel collision risk. Given the distance of the operational area from the nearest nesting sites (over 80 km) and the already minor impacts of lighting from the petroleum activity, the control cost outweighs the environmental benefit.	-

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
Substitute	Substitute external lighting during mercury preparation and removal activity with light sources designed to minimise impacts and marine turtles (as per NLPG 2020 management actions) by: • using flashing/intermittent lights instead of fixed beam • using motion sensors to turn lights on only when needed • using luminaires with spectral content appropriate for the species present • avoiding high-intensity light of any colour.	Reject	The retrofitting of all external lighting on the project vessels is significant in cost. Given the distance of the operational area from the nearest nesting sites (over 80 km) and the already minor impacts of lighting from the petroleum activity on marine fauna, the control cost outweighs the environmental benefit.	-
	Vary the timing of the petroleum activity to avoid peak turtle internesting periods (December to January) and hatchling periods.	Reject	The operational area overlaps with the flatback and hawksbill turtle internesting BIA. However is not in and not known to provide significant foraging habitat. Given already minor impacts of lighting from the petroleum activity on marine turtles, the control cost outweighs the environmental benefit	-
Engineer	During petroleum activities within 20 km of Thevenard Island during wedge-tailed shearwater breeding (Sept – April), implement light management actions (as per NLPG 2020 management actions) relevant to the activity, including: • extinguishing outdoor and deck lights not necessary for safety or navigation at night • using available block-out blinds on portholes and windows not necessary for safety and/or navigation at night • managing seabird landings appropriately and reporting interactions.	Accept	Potential reduction in impact, given the overlap with the wedge-tailed shearwater BIA (breeding and foraging) particularly during breeding (Sept – April) and the as-left survey is within 20km of Thevenard Island.	**PS 8.2.1**

ALARP Summary

The risk assessment and evaluation has identified controls (Table 8-4) that when implemented are considered to manage the impacts of light emissions on marine fauna to ALARP.

BHP considers the control measures described above are appropriate to reduce impacts of light emissions on marine fauna. Additional reasonable control measures were identified in Table 8-4 to further reduce impacts but rejected since the associated cost and sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

8.2.5 Demonstration of Acceptability

Illumination of working areas on the project vessels is necessary for safe working practices, as determined as part of a Vessel Safety Case assessment under the OPGGS Act requirements. Navigational lighting is also required to satisfy AMSA's Prevention of Collision Convention (Marine Order 30, Issue 7) requirements.

Given the adopted controls, the light emissions generated during the petroleum activity will not result in potential impacts greater than temporary and minor behavioural disturbance to marine fauna. Further opportunities to reduce the impacts have been investigated in Table 8-4.

No concerns or objections regarding light emissions from project vessels have been raised by relevant stakeholders. The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). BHP has considered information contained in recovery plans and threat abatement plans (Section 10). The environmental impacts meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the impact to be managed to an acceptable level.

8.2.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Environmental Performance Outcome	Performance Standard	Measurement Criteria
Minimise impacts to wedge-tailed shearwaters from light emissions	**PS 8.2.1** During petroleum activities within 20 km of Thevenard Island during wedge-tailed shearwater breeding (Sept – April), implement light management actions (as per NLPG 2020 management actions) relevant to the activity, including: • extinguishing outdoor and deck lights not necessary for safety or navigation at night • using available block-out blinds on portholes and windows not necessary for safety and/or navigation at night • managing seabird landings appropriately and reporting interactions.	Vessel and inspection records include identification of vessel controls when within 20 km of Thevenard Island during wedge-tailed shearwater breeding including: • extinguishing outdoor and deck lights not necessary for safety or navigation at night • using available block-out blinds on portholes and windows not necessary for safety and/or navigation at night • managing seabird landings appropriately and reporting interactions.

8.3 Noise Emissions

8.3.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Underwater noise emissions	Generation of underwater noise from the project vessels during normal operations.	Underwater sound emitted to marine environment, causing interference to marine fauna.	30	N/A	-	Type A Low Order Impact	Tolerable
	Generation of noise from cutting equipment.		10	N/A	-	Type A Low Order Impact	Tolerable
	Generation of noise from acoustic survey equipment, including MBES and SSS from ROV used for surveying subsea infrastructure (including GEP).		10	N/A	-	Type A Low Order Impact	Tolerable

8.3.2 Source of Hazard

Noise Generated by Project Vessels

Project vessels will generate noise when operating thruster engines, propeller cavitation, on-board machinery and such. This noise has the potential to exceed ambient noise levels which typically range from around 90 dB re 1 µPa (root square mean sound pressure level (rms SPL)) under very calm, low wind conditions, to 120 dB re 1 µPa (rms SPL) under windy conditions (McCauley, 2005).

The sound level and frequency characteristics generated by vessels depend on their size, weight and number and type of propellers. A typical general support vessel's peak frequency or band ranges from 1 to 500 Hz at a peak source level of 170 to 190 dB re 1 µPa at 1 m. Larger vessels' peak source levels have been presented in Arveson and Vendittis (2000). Larger vessels (such as a pipelay or CSV) may generate marginally higher peak source level (such as a 1 to 2 dB re 1 µPa at 1 m peak source level) compared to a smaller general support vessel, such as that used for the as-left survey activities (Section 4.9). Therefore, it is considered the sounds levels from project vessels used for the petroleum activity will be in the range of 170 to 192 dB re 1 µPa at 1 m at 1 to 500 Hz.

Indicative source characteristics for project vessels are summarised in Table 8-5.

Noise Generated by Helicopters

Crew changes via helicopters may be required during mercury preparation and removal activities. The main noise source associated with helicopters are the engines and rotor blades. Noise levels for typical helicopters used in offshore operations (Eurocopter Super Puma AS332) at 150 m separation distance have been measured at up to a maximum of 90.6 dB (BMT Asia Pacific, 2005). Noise level reported for a Sikorsky-61 is 108 dB re 1 µPa at 305 m (Simmonds et al., 2004), which further diminishes with increasing helicopter altitude. Sound emitted from helicopter operations is typically below 500 Hz (Richardson et al., 1995).

Noise Generated by Acoustic Survey Equipment

During the as-left survey, SSS and MBES may be deployed on the ROV. SSS devices operate at frequencies similar to those used in 'fish finders' by commercial fishers. The noise generated is highly directional and at high frequencies (75 to 900 kHz) (Jimenez-Arranz et al., 2017). MBES is another device which operates in similar fashion, typically emitting sounds at high frequencies (400 kHz). High-frequency acoustic signals attenuate quickly in the water column and typically do not propagate over long distances.

An underwater modelling study of geophysical equipment was performed by JASCO Applied Sciences (2013), off the coast of California. The study included SSS and MBES, and modelled them in a similar, underwater environmental setting to the North West Shelf (sandy bottom, between 10 to 4500 m water depth). The modelling assessed the worst-case SPL and frequency for the system being tested, and presented the distances at which the SPLs were reached for root mean squared (rms) (used as the average) threshold values. The maximum distance (Rmax) that the modelling showed the MBES and SSS SPLs were reduced to just above background level (120 dB re 1 µPa) was around 1 km and 1.5 km from the source respectively (JASCO, 2013). Although caution should be taken in applying results of noise modelling conducted for a different location, the results demonstrate a relatively localised effect of MBES and SSS operation on ambient noise levels.

Indicative source characteristics for typical acoustic survey equipment are summarised in Table 8-5.

Noise Generated by Cutting

The GEP will be cut near the PLEM during mercury removal preparation activities (Section 4.6) using a multi-cutter or diamond wire. More extensive cutting would be required during the contingent GEP removal activities (cut and lift option) (Section 4.8). Noise levels will be low and be emitted for a short period (minutes to hours) during the cut.

Twachtman et al. (2004) studied the operations and socio-economic impact of non-explosive removal of offshore structures, including noise, and concluded that mechanical cutting and diamond wire cutting methods, are generally considered harmless to marine life and the environment. Similarly, Pangerc et al. (2016) described the underwater sound measurement data during an underwater diamond wire cutting of a 32-inch conductor (10 m above seabed in around 80 m depth) and found the sound radiated from the diamond wire cutting of the conductor was not easily discernible above the background noise at the closest recorder located 100 m from the source. The sound that could be associated with the diamond wire cutting was primarily detectable above the background noise at the higher acoustic frequencies (above around 5 kHz) (Pangerc et. al., 2016) above the hearing range of low frequency cetaceans. Background noise was attributed to surface vessel activity such as dynamic positioning. In another study, the United States of America Navy measured underwater sound levels when the diamond saw was cutting caissons for replacing piles at an old fuel pier at Naval Base Point Loma (Naval Base Point Loma Naval Facilities Engineering Command Southwest, 2017).

Any noise propagating at seabed from cutting the GEP is likely to attenuate to levels at, or close to, background ambient levels within 100 m of the source, with ambient levels being elevated by the concurrent presence of a project vessel on DP immediately above the location. As such, noise from the GEP cutting will not add to cumulative noise levels for the operation to any extent.

Indicative source characteristics from cutting equipment is summarised in Table 8-5.

Table 8-5: Summary of Noise Emissions Generated During the Petroleum activity

Activity	Estimated SPL (dB re 1 µPa rms)	Frequency	Type
Project Vessels	170–192 dB re 1 µPa at 1 m	1 to 500 Hz	Continuous
GEP Cutting	136–141 dB re 1 µPa at 10 m	Around 5 kHz	Continuous
SSS	200–234 dB re 1 µPa at 1 m	75 to 900 kHz	Impulsive
MBES	210–247 dB re 1 µPa at 1 m	400 kHz	Impulsive

8.3.3 Environmental Impact Assessment

Underwater noise can affect marine fauna through:

- disturbance and stress leading to behavioural changes or displacement of fauna; the occurrence and intensity of disturbance is highly variable and depends on a range of factors relating to the animal and situation

- masking or interference with other biologically important sounds (including vocal communication, echolocation, signals and sounds produced by predators or prey)
- secondary ecological effects such as an alteration of predator/prey relationship
- injury to hearing or other organs. Hearing loss may be temporary (temporary threshold shift (TTS)) or permanent (permanent threshold shift (PTS)). Southall et al. (2007) defined TTS as a threshold shift of 6 dB above the normal hearing threshold. If the threshold shift does not return to normal, permanent threshold shift (PTS) has occurred. Threshold shifts can be caused by acoustic trauma from a very intense sound of short duration, as well as from exposure to lower-level sounds over longer time periods (Houser et al., 2017).

The extent of the impacts of underwater noise on marine fauna depends upon the frequency range and intensity of the noise produced and the type of acoustic signal (continuous or impulsive).

Available threshold criteria associated with behavioural and physiological impacts for sensitive receptors have been derived from a number of sources (NMFS, 2018; NMFS, 2014; Popper et al., 2014), as detailed in the next sections. These criteria have been compared with measured and predicted sound levels for different sound sources to assess potential impacts.

Marine Mammals (Cetaceans)

Marine mammal species differ in their hearing capabilities, in absolute hearing sensitivity, as well as frequency band of hearing (Richardson et al., 1995; Wartzok and Ketten, 1999; Southall et al., 2007).

Exposure to intense impulsive noise may be more hazardous to hearing than continuous (non-impulsive) noise. Impulsive sound sources include MBES and SSS, which are outside the auditory range of low-frequency cetacean auditory range (baleen whales, including humpback and pygmy blue whales) but within the mid-frequency cetacean auditory range (orca, sperm whales and dolphins) (Table 8-6).

Table 8-6: Frequency Range of Multi-Beam Echo Sounder and Overlap with Low, Mid and High Frequency Cetacean Auditory Range

Geophysical source	Frequency Range (kHz) (Jimenez-Arranz et al., 2017)	Potential disturbance from MBES		
		Low-frequency cetaceans	Mid-frequency cetaceans[1]	High frequency cetaceans[1]
Auditory frequency range (kHz) [1]		0.07 to 22	0.15 to 160	0.2 to 180
MBES	400	×	✓	✓
SSS	75 to 900	×	✓	✓

Note 1: Auditory frequency range for cetaceans taken from Southall et al., 2007

The PTS and TTS (for impulsive and continuous sources) are from NMFS (2018), which is the most current technical guidance for assessing the effect of anthropogenic sound on marine mammal hearing. These thresholds are also adopted by Southall et al. (2019) and Southall et al. (2021) reviews. The continuous noise and impulsive noise thresholds are summarised in Table 8-7 and Table 8-8 respectively and have been adopted for the activities' project vessel noise and GEP cuttings noise and survey noise. While dugongs may occur in the operational area, dugongs spend most of their time in shallow tidal and subtidal seagrass meadows. There are no assessments for impacts of vessel noise on dugongs (sirenians) using the NMFS (2018) criteria. As dugong hearing frequency is most similar to mid and high frequency cetaceans, results for vessel noise impacts on mid-frequency cetaceans may be used as a proxy for those on dugong.

Table 8-7: Continuous Noise – Acoustic Effects of Continuous Noise on Marine Mammals - Unweighted SPL and SEL_{24h} Thresholds

Hearing Group	NMFS (2014)	NMFS (2018)	
	Behaviour	PTS onset thresholds (received level)	TTS onset thresholds (received level)
	SPL (L_p; dB re 1 μPa)	Weighted SEL_{24h} ($L_{E,24h}$; dB re 1 $μPa^2·s$)	Weighted SEL_{24h} ($L_{E,24h}$; dB re 1 $μPa^2·s$)
Low-frequency cetaceans	120	199	179
Mid-frequency cetaceans		198	178

Table 8-8: Impulsive Noise – Unweighted SPL, SEL_{24h}, and PK Thresholds for Acoustic Effects on Mid Frequency Cetaceans

Hearing Group	NMFS (2014)	NMFS (2018)			
	Behaviour	PTS onset thresholds (received level)		TTS onset thresholds (received level)	
	SPL (L_p; dB re 1 μPa)	Weighted SEL_{24h} ($L_{E,24h}$; dB re 1 $μPa^2·s$)	PK (L_{pk}; dB re 1 μPa)	Weighted SEL_{24h} ($L_{E,24h}$; dB re 1 $μPa^2·s$)	PK (L_{pk}; dB re 1 μPa)
Mid-frequency cetaceans	160	185	230	170	224

Noise from the project vessels exceeds TTS and PTS thresholds at the source. However, since marine fauna are transient in the operational area, which lacks aggregating habitat such as resting or calving areas, individuals are expected to pass through the operational area, potentially showing localised avoidance via behavioural responses (see below). PTS is unlikely as individuals will likely show avoidance before getting within range, individuals are therefore not expected to remain within the vicinity of the noise source for the duration (24 hours) required to exceed PTS. Underwater noise generated by vessels (continuous (non-impulsive) noise) does not have the intensity and characteristics likely to cause physiological damage in marine fauna (Nedwell & Edwards, 2004; Hatch & Southall, 2009). For TTS, individuals would need to pass within tens of metres of the project vessels during operations. This would result in a temporary impact to a low proportion of the migrating population.

Project vessel noise levels may exceed the behavioural response levels in cetaceans (refer to Table 8-7) out to distances presented in Table 8-9. Within this area, cetaceans may exhibit localised avoidance and attraction behaviour.

Table 8-9: Sound Source Levels and Frequencies from Project Vessels and Distance to Behavioural Threshold for Cetaceans

Source of Aspect	Operating Frequency	Source Level (@1 m)		Sound Category	Distance to Behavioural Response Threshold for Cetaceans for Continuous Noise Sources
		SPL (L_p)	PK (L_{pk})		
Support vessel	0.2 to 1 kHz [1]	182 to 186 [1]	-	Continuous	4 km [1]
Larger vessel	10 Hz - 40 kHz [2]	178.2 -192.1 [2]	-	Continuous	6 km [3]

[1] McCauley (1998)

[2] Arveson and Vendittis (2000)

[3] Estimated based on Woodside (2020) and McCauley (1998)

Impulsive PTS and TTS thresholds for mid- and low-frequency cetaceans (refer Table 8-8) are only expected to be exceeded close to the source. Observed disturbance responses in marine mammals close to impulsive sound sources may include altered swimming direction, increased swimming speed including startle reactions, breathing and diving patterns, avoidance of the sound source area and other behavioural changes. Due to the lack of aggregating areas for sensitive marine fauna species, individuals are expected to be transitory only, displaying behavioural responses, and moving away from the source, before thresholds are exceeded.

Marine mammals that may occur within the operational area are detailed in Table 5-9 and include low-frequency (such as baleen whales), medium-frequency (ondocetes, such as orca and sperm whale) and high-frequency (such as dolphins) cetaceans and sirenians (dugongs). Of these species, the humpback whale is expected to be the most frequently encountered, particularly during annual migrations, given the overlap of the operational area with the migration BIA. However, the nearest area of known importance to humpback whales is the Exmouth Gulf resting area, located over 70 km south-west of the operational area. Impacts to migrating humpback whales are limited to localised behavioural response and temporary impact due to TTS should individuals come into close proximity of the project vessels. The size of the migration BIA is presented in Figure 5-7 and the area relating to cetacean behavioural threshold exceedance is a fraction of this overall BIA, giving the migrating individual room to deviate if required. Impacts are not expected to alter humpback whale migration to the detriment of the individual or population.

The operational area overlaps the pygmy blue whale BIA for distribution. The pygmy blue whale may transit the operational area during their Northward (May – August) and southward migration period (October-December). The pygmy blue whales tend to pass along the shelf edge at depths between 500m to 1000m during their migration (Commonwealth of Australia, 2015), which is outside the depths of the operational area (approximately 130m), therefore significant numbers of the species are not expected. However, should pygmy blue whales be present within the operational area impacts will be limited to localised behavioural response and temporary impact due to TTS should individuals come into close proximity of the project vessels.

Any impacts continuous and impulsive noise sources to marine mammals are anticipated to be temporary and minor and relate to behavioural changes only.

Marine Turtles

Marine turtles are at low risk of mortality or permanent injury from to continuous noise sources, such as project vessels, even near the source (Popper et al., 2014).

Popper et al. (2014) provided injury thresholds for turtles (>207 dB PK); however, no thresholds were provided for behavioural disturbance. For continuous noise sources, such as vessel operations, marine turtles have been shown to avoid low-frequency sounds (Lenhardt, 1994). Further, playback study of diamondback terrapins (*Malaclemys terrapin terrapin*) using boat noise, some animals were observed to increase or decrease swimming speed while others did not alter their behaviour at all (Lester et al., 2013).

Dow Piniak (2012) found green, leatherback and hawksbill turtles have the greatest hearing sensitivity, between 50 to 400 Hz; therefore, the audible frequency range of marine turtles overlaps with the MBES and SSS frequency presented in Table 8-6. Studies indicate turtles may begin to show behavioural responses to approaching impulsive sounds levels of around 166 dB re 1 µPa (McCauley et al., 2000). Considering the United States of America National Marine Fisheries Service criteria for behavioural effects in turtles of 166 dB re 1 µPa (SPL) and the sound modelling (JASCO, 2013) the MBES and SSS equipment could potentially disturb turtles within a distance of a few hundred metres. Turtle behavioural responses when exposed to underwater noise include diving and avoidance. Such disturbances are not expected to have any significant effect on individual turtles and be limited to behavioural changes for the duration of exposure.

Five marine turtle species were identified as potentially occurring in the operational area (Table 5-9). The operational area overlaps an inter-nesting habitat critical to the survival of flatback, green and hawksbill turtles, as well as flatback and hawksbill internesting buffer BIAs (Section 5.6.2). The nearest marine turtle nesting site (Thevenard Island) is 20 km from the operational area at the GEP State/Commonwealth waters boundary. The as-left survey will be conducted from a single general support vessel (refer Section 4.9) which will be at a location within 20 km of Thevenard Island for less than a day. The mercury preparation (Section 4.6) and removal activity (Section 4.7) scopes are located 80 km from the nearest marine turtle nesting site. Marine turtles are not expected to be in the operational area in high numbers during the removal activities, even during nesting and internesting periods, given the distance from the known nesting beaches.

Both continuous and impulsive noises may result in localised behavioural responses to individuals transiting through the operational area, with minor impact only. Individuals may deviate slightly from their activities but are expected to resume normal behaviour as they move away from the activities. Any impacts are anticipated to be temporary and minor and not impact any biologically important behaviours.

Fish, Sharks and Rays

All fish species can detect noise sources, although hearing ranges and sensitivities vary substantially between species (Dale et al., 2015). Sensitivity to sound pressure seems to be functionally correlated in fishes to the presence and absence of gas-filled chambers in the sound transduction system. These enable fishes to detect sound pressure and extend their hearing abilities to lower sound levels and higher frequencies (Ladich and Popper, 2004; Braun and Grande, 2008). Based on their morphology, Popper et al. (2014) classified fishes into three animal groups, comprising:

- fishes with swim bladders whose hearing does not involve the swim bladder or other gas volumes
- fishes whose hearing does involve a swim bladder or other gas volume
- fishes without a swim bladder that can sink and settle on the substrate when inactive.

The criteria defined in Popper et al. (2014) for continuous (Table 8-10) noise sources on the above groups have been adopted.

Table 8-10: Continuous Noise – Criteria for Noise Exposure for Fish, adapted from Popper et al. (2014)

Potential Marine Fauna Receptor	Mortality and Potential mortal injury	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
Fish: No swim bladder (particle motion detection)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: Swim bladder not involved in hearing (particle motion detection)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: Swim bladder involved in hearing (primarily pressure detection)	(N) Low (I) Low (F) Low	170 dB SPL for 48 h	158 dB SPL for 12 h	(N) High (I) High (F) High	(N) High (I) Moderate (F) Low
Fish eggs and fish larvae	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low	(N) Moderate (I) Moderate (F) Low

Note: Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N) – tens of metres, intermediate (I) - hundreds of metres, and far (F) – thousands of metres.

Note: Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N) – tens of metres, intermediate (I) - hundreds of metres, and far (F) – thousands of metres.

Based on criteria developed by Popper et al. (2014) for noise impacts on fish, project vessel noise has a low risk of resulting in mortality and a moderate risk of TTS impacts when fish are within tens of metres from the source. Behavioural impacts to fish from survey equipment (MBES and SSS) noise may occur in individuals located within hundreds of metres of the source. However, none of the survey equipment has energy below 1 kHz; therefore, it cannot be heard by most fish, which further reduces the risk of impact (Ladich and Fay, 2013). The most likely impacts to fish from noise will be behavioural responses, reducing any TSS impact. Individual demersal fish may be impacted in the vicinity of the operational area and tuna and billfish and other mobile pelagic species may transverse the operational area.

The operational area overlaps a whale shark foraging BIA. Whale sharks could potentially be impacted from continuous project vessel noise. If in the area, whale sharks would be expected to show avoidance to vessel noise, although they can likely tolerate low level noise.

The operational area is not known to be an important spawning or aggregation habitat for commercially-caught targeted species. Therefore, no impacts to fish stocks are expected.

Any impacts from continuous and impulsive noise sources to fish, sharks and rays are anticipated to be temporary and minor and relate to behavioural changes only.

Cumulative Noise Emission Impacts

Typically, only one general support vessel will be performing the as-left survey in the operational area for a period of approximately 2 to 4 weeks. Typically, a maximum of two vessels (an installation vessel and a general support vessel) will be in the operational area at the PLEM location at any one time during mercury removal activities for a period of approximately 2 to 4 months (refer Section 4.10).

Impacts from noise emissions to marine fauna have been discussed in the above sections. More sensitive periods relate to the main humpback whale migration period (July to early October). However, the nearest area of known importance to humpback whales is the Exmouth Gulf resting area is located over 70 km south-west of the operational area. Whilst a foraging BIA for whale sharks is over the operational area, the foraging (high density prey) is 86 km from the operational area (Section 5.6.2).

Cumulative impact from the use of multiple project vessels is not considered to present significant impacts to marine fauna given their mobility and ability to avoid the sound source and the distance from the humpback whale Exmouth Gulf resting area and whale shark high prey foraging area. Whilst the project vessels may generate noise emissions for a cumulative period of around 2 to 4 months during the mercury preparation and removal activities, the noise levels exceeding the distances for behavioural response levels for cetaceans (presented in Table 8-9) remain valid given they are based on the worst case frequency and source levels from a single project vessel (other vessels noise within the operational area will remain below these levels). Noise emissions at behavioural thresholds will therefore not reach the sensitive areas of the Exmouth Gulf. The size of the humpback migration BIA is presented in Figure 5-7 and the area relating to cetacean behavioural threshold exceedance is a fraction of this overall BIA, it is determined that the cumulative project vessel noise will not alter the migration or be detrimental the individual humpback whale or population.

Impacts from cumulative noise emissions will continue to relate to behavioural disturbance / avoidance only. The operational area is not within an area of high shipping density (Section 5.7.5), therefore should avoidance behaviour occur it is anticipated that marine fauna would be able to move to an area below the behavioural threshold. Any impacts from cumulative noise emissions on marine fauna are anticipated to be temporary and minor.

Species Recovery Plans and Threat Abatement Plans

BHP has considered information contained in relevant recovery plans for marine fauna that identify noise interference / acoustic disturbance as a threat (Section 10). This includes the objectives and actions within the Conservation Management Plan for the Blue Whale 2015–2025 (Commonwealth of Australia, 2015a), the Approved Conservation Advice for the Humpback Whale (TSSC, 2015) and the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017) which relate to noise emissions.

8.3.4 Demonstration of As Low As Reasonably Practicable

A summary of the ALARP process for the environmental aspect is presented in Table 8-11. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 8-11: Noise Emissions – As Low As Reasonably Practicable Assessment Summary

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
Administrate	Engines, compressors and machinery on the vessel are maintained via the vessel preventative maintenance system (PMS).	Accept	Maintenance and inspection completed as scheduled on PMS reduces the generated noise emissions and associated impacts. Machinery maintenance is part of normal operations to ensure operating in accordance with manufacturer's guidelines. The control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 8.3.1**
	Pre-watch for marine fauna from the vessel bridge prior to DP	Reject	Pre-watch for marine fauna prior to DP operations will identify if any marine fauna are in sight prior to use of DP. This may	-

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
	operations and not undertaking DP operations until no marine fauna (such as pygmy blue whale and humpback) are present.		reduce the instance of behavioural impacts to marine fauna, such as pygmy blue and humpback whale, which may be present given the operational area overlaps with their BIA (Table 5-10). Typically, a maximum of two vessels (an installation vessel and a general support vessel) will be in the operational area at the PLEM location at any one time during mercury removal activities for a period of approximately 2 to 4 months (refer Section 4.10). It should be noted that DP is also not a constant during the operations, but it is required during certain activities requiring the vessel to be stationary for periods. The noise impacts are anticipated to be temporary and minor and relate to behavioural changes only. Given the low risk of impacts associated with underwater noise and the low vessel use in the general vicinity of the field (refer to shipping density, Section 5.7.5), which given the species ample room to move out of the noise behavioural threshold zone. The pre-watch from the vessel and delay of DP operations if necessary is disproportionate to the negligible benefit that may accrue.	
Substitute	Manage the timing of the mercury removal activity to avoid sensitive periods (such as humpback whale migration, whale shark foraging). *Note: main humpback whale migration period (July to early October)*	Reject	Would reduce the risk of impacts from noise emissions during environmentally sensitive periods. The benefit that may accrue from avoiding periods of peak humpback whale migration is considered to be negligible based on the observation that even with all the oil and gas development (and associated vessel movements) occurring in the Exmouth Basin over the last ten years, the humpback whale population (Stock IV) has grown at an estimated 10% per year to the point where International Union for Conservation of Nature has removed the humpback whales from the threatened category. Bejder et al. (2015) found the population abundance of eastern and western Australian humpback whales has recovered to more than around 50% of their pre-whaling abundance and argued that, based on meeting the eligibility criteria for removing a species from any category in the list of threatened species under the EPBC Act, the available scientific evidence does not support the listing of humpback whale populations on the EPBC Act list of threatened species. The cost associated with avoiding periods of peak whale density would be several millions of dollars if it requires placing contracted vessels on standby or the petroleum activity to be put on hold, delaying the mercury removal activities and the decommissioning of the GEP. Given the	-

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
			low risk of impacts associated with underwater noise, it is considered the cost of this additional control is grossly disproportionate to the negligible benefit that may accrue.	
	Manage the timing of the as-left survey activity to avoid sensitive periods (such as humpback whale migration, whale shark foraging). *Note: main humpback whale migration period (July to early October)*	Reject	Would reduce the risk of impacts from noise emissions during environmentally sensitive periods. The benefit that may accrue from avoiding periods of peak humpback whale migration is considered to be negligible based on the observation that even with all the oil and gas development (and associated vessel movements) occurring in the Exmouth Basin over the last ten years, the humpback whale population (Stock IV) has grown at an estimated 10% per year to the point where International Union for Conservation of Nature has removed the humpback whales from the threatened category. Bejder et al. (2015) found the population abundance of eastern and western Australian humpback whales has recovered to more than around 50% of their pre-whaling abundance and argued that, based on meeting the eligibility criteria for removing a species from any category in the list of threatened species under the EPBC Act, the available scientific evidence does not support the listing of humpback whale populations on the EPBC Act list of threatened species. Any noise impacts are anticipated to be temporary and minor and relate to behavioural changes only over a small area of the overall humpback migration corridor. The as-left survey will be undertaken immediately after the mercury removal activities offshore, as required to detail the as-left status of the GEP. It will be undertaken using the same vessels as contracted for the mercury removal activities. The cost associated with avoiding periods of peak whale density would be several millions of dollars if it requires placing contracted vessels on standby or the petroleum activity to be put on hold, delaying the as-left survey activities. Given the low risk of impacts associated with underwater noise, it is considered the cost of this additional control is grossly disproportionate to the negligible benefit that may accrue.	-
	Vessel to use anchors to maintain position rather than DP.	Reject	Would complicate and increase risk of works in proximity to subsea infrastructure. Anchoring will cause seabed disturbance. Given the low risk of impacts associated with underwater noise, the increased risks and impacts outweigh the marginal environmental benefit.	-

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
	Use of small vessels with lower DP noise levels	Reject	May reduce the amount of noise emissions from vessels as small vessels require a lower power DP. However, any noise impacts are anticipated to be temporary and minor and relate to behavioural changes only activities required are minimal. The vessel sizes are required to undertake the activities and sizes cannot be reduced as they have been chosen based on the engineering assessment. Reducing the size of vessels in the field may lead to unsafe or increased engineering risks during the removal activities and is therefore not feasible.	-
Eliminate	Eliminate use of vessels.	Reject	The use of vessels is required to conduct the petroleum activity. Control not feasible.	-
Engineering	Reduction in number of vessels required for the petroleum activities	Reject	May reduce the amount of noise emissions from vessels. However, any noise impacts are anticipated to be temporary and minor and relate to behavioral changes only activities required are minimal. The number of vessels required to undertake the activities cannot be reduced and numbers have been chosen based on the engineering assessments. Reducing the number of vessels in the field may lead to unsafe or increased engineering risks during the removal activities and is therefore not feasible.	-

ALARP Summary

The risk assessment and evaluation has identified controls (Table 8-11) that when implemented are considered to manage the impacts of noise emissions on marine fauna to ALARP.

BHP considers the control measures described above are appropriate to reduce impacts of noise emissions on marine fauna. Additional reasonable control measures were identified in Table 8-11 to further reduce impacts, but rejected since the associated cost and sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

8.3.5 Demonstration of Acceptability

Given the adopted controls, the underwater noise emissions generated during the petroleum activity will not result in potential impacts greater than temporary and minor behavioural disturbance to marine fauna. Further opportunities to reduce the impacts have been investigated in Table 8-11.

The adopted controls are considered good oil-field practice/industry best practice. No concerns or objections regarding the impacts of noise emissions have been raised by relevant stakeholders. The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). BHP has considered information contained in recovery plans and threat abatement plans (Section 10). The environmental impacts meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the impact to be managed to an acceptable level.

8.3.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Environmental Performance Outcome	Performance Standard	Measurement Criteria
No injury or mortality to EPBC Act 1999 and *WA Biodiversity Conservation Act 2016* listed fauna during the petroleum activity	**PS 8.3.1** Contractor has PMS to ensure engines and power generation equipment, compressors and machinery on the vessel are maintained.	Pre-start inspection shows maintenance has been satisfactorily completed as scheduled in PMS.

8.4 Project Vessel Atmospheric Emissions

8.4.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Project vessel atmospheric emissions	Atmospheric emissions from vessel engines and generators, and incinerators on vessel.	Localised and temporary reduction in air quality as a result of greenhouse gas (GHG) emissions, non-GHG emissions, particulates and volatile organic compounds.	10	N/A	-	Type A Low Order Impact	Tolerable

8.4.2 Source of Hazard

The project vessels use MDO to power vessel engines, generators, mobile and fixed plant and equipment and the incinerator for the duration of the petroleum activity. The combustion of fuel and the incineration of waste on-board the vessels will generate emissions of greenhouse gases, such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and non-GHG such as sulphur oxides (SOx) and nitrogen oxides (NOx), particulate material and volatile organic compounds.

Total GHG emissions (Scope 1) associated with the petroleum activity are estimated to represent less than 0.002% of annual (2020) Australian GHG emissions. These emissions are associated primarily with project vessel fuel consumption and waste incineration.

8.4.3 Environmental Impact Assessment

Atmospheric emissions generated during the petroleum activity will result in a localised, temporary reduction in air quality in the environment immediately surrounding the discharge point and present a negligible contribution to the GHG emissions. The closest residential area is Onslow, 70 km to the south-east of the operational area where project vessel use is proposed. The quantities of atmospheric emissions are relatively small and will quickly dissipate into the surrounding atmosphere, therefore will not impact any residential areas.

Gaseous emissions under normal circumstances quickly dissipate into the surrounding atmosphere. The impact of atmospheric emissions on air quality is anticipated to be temporary and minor, with no impacts to marine fauna.

8.4.4 Demonstration of As Low As Reasonably Practicable

A summary of the ALARP process for the environmental aspect is presented in Table 8-12. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 8-12: Atmospheric Emissions – As Low As Reasonably Practicable Assessment Summary

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
Administrate	Project vessels will comply with Marine Order 97 (Marine Pollution Prevention – Air Pollution), which details requirements for: • International Air Pollution Prevention (IAPP) Certificate, required by vessel class • use of low sulphur fuel when available • Ship Energy Efficiency Management Plan, where required by vessel class • onboard incinerator to comply with Marine Order 97.	Accept	Control is legislative requirement and reduces impacts from air pollution. The control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 8.4.1**
	Project vessel engines and other machinery are maintained as per PMS to ensure equipment is operating efficiently.	Accept	Maintenance and inspection completed as scheduled on PMS reduces the noise emissions and associated impacts. Machinery maintenance is part of normal operations to ensure operating in accordance with manufacturer's guidelines. The control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 8.4.2**
Eliminate	No incineration of waste on the project vessels.	Reject	With no incineration of waste on-board the project vessels, waste would need to be stored and this would have an associated health and safety risk. The control is not feasible.	-

ALARP Summary

The risk assessment and evaluation has identified a range of controls (Table 8-12) that when implemented are considered to manage the impacts of atmospheric emissions from project vessels to ALARP.

BHP considers the control measures described above are appropriate to reduce the atmospheric emissions associated with the project vessels' operations. Additional reasonable control measures were identified in Table 8-12 to further reduce impacts, but rejected since the associated cost and sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

8.4.5 Demonstration of Acceptability

Given the adopted controls, the atmospheric emissions from project vessels will not result in potential impacts greater than temporary and minor. Further opportunities to reduce the impacts have been investigated in Table 8-12.

The adopted controls are considered good oil-field practice/industry best practice. No concerns or objections regarding the atmospheric emissions from project vessels have been raised by relevant stakeholders. The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). The environmental impacts meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the impact to be managed to an acceptable level.

8.4.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria
Atmospheric emissions comply with Marine Order requirements to restrict emissions to those necessary to perform the petroleum activity	**PS 8.4.1** Project vessels comply with Marine Order 97 (Marine Pollution Prevention – Air Pollution (as applicable to vessel class which details requirements for: • IAPP Certificate, required by vessel class • use of low sulphur fuel when available • Ship Energy Efficiency Management Plan (SEEMP), where required by vessel class • onboard incinerator to comply with Marine Order 97.	Completed Vessel Assurance Questionnaire for project vessels demonstrating the existence of: • valid IAPP Certificate • documented SEEMP. Fuel delivery receipts indicates only low sulphur fuel.
	PS 8.4.2 Contractor has PMS to ensure engines and power generation equipment, compressors and machinery on the vessel are maintained.	Pre-start inspection shows maintenance has been satisfactorily completed as scheduled on PMS.

8.5 Routine Project Vessel Discharges

8.5.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Routine project vessel discharges	Routine planned discharge of sewage, grey water, putrescible (food), desalination brine, cooling water, and deck and bilge water to the marine environment from the project vessels.	Localised and temporary reduction in water quality adjacent to the discharge point associated with minor increases in nutrients, salinity, temperature and oily water/ chemical residues.	10	N/A	-	Type A Low Order Impact	Tolerable

8.5.2 Source of Hazard

Project vessels will generate and routinely discharge to the marine environment treated sewage, grey water, putrescible (food) wastes and desalination brine, cooling water, bilge water and deck drainage, as described below.

Sewage, Grey Water and Food Waste

The volume of sewage, grey water and food wastes generated by the vessel is directly proportional to the number of persons on-board the project vessels. The total volume of sewage and grey water generated by the project vessels is estimated to be in the order of 5 m^3 to 15 m^3 per day, per vessel depending on persons on-board. Food waste generated is typically 1 L per person per day. This scale of discharge falls within the scope of the Environment Plan Reference Case – Planned Discharge of Sewage, Putrescible Waste and Grey Water (National Energy Resources Australia, 2017).

Desalination Brine Reject from Reverse Osmosis

Potable water is produced on-board the vessel using reverse osmosis machinery. Reverse osmosis is a membrane-technology filtration method that removes salt molecules and ions from seawater by applying pressure to the solution when it is on one side of a selective membrane. The result is that a brine solution with salinity elevated by around 10% is retained on the pressurised side of the membrane and the potable water is allowed to pass to the other side.

Cooling Water

Seawater is used as a heat exchange medium for cooling machinery engines on some vessels, others use air cooling. Seawater is pumped on board the vessel, passes through heat exchangers and subsequently discharged from the vessel with temperature elevation in the order of 2 to 5°C. Seawater used for cooling is dosed with chlorine after intake and discharged with low residual chlorine concentrations that are rapidly diluted by prevailing water currents.

Deck Drainage

No wastes contaminated with hydrocarbons or chemicals will be routinely discharged from the project vessel deck drains. Drainage from areas of a high risk of hydrocarbon or chemical contamination will be managed to ensure it has an oil content of less than 15 ppm before overboard discharge or sent to shore for disposal.

Rainfall and washdown of the decks may result in minor quantities of chemical residues, such as detergent, oil and grease entering the deck drainage system and being possibly discharged overboard.

8.5.3 Environmental Impact Assessment

The project vessel discharges will be quickly dispersed and diluted such that any temporary change in water quality above baseline values will be limited to the vicinity of the discharge point for a very short time. Marine fauna within the operational area are likely to be transient; however, they may be come in direct contact with the releases (by passing through the immediate discharge area). If contact does occur with any marine fauna, it will be for a short duration, such that exposure time may not be of sufficient duration to cause a toxic effect. Given the small volumes of discharges, the water depth of release and the rapid dilution, the likelihood of ecological impacts to marine fauna is considered to be highly unlikely. The next subsections examine in more detail the environmental impact of each of the identified routine vessel discharges.

Sewage, Grey Water and Food Waste

The potential impacts associated with sewage, grey water and food waste discharges from vessels are discussed in detail in the Environment Plan Reference Case (National Energy Resources Australia, 2017).

The impacts from routine project vessel discharges are considered to fall within the scope of this description since:

- the volume and types of discharge are consistent with the Reference Case limitations
- the discharges will not affect a (State or Commonwealth) marine reserve or occur within 3 nm of a World Heritage Property, National Heritage Place, Wetland of International Importance or the Great Barrier Reef Marine Park

- the discharges are not inconsistent with management documentation for any EPBC Act-listed threatened or migratory species.

Studies of moving vessels have shown very high dispersion rates for effluents (Loerh et al., 2006). Mixing and dispersion would be facilitated in deep offshore waters of the operational area and through regional wind and large-scale current patterns. The potential environmental impact from routine vessel discharges is considered temporary and minor and relates to a localised reduction in water quality, with no significant impacts to marine fauna anticipated.

Brine Reject from Reverse Osmosis

The brine solution will be quickly dispersed and diluted to undetectable levels within a few metres of the discharge point. Given the relatively low volume of discharge, the relatively low increase in salinity and the open ocean environment, the discharge of reverse osmosis brine streams is considered temporary and minor and relates to a localised reduction in water quality, with no significant impacts to marine fauna anticipated.

Cooling Water

When discharged to sea, the cooling water will be subject to turbulent mixing and loss of heat to the surrounding waters. The area of detectable increase in seawater temperature is likely to be less than 10 m radius. The impact of cooling water discharge is considered temporary and minor and relates to a localised reduction in water quality, with no significant impacts to marine fauna anticipated.

Deck Drainage

Due to the small volumes of deck drainage, the very low levels of contaminants likely to be entrained in the discharge and the rapid dilution and dispersal that will result in the open ocean, the environmental effects will be temporary and localised. The discharge of deck drainage is considered temporary and minor and relates to a localised reduction in water quality, with no significant impacts to marine fauna anticipated.

Species Recovery Plans and Threat Abatement Plans

BHP has considered information contained in relevant recovery plans for cetaceans and marine turtles that identify chemical discharges/pollution as a threat (Section 10). This includes the objectives and actions within the Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017), which relate to discharges.

8.5.4 Demonstration of As Low As Reasonably Practicable

The ALARP process for the environmental aspect is summarised in Table 8-13. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 8-13: Routine Vessel Discharges – As Low As Reasonably Practicable Assessment Summary

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
Administrate	Marine Order 95 – pollution prevention – garbage (as appropriate to vessel class), which requires putrescible waste and food scrap discharges from the project vessels to pass through a macerator, so it is capable of passing through a screen with no opening wider than 25 mm.	Accept	Controls based on legislative requirements must be accepted. Reduces probability of garbage being discharged to sea. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 8.5.1**

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
	Marine Order 96 – pollution prevention – sewage (as appropriate to vessel class), specifically project vessels have: • a valid International Sewage Pollution Prevention (ISPP) Certificate, as required by vessel class • an AMSA-approved sewage treatment plant • sewage comminuting and disinfecting system • a sewage holding tank sized appropriately to contain all generated waste (black and grey water) • discharge of sewage which is not comminuted or disinfected will only occur at a distance of more than 12 nm from the nearest land • discharge of sewage which is comminuted or disinfected using a certified approved sewage treatment plant will only occur at a distance of more than 3 nm from the nearest land • discharge of sewage will occur at a moderate rate while the vessel is proceeding (>4 knots), to avoid discharges in environmentally sensitive areas.	Accept	Controls based on legislative requirements, must be accepted. Reduces potential impacts of inappropriate discharge of sewage. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 8.5.2**
	Marine Order 91 – oil (as relevant to vessel class) requirements, which include mandatory measures for processing oily water before discharge and requires vessels have a valid IOPP Certificate, as required by vessel class.	Accept	Controls based on legislative requirements must be accepted. Reduces potential impacts of planned discharge of oily water to the environment. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 8.5.3**
Engineer	Routine vessel wastes (sewage, greywater and foods wastes) stored on-board and transferred to shore for onshore treatment and disposal.	Reject	Health and safety risks associated with the storage of routine vessel wastes on-board. Additional costs involved in waste transfers disproportionate to the environmental benefit gained, given the rapid dilution in offshore waters and minor and localised potential impact from routine vessel discharges.	-
Eliminate	Eliminate use of vessels.	Reject	The use of vessels is required to conduct the petroleum activity. Control not feasible.	-

ALARP Summary

The risk assessment and evaluation has identified a range of controls (Table 8-13) that when implemented are considered to manage the impacts of routine vessel discharges from the project vessels to ALARP.

BHP considers the control measures described above are appropriate to reduce the potential impacts of routine vessel discharges from the project vessels. Additional reasonable control measures were identified in

Table 8-13 to further reduce impacts, but rejected since the associated cost or sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

8.5.5 Demonstration of Acceptability

Given the adopted controls, the routine vessel discharges from the project vessels will not result in potential impacts greater than temporary and minor reduction in water quality. Further opportunities to reduce the impacts have been investigated in Table 8-13.

The adopted controls are considered good oil-field practice/industry best practice. No concerns or objections regarding the routine vessel discharges from the project vessels have been raised by relevant stakeholders. The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). The environmental impacts meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the impact to be managed to an acceptable level.

8.5.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria
Routine vessel discharges are in compliance with Marine Order requirements to restrict emissions to those necessary to perform the petroleum activity	**PS 8.5.1** Project vessels comply with Marine Order 95 – pollution prevention – garbage (as appropriate to vessel class), which requires putrescible waste and food scraps to pass through a macerator, so it is capable of passing through a screen with no opening wider than 25 mm before discharge.	Records demonstrate project vessels are compliant with Marine Order 95 – pollution prevention – garbage (as appropriate to vessel class).
	PS 8.5.2 Project vessels are compliant with Marine Order 96 – pollution prevention – sewage (as appropriate to vessel class).	Records demonstrate project vessels are compliant with Marine Order 96 – pollution prevention – sewage (as appropriate to vessel class).
	PS 8.5.3 Project vessels are compliant Marine Order 91 – oil (as relevant to vessel class) requirements, which include mandatory measures for processing oily water before discharge and requires vessels have a valid IOPP Certificate, as required by vessel class.	Records demonstrate project vessels comply with Marine Order 91 – oil (as relevant to vessel class), including having a valid IOPP Certificate and oil record book.

8.6 Seabed Disturbance from GEP

8.6.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Physical disturbance to seabed	Long term presence of the GEP on the seabed.	Physical modification to the seabed.	10	N/A	-	Type A Low Order Impact	Tolerable
	Contingent removal of the GEP.	Physical modification to the seabed. Localised and temporary reduction in water quality.	10	N/A	-	Type A Low Order Impact	Tolerable

8.6.2 Source of Hazard

Long Term Physical Presence of the GEP

The long term physical presence of the GEP has the potential to cause localised seabed disturbance / physical modification to the seabed, altering of benthic habitats by providing a hard substrate. The GEP currently provides hard substrate resulting in the creation of new habitat. Marine growth was observed on the GEP at a thickness of 50 mm along the GEP in water depths of greater than 25m and consisted of hydroid grass (5-15%) with entrapped sediment and assorted shellfish (barnacles, mussels etc) (10 to 20%) (Section 4.5) (BHP, 2017b).

From the Commonwealth / State waters boundary (approximately KP 35) for 3 km the GEP was trenched and has naturally backfilled (refer Section 4.5). Three rock bolts are present at the Commonwealth / State waters boundary. From 3 km onwards, no secondary stabilisation measures were implemented and while previously unburied, the self-burial process has already begun to occur with the observation of freespans and localised GEP lowering into the seabed. An example of GEP burial at a location 5 km from the Commonwealth / State waters boundary, taken from the 2017 ROV survey is presented in Figure 8-1.

Contingent Removal of the GEP

During contingent GEP removal, excavation is required to gain access to the GEP for both a cut and recovery method and s-lay recovery method, the GEP is then recovered to the vessel, either by crane (cut and recover) method or by s-lay (s-lay recovery method) (refer Section 4.8).

For the purposes of the environmental impact assessment the subsea cut and recovery option is considered to present a worst case seabed disturbance impact, as it will require a greater amount of seabed intervention/disturbance. Whilst an s-lay recovery option may be utilised, the feasibility of this method is dependent on the condition of the concrete coating and the steel. At this stage it is not clear that this method is feasible, this can only be determined following recovery and testing of a section of the GEP to confirm concrete integrity can withstand the tensioner loads.

GEP removal has the potential to cause localised seabed disturbance / physical modification to the seabed on either side of the GEP. A conservative estimate of disturbed seabed is 5 m on either side. Given the length of the GEP in Commonwealth waters is 25 km, a conservative total seabed disturbance of 0.25 km^2 is calculated.

The seabed disturbance during GEP removal will also result in localised sediment disturbance and localised temporary increase in turbidity.

Use of the ROV during the petroleum activity may result in temporary seabed disturbance and suspension of sediment, causing increased turbidity and suspended sediment as a result of working close to, or occasionally on, the seabed.

8.6.3 Environmental Impact Assessment

Physical Modification to the Seabed and Soft Sediments from decommissioning GEP *in situ*

The presence of the GEP on the seabed can interact with surrounding hydrodynamic conditions potentially resulting in disturbance to the seabed (scouring) which may subsequently impact or alter associated benthic habitats.

Where exposed, the GEP is expected to progressively self-bury in sandy sediment. Burial will occur through the initiation of scour underneath the GEP at discrete locations. Free spanning and lowering, as result of localised scouring of the seabed, will continue until a state of equilibrium is reached. This is estimated to take between 70 and 100 years (Atteris, 2019a). The GEP is expected to partially bury (60% - 90% of its outside diameter) along most sandy sections of the route (Atteris, 2019a). The GEP can be expected to lower into the seabed to 85% outside diameter on average (Atteris, 2019a).

Local scour around the GEP will only occur whilst the GEP structure is intact and provides a disruption to the flow of water. It will stop occurring once the GEP degrades and loses its shape or once the GEP is buried and no longer protruding above the seabed.

Any scouring or modifications of the seabed over time (70 and 100 years) as the GEP lowers into the seabed are limited to the already modified area of seabed below the GEP. The operational area overlaps the Ancient Coastline at 125 m depth contour (refer Figure 5-4) and seabed modifications may directly disturb a very small, localised area of sediments over the KEF. However, no lasting effects are anticipated to the ecological properties of the KEF. Sediment-burrowing infauna and surface epifauna invertebrates on or around the GEP may alter over time as the GEP buries and breaks down, impacts however will continue to be localised and minor.

Provision of Hard Substrate and Benthic Habitat from Decommissioning GEP *in situ*

BHP has completed fish habitat studies and infrastructure degradation studies to understand the long-term impacts of leaving the GEP *in situ*. As detailed in Section 5.4.3, the GEP in Commonwealth waters is characterised by the presence of commercially important species and abundances of larger-bodied, commercially important species such as: *P. multidens* (goldband snapper), *Lutjanus malabaricus* (saddletail snapper) and *Lutjanus russelli* (Moses' snapper) among others. The most ubiquitous species on and off-pipeline at depth are listed in Table 5-6, Section 5.4.3. Five out of the 10 species occurring on the GEP are commercial species. The most commonly occurring species being *P. multidens* (goldband snapper), an important commercially targeted species in this region and targeted by line and trap fisheries. The abundance distribution of commercial species along the GEP is displayed as a heat map (using latitude and longitude only) in Figure 5-3, Section 5.4.3.

The GEP is currently providing a hard substrate for commercial fish species, this may decrease over time as the GEP buries (discussed in Section 8.1), which is estimated to take between 70 and 100 years (Atteris, 2019a). No significant impacts are anticipated as a result of the loss of hard substrate as the GEP buries.

Contingent Removal of the GEP

Elevated turbidity and disturbance of seabed habitat and associated communities from the GEP removal are confined to sediment burrowing infauna and surface epifauna invertebrates, such as filter feeders in the immediate vicinity. These species are considered to have low sensitivity to localised physical disturbance around the GEP. Any impacts are anticipated to be localised and minor, given the low densities of benthic organisms (refer Section 5.4.2) and representation of the infauna communities along the GEP.

The GEP is currently providing a hard substrate for commercial fish species, as described in the above section. This hard substrate habitat will be removed during GEP removal and it is likely that the commercial fish presence decreases significantly over time.

The operational area overlaps the Ancient Coastline at 125 m depth contour (refer Figure 5-4) and seabed disturbance may directly change the sediment quality of a very small, localised area of sediments over the KEF. However, no lasting effects are anticipated to the ecological properties of the KEF.

8.6.4 Demonstration of As Low As Reasonably Practicable

The ALARP process for the environmental aspect is summarised in Table 8-14. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 8-14: Seabed Disturbance – As Low As Reasonably Practicable Assessment Summary

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
Eliminate	Removal of GEP	Reject	Section 3 determined that leaving the GEP *in situ* provides equal or better environmental outcomes compared to complete removal. Furthermore, GEP has the potential to provide a benefit due to the creation of a hard substrate habitat on a seabed predominantly comprised of soft sediment, even when partially buried. The removal of the GEP has been included as a contingent activity. Section 4.8 includes the GEP removal philosophy.	-
	Eliminate ROV use.	Reject	The use of ROVs (including work close to or occasionally landed on the seabed) is required during GEP removal and as-left surveys. ROV usage is already limited to only that required to conduct the work effectively and safely.	-
Administrate	Environmental monitoring of the seabed to assess any impacts to the seabed from GEP breakdown / burial or contingent removal.	Reject	Studies have shown the degradation of the GEP will occur over an extended period (over 800 years), therefore the rate of change is predicted to be slow and unlikely to be easily detected over short to medium timeframes. Given the timeframe for breakdown of materials, ongoing monitoring is impractical. Control grossly disproportionate. Monitoring will not reduce the consequence of any impacts to the seabed (which have been determined to be acceptable), and the costs associated with the level of monitoring required to accurately assess any impacts greatly outweighs the benefits. Whilst ongoing monitoring has been determined not to be required based on the ALARP assessment above, an as-left ROV survey will be undertaken along the GEP left either left *in situ* or removed (refer Section 4.8). Further detail on long term monitoring is provided in Section 12.4.2.	-

ALARP Summary

Impacts are considered localised and minor from seabed disturbance associated with the GEP. Reasonable control measures were identified in Table 8-14 to further reduce impacts but rejected since the associated cost and sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

8.6.5 Demonstration of Acceptability

Seabed impacts will not result in potential impacts greater than temporary and minor disturbance to seabed habitat. Further opportunities to reduce the impacts have been investigated in Table 8-14.

No concerns or objections regarding seabed disturbance have been raised by relevant stakeholders. The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). BHP has considered information contained in recovery plans and threat abatement plans (Section 10). The environmental impacts meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the impact to be managed to an acceptable level.

8.6.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Not applicable as seabed disturbance impacts are considered to be as low as reasonably practicable.

8.7 Subsea Discharges from GEP Breakdown and GEP Cutting

8.7.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Hazard	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Subsea discharges from breakdown of GEP and GEP cutting	Discharges from steel during the breakdown of GEP.	Localised and long term reduction in sediment quality.	10	N/A	-	Type A Low Order Impact	Tolerable
	Discharges from concrete during the breakdown of GEP.	Localised and long term reduction in sediment quality.	10	N/A	-	Type A Low Order Impact	Tolerable
	Discharges from plastics (within the coating) during the breakdown of GEP.	Localised and long term reduction in sediment quality. Addition of marine plastics within the marine environment.	10	N/A	-	Type A Low Order Impact	Tolerable
	Discharges of Mercury during the breakdown of GEP.	Localised and long term reduction in sediment quality.	10	N/A	-	Type A Low Order Impact	Tolerable
	Discharges from GEP cutting and recovery (contingent GEP removal).	Localised and temporary reduction in sediment quality. Localised and temporary reduction in water quality.	10	N/A	-	Type A Low Order Impact	Tolerable

8.7.2 Source of Hazard

The GEP and associated components by weight are presented in Section 4.5, Table 4-4. The GEP predominantly comprises of carbon steel and concrete weight coating, with lower masses of mastic cutback infill and pipeline coating systems (FBE and HSS). As the GEP is left *in situ*, the components will eventually breakdown over time, which will result in the discharge of steel, concrete and very minor (0.3% of the GEP) amounts of plastics (Linear Low-Density Polyethylene within the HSS and Epoxy resin in the FBE) to the marine environment.

Degradation mechanisms / initiating events for the breakdown of GEP and associated components include:

1. Coating Breakdown:
   - FBE, which is an epoxy coating used on the pipe joints to exclude water from the majority of the joint length.
   - HSS, which is used to exclude water from the field joint cutbacks after the pipe joint is welded into the pipeline.
   - Mastic which is used to fill in the space left by the cutback of the CWC at the field joints.
2. Iron Corrosion
   - GEP external corrosion - External corrosion will occur on the GEP when the steel surface becomes exposed to seawater and is no longer protected by the CP system. Corrosion occurs due to chemical reactions between the water, oxygen and the iron in the pipeline steel. Corrosion may also occur on the pipeline buried in sediment by the action of certain corrosion inducing bacteria. External corrosion will eventually lead to perforations of the pipeline wall. External corrosion should not take place until the pipeline coating system (FBE and HSS) breaks down and the CP system becomes deficient i.e. anodes have depleted.
   - GEP internal corrosion - Internal corrosion is characterised by material loss and thinning of the inside of the pipe wall. It requires a corrosive environment (i.e. presence of bacteria, oxygen, H_2S, CO_2) to occur and can occur due to electrochemical or biological processes.
   - GEP secondary stabilisation corrosion - Rock bolts are used to provide secondary stabilisation to the GEP and to provide lateral stability. External corrosion is a primary degradation mechanism for this mild steel structure. Rock bolts are protected with protective paint and a cathodic protection system.
3. Concrete coating breakdown
   - To improve the stability of the GEP, CWC was added during manufacture to increase the on-bottom weight of the GEP. Over time the reinforcing wires in the CWC may corrode, causing the concrete to spall, also known as concrete cancer. This will reduce the weight of the GEP, increasing its vulnerability to instability.
4. On-bottom stability
   - The GEP is located in a region where severe storm and cyclones are common. These cyclonic conditions can subject the GEP to significant wave and current loading. These hydrodynamic loads can cause the GEP to move (both laterally and vertically). Due to various degradation mechanisms, the GEP self-weight and sediment resistance required to prevent this from occurring will be reduced over time. If the GEP displaces laterally due to hydrodynamic loads, it may make contact with an object (e.g. rocky outcrop etc.) and subsequently buckle / rupture due to bending and impact loading.
5. Pipeline free spans
   - A pipeline freespan refers to a section that is suspended above the seabed over a specific length. Pipeline freespans occur when a pipeline is installed over uneven terrain (i.e. rocky outcrops, artificial supports, sand waves etc.) or where scour occurs below the pipeline. Pipeline freespans in combination with steady currents and / or wave induced flow can lead to Vortex Induced Vibrations (VIV). The severity of VIV increases with increasing pipeline freespan length. Over time, VIV can cause fatigue cracks to appear in the GEP, most likely at the girth welds.
6. Accidental external impact

   Accidental external impacts such as dropped objects from passing vessels and fishing activity / trawling may cause buckle / rupture in the GEP.

A degradation study by Atteris (Atteris, 2019a) has been conducted to provide an evaluation of the degradation timeline for the GEP. This evaluation has been performed by identifying all potential degradation mechanisms (described in the 6 points above) and their respective cause(s), identifying points of initiation, and assessing their contribution to the degradation process.

The study concludes that the GEP will primarily degrade through iron corrosion. A variety of factors will influence how this corrosion proceeds along the GEP:

- The GEP cathodic protection system will delay the corrosion of the GEP until the anodes are depleted. These anodes will deplete at different rates along the GEP. As described in Section 4.5, GEP corrosion is not considered an integrity concern at present and there is approximately 100 years of design life remaining.
- At the open GEP end termination (or at any large openings along the GEP which form), internal corrosion will begin to consume the steel. Due to the low internal water volume exchange and low rate of oxygen and nutrient diffusion along the GEP, extensive internal corrosion is unlikely to extend beyond a few hundred meters before external corrosion perforates the pipe extensively.
- The concrete weight coating and GEP coatings will degrade, allowing the external corrosion of the GEP to accelerate over time due to exposure to the marine environment. The speed and location of coating breakdown depends on installation and operation damage and local environmental conditions.
- Perforations in the GEP will form because of external corrosion and possible fatigue cracking at large spans. These will allow the ingress of oxygen and nutrients, initiating internal corrosion in these areas.

In addition to the above, the GEP and components will exhibit several major environmentally driven behaviours, altering its state:

- Localised seabed scouring from water flow over and under the GEP (through the permeable seabed) resulting in free spanning and lowering of the GEP to an equilibrium depth within the seabed (refer Section 8.6).
- Regional seabed scour and sediment transport resulting in the backfilling of spans, scour holes and potentially transporting sufficient material to bury the GEP (refer Section 8.6).
- Cyclic (temporary) localised exposure of the GEP (due to scour effects and marine life activity) which may result in attraction of marine growth creating temporary habitats for marine life (refer Section 8.6).
- Exposed and spanning areas of the GEP, which may exhibit some instability and areas of fatigue cracking due to hydrodynamic loading and high contents density.

The estimated degradation timeline for the GEP results in a loss of structural integrity and breakup in 200 – 500 years, with this estimation extending to up to 800 years in areas of benign corrosion conditions (Atteris, 2019a) (refer Figure 8-4). Further details on the degradation of the GEP is provided below.

Griffin GEP Degradation Timeline

The GEP degradation process determined by Atteris (2021) is summarised below:

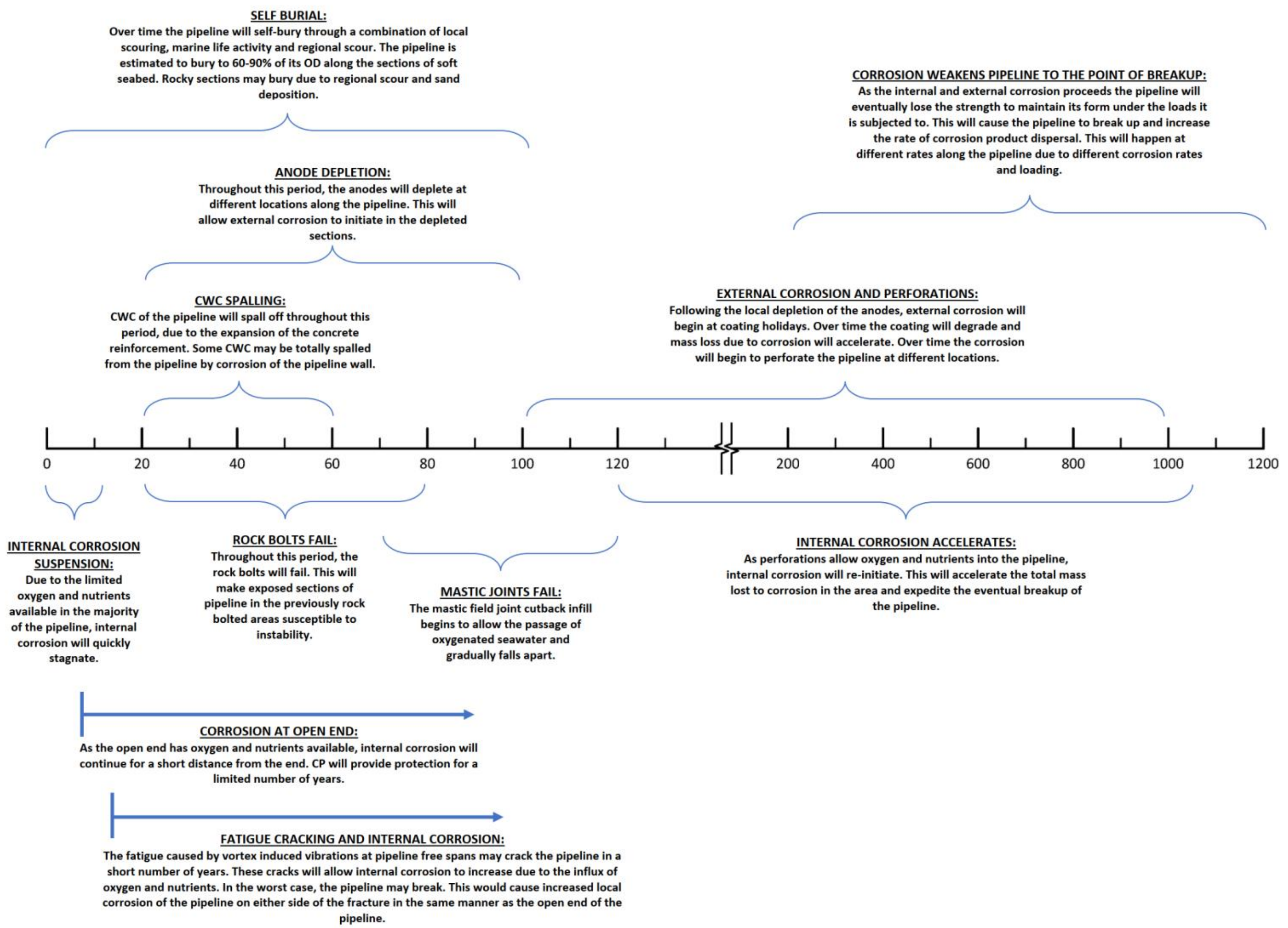
- Over the next 70 to 100 years the GEP is likely to self-bury to approximately 60% - 90% of its diameter through the areas of soft seabed. Through areas of hard seabed, burial is unlikely though burial due to high sediment deposition rates that have been observed in GEP surveys (BHP, 2017b).
- The sacrificial GEP anodes will take anywhere between 20 years and 100 years to deplete (refer Section 4.5), depending on the condition of the GEP coatings and the GEP burial status. The open end of the GEP at the PLEM is likely to exhaust its CP quicker, due to the increased draw caused by the flooded, unprotected internal surface of the pipe. The remaining GEP will not be impacted by draw due to the stagnant conditions internally.
- Away from the open end of the GEP, the CP system will provide little to no protection to the internal surface of the GEP. As such a burst of corrosion will occur internally due to first oxygen corrosion and then Microbial Induced Corrosion (MIC). This will occur until the oxygen and nutrient supply is exhausted in the stagnant part of the GEP. The corrosion will then reduce to an extremely low rate until fresh oxygen or nutrients become available (e.g., when GEP cracks).
- Once the CP system locally fails, external corrosion will begin at coating (FBE and HSS) defect sites. Corrosion of the steel will most likely occur at weak points within the system. Accounting for the protection afforded by the CWC, it is estimated that the corrosion perforation may occur between 100 years and 800 years after local CP system depletion. The primary method of failure for FBE is disbonding from the

GEP. This is caused by a variety of means, from water and oxygen permeation, cathodic disbonding cause by formation of hydrogen on the steel surface and through standard plastic degradation pathways such as photo and thermo-oxidative reactions. The lifetime estimate for the FBE to fully degrade to the point of no longer adhering to any substrate or being able to maintain its form is one to three thousand years. As the steel of the GEP is unlikely to remain intact for this length of time, the FBE is expected to break apart due to the mechanical force of the GEP corroding and disintegrating.

- On the GEP the HSS has been coated in a mastic filler. This coating will extend the degradation timeline to some extent by limiting the access of the HSS to water and oxygen. Eventually the HSS will disintegrate. This will expose the HSS and underlying steel to greater rates of oxygen and nutrient ingress, increasing the corrosion rate. Mastic filler degradation is predicted over the next 70 – 120 years.
- Due to the significant weight of the flooded GEP, it is likely that some spans may be subject to fatigue cracking. This will perforate the GEP and may occur significantly before the external corrosion perforation estimate. These cracks will allow internal corrosion to continue due to the influx of oxygen and nutrients. The fatigue crack may progress to a full-bore fracture. This would increase the corrosion rate in the immediate area of the fracture but would have little effect on the remainder of the GEP.
- The CWC will take at least 15 years to crack due to reinforcement corrosion. Once cracked the spalling of the concrete is likely to accelerate with the concrete coating no longer providing corrosion suppression after 20 – 60 years. After detachment, the CWC will either remain buried or be dispersed into the surrounding area due to hydrodynamic loads. Due to its high density, it is likely to remain in the immediate area. While in place, the CWC will dramatically slow the corrosion rate of the GEP and aid the stability.
- The rock bolts stabilising the GEP (located in Commonwealth waters) will also exhaust their anodes and begin to corrode over time, estimated to be between 20 and 80 years. Once the rock bolts fail, the GEP will be at risk of becoming unstable during major storms.
- The rate of external corrosion of the GEP will increase as the GEP coatings (FBE and HSS) lose integrity and corrosion has opened multiple perforations. These perforations are likely to grow, leading to a greater influx of untreated seawater into the GEP. This will subsequently increase the rate of internal corrosion in the area. Ocean currents may begin to contribute to the influx of seawater into the GEP depending on the level of burial. Sediment will also begin to migrate into the GEP.
- As the number of GEP perforation sites increase over time, the internal corrosion of the GEP will accelerate. The GEP will eventually fully corrode, and corrosion product will either remain buried *in situ* or will be dispersed due to hydrodynamic loading during the degradation process.
- Any parts of the GEP coating system (FBE and HSS) that flake off will either remain buried or be dispersed by hydrodynamic loading.

An indicative timeline figure for the GEP degradation process described above is presented in Figure 8-4.

Figure 8-4: GEP Degradation Timeline



Material Release Scenarios and Estimates

Material release estimates during the GEP breakdown have been provided in Table 8-15, based on the Atteris (2021) study.

Degradation products from sections of GEP that are not buried will be dispersed by currents. A certain amount of buried material will also be dispersed due to regional scour processes. The remaining buried corrosion products and coating (FBE and HSS) material buried greater than the scour depth are likely to remain buried. The mass/percentage of buried and dispersed GEP corrosion products and coating material have been calculated based on 0%, 50%, 100% and burial, with estimates presented in Table 8-15. Whilst the estimates refer to the full GEP length (61 km), it should be noted that only 25 km of the GEP is within Commonwealth waters, therefore it is reasonable to assume that the quantities released in Commonwealth waters are approximately half of those presented in Table 8-15.

Table 8-15: Breakdown of Total Dispersed and *In situ* Material from GEP (61.7 km, average CWC) (Atteris, 2019a)

Description	Approximate Degradation Product Density (SG)	Total Dispersed Mass [1] (Te)		
		0% Buried	50% Buried	100% Buried
Steel Corrosion Product	5.0	3,513	1,757	0
FBE Coating	1.5	31	15	0
HSS Field Joint Coating	0.9	4	2	0
Concrete Weight Coating	3.0	5,448	2,724	0
Field Joint Filler (Mastic)	2.0	188	94	0

Note 1. Any material not dispersed will remain buried.

Table 8-16 provides an insight into the events which are likely to the largest and smallest likely particle sizes to be released from the GEP material.

Table 8-16: Estimated GEP Material Breakdown Initiating Events (Atteris, 2019a)

Material	Estimated Degradation Events Leading to Material Breakup		Notes
	Small Particles	Large Particles	
Weight Coatings (CWC and Mastic)	• Spalling • Abrasion • Biotic degradation (Mastic)	• Spalling • Extreme environmental loading • External impact	Over time the reinforcing wires in the CWC may corrode, causing the concrete to spall, also known as concrete cancer. This will reduce the weight of the pipeline, increasing its vulnerability to instability. The rate of spalling is likely to dictate the size of the CWC pieces, with rapid spalling likely to result in larger pieces. The timing of an extreme loading event is likely to determine Mastic particle size, with early events likely to result in larger pieces and late life events likely resulting in smaller pieces.
Corrosion Coatings (Fusion Bonded Epoxy and Heat Shrink Sleeve)	• Biotic degradation • Abiotic degradation • Substrate corrosion	• Extreme environmental loading • External impact • Substrate corrosion	The main factor in particles size formation is when the event occurs. This dictates the residual strength of the material during the loading. If it happens early in the timeline, larger pieces are likely as the material is strong enough to stay together. Late in the timeline, the material may be weak and small particles are more likely to form. FBE and HSS material buried greater than the scour depth are likely to remain buried.
Pipeline Steel	• Relatively uniform corrosion	• Extreme environmental loading • External impact • Very irregular corrosion • Fatigue • On-Bottom instability	Irregular corrosion, on-bottom stability and fatigue may cause the separation of sections of steel. Any large, separated sections of steel will continue to corrode in their new position.

Table 8-17 provide an insight into the release mechanisms, possible size and dispersion patterns of the GEP materials and degradation products.

Table 8-17: Estimated GEP Material Breakdown Outcomes (Atteris, 2019a)

Material	Estimated Material Breakdown Size and Causing Event			Estimated Dispersion Characteristics
	Lower Bound Size	Upper Bound Size	Likely Size and Event	
Concrete Weight Coating (CWC)	Sand Like Particles <1 mm Abrasion, spalling and self-erosion due to seabed mobility and movement may form sand like particles from both the cement and sand aggregate.	Large Pieces >50 cm In the event of an external impact, movement due to extreme environmental loading events or large sections of spalling; large sections of the CWC may break away from the pipe. Most likely in pipeline sections of 50 mm and 75 mm CWC thickness.	Chunks < 10 cm x 10 cm x ½ CWC thickness Spalling of the CWC due to concrete reinforcement and pipeline corrosion is the most likely method of CWC release.	Sections of the GEP are likely to remain permanently buried, any material in these sections which lie below the regional scour depth will remain buried. Buried material is unlikely to disperse. Any exposed pieces are likely to remain on the local area and be incorporated into the seabed due to the significantly higher density than seawater. Larger pieces are likely to erode in the seabed into small particles and aggregate.
Fusion Bonded Epoxy (FBE)	Micro Plastics <<1 mm Abrasion by seabed particles may cause weakened material to dislodge.	Large Flakes >1 cm Rapid corrosion of the underlying steel may cause the release of larger flakes due to the loss of substrate. It is unlikely that these particles will remain large for long, due to their low thickness (0.5mm).	Small and Micro Particles <5 mm Dislodgement likely to be caused by corrosion of the underlying pipeline steel substrate. This may break up the FBE and cause its release.	Sections of the GEP are likely to remain permanently buried, any material in these sections which lie below the regional scour depth will remain buried. Buried material is unlikely to disperse. Any exposed pieces are likely to be dispersed regionally due to regional scour as FBE has a slightly higher density than seawater. Larger flakes are likely to erode and fracture into microplastics.
Heat-Shrink Sleeve (HSS)	Micro Plastics <<1 mm Abrasion by seabed particles may cause weakened material to dislodge.	Large Pieces >1 cm Rapid corrosion of the underlying steel may cause the release of larger pieces due to the loss of substrate.	Small and Micro Particles <5 mm Dislodgement likely to be caused by corrosion of the underlying pipeline steel substrate. This may break up the HSS and cause its release.	Sections of the GEP are likely to remain permanently buried, any material in these sections which lie below the regional scour depth will remain buried. Buried material is unlikely to disperse. Any exposed pieces are likely to float and be very widely dispersed due to lower density than seawater. Larger pieces are likely to erode and fracture into microplastics.

Mastic Infill	Small limestone dust and hydrocarbon particles << 1 mm Abrasion by seabed particles cause weakened particles to dislodge.	Large Pieces > 50 cm In the event of an external impact, movement due to extreme environmental loading events or large sections of degradation; large pieces of mastic may break away from the pipe. Most likely in sections of approximately 50 cm.	Small and Moderate Pieces < 5 cm x 5 cm x 1 - 5 cm Dislodgement likely to be caused by material degradation (cracking, disbondment and biological degradation) combined with corrosion of underlying GEP steel.	Sections of the GEP are likely to remain permanently buried, any material in these sections which lie below the regional scour depth will remain buried. Buried material is unlikely to disperse. Any exposed pieces are likely to remain in the immediate area and be incorporated into the seabed due to the significantly higher density than seawater. Larger pieces are likely to erode into small particles and aggregate on the seabed.
Pipeline Steel	Small Corrosion Steel Particles <1 mm Steel corrosion products can be abraded off the armour wires by seabed movement.	Pieces of Heavily Corroded Steel <15 cm Heavily corroded pieces of steel may be released from the pipeline by impacts or uneven corrosion. Sections are likely to independently corrode in their new location.	Small and Moderate Flakes <5 cm Dislodgement likely to be caused by abrasion, environmental loading, weight of marine growth and marine fauna activity.	Sections of the GEP are likely to remain permanently buried, any material in these sections which lie below the regional scour depth will remain buried. Buried material is unlikely to disperse. Any exposed sections are likely to remain in the immediate area and be incorporated into the seabed due to the significantly higher density than seawater. A portion of the metals may remain dissolved and be incorporated into local marine life.

Mercury Contamination

As referred in Section 4.5.3, mercury contamination is present in the GEP and considered above acceptable limits (ANZECC, 2000 for mercury in sediments) in the GEP at present (Atteris 2019b, Qa[3], 2021a). Prior to being left *in situ*, the GEP will be treated with MerCure treatments (refer to Section 4.7) which aim to achieve an acceptable level of mercury removal (refer to Section 8.7.5).

Qa3 laboratories (Qa[3], 2021a, 2021b) summarizes the results from 57 coupons analysed by acid digestion, with an average mercury concentration of 23.6 mg/kg and a concentration range of 6.4 – 86.3 mg/kg. Since these analyses are done on the pipeline end manifold (PLEM) which has thicker walls than the GEP, this corresponds to a mercury concentration of 34.5 mg/kg for the GEP as previously summarised in Section 4.5.3.

Mercury is known to be a potent neurotoxin in fish, wildlife and humans. Methyl Mercury (CH3Hg+) is the most toxic organic form of mercury and is formed by Sulphate Reducing Bacteria upon the reduction of mercury sulphide. Methyl Mercury accumulates in the food chain with predatory fish such as sharks having more than one million times more methyl mercury contamination than smaller fish (Lavoie, 2013). The ability of methyl mercury to react with proteins, peptides, nucleotides, and other biological molecules is presumed to be the reason for its toxicity (Ebadian, 2001). To date, surveys of the Griffin field and GEP have not recorded elevated levels of mercury in the sediments (Gardline, 2015) (refer Section 5.4.1).

ANZECC interim sediment quality guidelines (ISQG) are often used to address site-specific management needs, but the quality of the sediment is often an indicator of overall environmental health (MacDonald 1994). Sediments are fundamentally important to benthic communities and provide habitats for essential biological processes, such as spawning (MacDonald, 1994). Therefore, sediments provide an essential link and insight into the health of the benthic community. The low range ANZECC ISQG value (≤ 0.15 mg/kg) denotes a concentration below which adverse effects to benthic organisms are rarely observed and represent the guideline values for the protection of ecosystems. The high range value (< 1 mg/kg) (i.e., ANZECC ISQG high) denotes a concentration that is distinctly associated with adverse effects to benthic organisms (Long et al. 1995; MacDonald et al. 1996; Burton 2002).

BHP commissioned Norwegian Geotechnical Institute (NGI) to evaluate the possible concentration of mercury and environmental risks associated with the mercury content of the GEP in the case of *in situ* abandonment of the whole pipeline (NGI, 2021).

The NGI, 2021 study found that leaving the GEP 'as is' without cleaning prior to decommissioning *in situ*, and assuming 33 km of exposed GEP (predominantly in Commonwealth waters, refer Section 4.5), then between 0.066 and 3.2 km^2 of the seabed can have mercury concentrations above 0.15 mg/kg (ANZECC ISQG low value) in the biologically active zone, depending on the degree of spreading. However, following MerCure treatment procedure (refer Section 4.7) to remove >95% of the mercury in the GEP, the area immediately underneath the GEP can still be contaminated to levels above the 0.15mg/kg limit (ANZECC ISQG low value), only in areas where the spreading of the GEP material is limited to a few meters sideways. With a conservative assumption of only 5 m sideways distribution within the seabed sediment, the average mercury concentration in the sediment is estimated to be 0.13 mg/kg (which is below the ANZECC ISQG low value) (assuming the concentration distribution described in Section 8.7.3), with the maximum concentration localised at the centreline estimated to not exceed 0.26 mg/kg (below the ANZECC ISQG high value).

Discharges from GEP Cutting and Recovery

During the cutting of GEP into sections during the cut and recovery method, there will be a discharge of shards of GEP material (refer to Table 4-4 for GEP material). This will be a very minor release, assumed to be 5 cm^3 per cut based on the GEP diameter and nature of the cutting tool (diamond wire saw). Based on a cutting the GEP into 36 m sections prior to recovery a <0.05 m^3 of GEP material may be lost from cutting.

During the recovery via crane or s-lay reeling some coating loss may also occur. This is anticipated to be minor, assumed small 1-5 cm brittle pieces.

8.7.3 Environmental Impact Assessment

As the GEP is left *in situ*, the components will eventually breakdown over time (refer Section 8.7.2), which will result in the discharge of steel, concrete, minor amounts of plastics and contaminants (mercury) to the marine environment. GEP is expected to partially bury (60% - 90% of the outside diameter) along most sandy sections of the route (Atteris, 2019a) over a period between 70 and 100 years (Atteris, 2019a). Any degraded material buried section which lie below the regional scour depth will remain buried. Buried material is unlikely to disperse.

The GEP will breakdown into a range of particle sizes (refer Table 8-17) depending on the initiating event. Larger particles and chunks may further degrade and corrode *in situ* into smaller particles once they have been separated from the GEP.

Steel

The GEP is predominantly comprised of API 5L X60 Carbon Steel (refer Section 4.5). The GEP will breakdown into a range of particle sizes (refer Table 8-17), which have a higher density than seawater. Any material from the GEP which lie below the regional scour depth will remain buried.

Where the GEP is not buried, larger particles or chunks (refer Table 8-17) will settle immediately below and adjacent to the GEP, moderate flakes will settle within the operational area and small particles released predominately from abrasion may become dissolved and/or suspended in the water column and undergo rapid dilution in the open water marine environment. This is expected to occur over a prolonged period of time, as detailed in Section 8.7.2. Carbon steel is made up of 98.5% iron, which is not considered a significant contaminant in the marine environment and is only toxic to marine organisms at high concentrations (Grimwood and Dixon, 1997) and is an abundant element in marine sedimentary systems (Taylor et al, 2011). Elevated levels of iron may appear in the marine sediments directly adjacent and beneath the GEP as it corrodes and degrades, however given the rate of corrosion (hundreds of years, refer Section 4.5) and lack on sensitive habitat on the seabed along the GEP (refer Section 5.4.1), iron levels are unlikely to result in an impact greater than a localised and minor change in sediment quality. Impacts to marine fauna are unlikely, however a change in burrowing infauna and surface epifauna invertebrates on or around the GEP may alter over time, however as this occurs naturally over time, this change would be hard to attribute to the release of steel from the GEP alone.

Approximately 1.5% of the total metals in the GEP are lead, copper and steel alloy. The corrosion of lead, copper and steel alloy has the potential to release a number of compounds to the marine environment, including lead carbonate, potassium dichromate, chromatic chloride, copper oxide and copper chloride compound. None of these compounds are listed as 'bioaccumulative' by ANZECC and these metals are not likely to be present in a bioavailable form, given the pH of the ocean and the fact they originate from hard metal parts. Given these components make up a very small portion of the GEP, they are unlikely to exist in harmful concentrations and are unlikely to result in an impact greater than a localised and minor change in sediment quality.

Given the lack on sensitive habitat on the seabed along the GEP (refer Section 5.4.1) impacts from the fate of the steel corrosion particles are unlikely to result in an impact greater than a localised, long term and minor change in sediment quality and water quality within the operational area.

Concrete

Although the exact composition of the concrete in the CWC is unknown, concrete components are usually chemically inert. This indicates corrosion products from concrete will not react in the marine environment.

Concrete in the CWC has a higher density than seawater and is likely to remain in the operational area as it degrades. Any concrete material from the GEP which lies below the regional scour depth will remain buried. Concrete is likely to degrade, with large pieces initially breaking off the infrastructure, which then likely to erode in the seabed into small particles and aggregate (refer Table 8-17). The breakdown of material is a slow process, as the concrete erodes small amount of material will enter the water column and undergo rapid dilution in the open water marine environment.

Given the lack on sensitive habitat on the seabed along the GEP (refer Section 5.4.1) impacts from the fate of the concrete corrosion particles are unlikely to result in an impact greater than a localised, long term and minor change in sediment quality and water quality within the operational area.

Plastics within the Corrosion Coatings (FBE and HSS)

Any plastic material which lies below the regional scour depth will remain buried. FBE has a slightly higher density than seawater and large pieces are likely to remain *in situ* on the seabed, with some local movement from hydrodynamic forces.

Fractured pieces of the HSS have a lower density than seawater and will to disperse over a wider area. These pieces of material will be likely be small and become detached from the GEP by corrosion of the underlying pipeline steel substrate (refer Table 8-17). Small pieces of HSS will float and contribute to marine plastic pollution. These pieces have the potential to be ingested by marine fauna including whales, marine reptiles and turtles, in turn causing detrimental impacts such as blocking of the digestive tract. It should be noted however that the vast majority of the HSS within the GEP will be buried and not disperse into the marine environment. Given the small volumes of HSS expected to be released to the marine environment as small particles and the distance of the operational area from shorelines and sensitive turtle habitats, it is considered the small volumes of plastic particles from the HSS are not expected to result in an impact greater minor to a small number of marine fauna. Impacts will not be at the population level.

Larger exposed pieces of both the FBE and HSS will also erode and fracture into microplastics and be widely dispersed in the marine environment (Atteris, 20219a)

Microplastics will be released from exposed FBE and HSS as they erodes, which will contribute detrimentally to the amount of microplastics already within the marine environment and have the potential to disperse widely in the marine environment, because of their small particle sizes. Microplastics within the ocean are from a combination of many sources and the bioaccumulation potential is high within marine fauna. They are ingested by marine fauna including corals, planktons, fish, seabirds and marine mammals and are transferred along the food chain. Filter feeders ingests substantial amounts of microplastics either directly swallowing from ocean water or indirectly by consuming prey containing microplastics in their body cavity.

Significant microplastics within marine fauna have the potential to present a series of toxic effects, including inhibition of growth and development, impact on feeding and behavioural ability, reproductive toxicity, immunity toxicity, genetic damage. However the volumes of microplastics dispersed from the GEP alone are not large enough alone for such impacts to occur in the marine environment.

Benthic organisms such as polychaete and tubifex worms, amphipods and molluscs will encounter microplastics settled within the marine sediments on the seabed, the presence within these organisms is influenced by feeding mode (Carlosde Sa et al, 2018). The benthic environment is one of the significant feeding ecosystems for a range of marine fauna, therefore transferring marine plastics along the food chain (Chatterjee and Sharma, 2018).

Whilst there is a release of plastics (over hundreds of years, refer Section 8.7.2) from the GEP, the volumes relatively low quantity (refer to Table 8-15) and plastics make up 0.3% of the overall GEP by weight. The release plastics will be predominately buried within the seabed as the GEP degrades. The contribution of microplastics from the GEP breakdown is not considered to result in an impact greater minor to a small number of marine fauna. Impacts will not be at the population level. It is however recognised that the plastic degradation does contribute to the overall volume of microplastics within the marine environment.

Whilst the microplastics entering the marine environment from the GEP are unlikely to result in an impact greater than minor, it is recognised that the discharge of plastics is a threat within recovery plans and approved conservation advice. An assessment of the HSS and FBE plastic discharge against these is made in Section 10.

Mercury Contamination

In general, the risk associated with mercury in the GEP will depend on the amount of mercury remaining, its mobility and its availability to organisms. The availability of mercury to organisms at the seabed or in the overlying water is strongly influenced by physical and chemical conditions, such as:

- Mercury speciation (also important for its ecotoxicity)
- Redox conditions (depending on oxygen availability)
- How well isolated the mercury is from marine organisms.

This will in turn is dependent on the physical conditions of the GEP and its environment, such as:

- Physical status of the GEP (intact -> fully degraded)
- Depth of burial of GEP
- Soil conditions above GEP
- Water currents.

The environmental risk to marine organisms is controlled by the uptake in these organisms which in turn is controlled by the aqueous concentration of mercury in the seawater or in the sediment pore water and in easily available sediment fractions (Chen, et al., 2009) and (Lawrence & Mason, 2001).

When the GEP material breaks down and becomes a part of the seabed sediment along the route, the environmental risk will be associated with the mercury concentration in the biologically active layer at the sediment water interface, often referred to as the bioturbation layer, typically the upper 5 cm to 15 cm of the seabed sediment with a global mean (±SD) of 5.75 ± 5.67 cm (n = 791) (Teal, Bulling, & Parker, 2008). This indicates that most of the bioturbation will occur at shallower depths than 10 cm in the sediment, making 10 cm a reasonable but conservative estimate of the thickness of the biological active zone.

The work undertaken by NGI (NGI, 2021) has been referred to throughout this Section to describe the fate of mercury and environmental risks associated with the mercury content of the GEP in the case of *in situ* abandonment. This work and assessment is based on the burial status and Zones (1-3) of GEP, presented in Table 8-18 and Figure 8-5. It should be noted that the burial status is particularly important for the risk assessment of the mercury in the long term. The GEP within Commonwealth waters is partially to fully exposed from KP 38.8 (refer Section 4.5). However, as described in previous Sections, over the next 70 to 100 years the GEP is likely to self-bury to approximately 60% - 90% of its diameter through the areas of soft seabed and the breakdown / corrosion of the GEP will occur post this period (refer Figure 8-4) (Atteris, 2014).

The GEP crosses from State to Commonwealth waters at approximately KP 35. Whilst the assessment in this Section and the NGI, 2021 assessment also includes the release of mercury into the sediment within State waters, this is for context and information purposes.

Table 8-18: GEP Burial

	Trenched and Fully Buried		Partially Exposed Secondary Stabilisation		Exposed	
	Zone 1		Zone 2		Zone 3	
	From	To	From	To	From	To
KP	-0.4	18	18	38.8*	38.8	61.7
Water depth (m)	0	10	10	70	70	133

*Note, at approximately KP 35 the GEP crosses the State / Commonwealth waters boundary

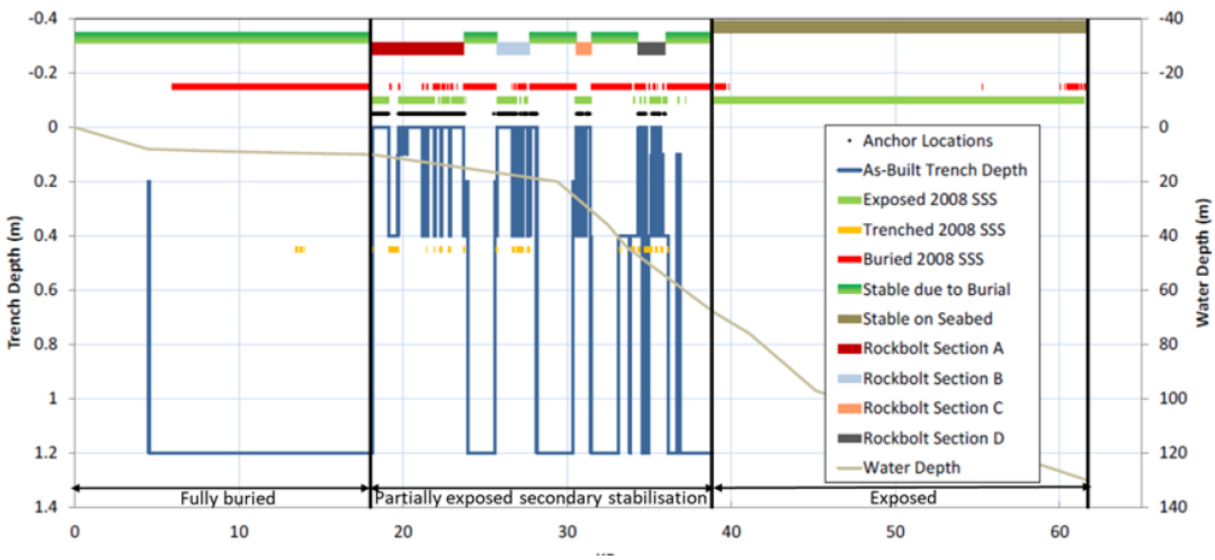


Figure 8-5: GEP Burial

The assessed GEP breakdown scenarios in NGI, 2021 are summarised in Table 8-19. Scenario 4 is considered most relevant as a worst case release of mercury from the GEP.

Table 8-19: NGI, 2021 Assessed Scenarios

	Zone 1: Fully Buried Length of section: 18 km If shorter buried sections from Zone 2 are included: 28 km	Zone 2: Partially Exposed Length of section: 20 km If shorter buried sections are excluded: 11 km	Zone 3: Fully Exposed Length of section: 23 km
Scenario 1: Pipeline sealed and intact (situation today)	Corrosion protection by sacrificial anodes are intact, no exposure of contaminated internal part of pipeline to water.	Corrosion protection by sacrificial anodes are intact, no exposure of contaminated internal part of pipeline to water.	Corrosion protection by sacrificial anodes are intact, no exposure of contaminated internal part of pipeline to water.
Scenario 2: Pipeline degradation starts, and corrosion causes holes in the pipe	Inside of pipeline is exposed to seawater, water movement is restricted.	Inside of pipeline is exposed to seawater, water movement is restricted.	Inside of pipeline is exposed to seawater, water movement is restricted.
Scenario 3: Pipeline is degraded to more or less full collapse	Inside of pipeline is exposed to seawater, water movement in the pipeline is restricted.	Inside of pipeline is exposed to seawater, substantial parts of the pipeline material are spreading, movement of water inside pipeline is somewhat restricted in buried sections and unrestricted in exposed sections.	Inside of pipeline is exposed to seawater, substantial parts of the pipeline material are spreading, movement of water inside pipeline is unrestricted.
Scenario 4: Pipeline fully degraded and becomes a part of the sediment	Contaminated pipeline material has become part of the sediment, contaminated material is buried below 120 cm sediment, mercury transport is dominated by diffusive or advective transport in the sediment.	Contaminated pipeline material has become part of the sediment, contaminated material is partly buried, mercury transport is dominated by diffusive or advective transport in the sediment or mass-transfer from exposed contaminated materials.	Contaminated pipeline material has become part of the sediment, and mixed into the surface sediment, mercury transport is dominated by mass-transfer from exposed contaminated materials.

In coupons treated with MerCure to remove >97 % of the mercury, an extended leaching test was conducted lasting 112 days (Qa^3, 2021c). The ratio of exposed surface and volume of seawater used in the test corresponded to the ratio in the GEP. No mercury was detected in the seawater after 112 days. The detection limit of mercury was 0.2 µg/L, and no mercury was detected above the detection limit during the experiment. This is in line with the speciation data for the MerCure treated samples, which show that mercury for the most part remains as stable and insoluble mercury supplied after the treatment. (Qa^3, 2021c). The only release of mercury to the marine environment determined to present a credible impact is once GEP is fully degraded and becomes a part of the sediment (Scenario 4, Table 8-19).

Scenario 4: Pipeline fully degraded and becomes a part of the sediment

The evaluation of stability and degradation of the GEP (Atteris, 2014) assumes that the first pinholes will appear around year 2100 (80 years from now), after which it is expected that GEP degradation occurs within 100-1,000 years (refer Figure 8-4). During the degradation some of the GEP material will be released to the water phase, some of this as dissolved material but the major part of the material will be detached from the GEP structure as particles of solid material, as presented in Table 8-17 and summarised in Table 8-20, below. The steel particles will also contain mercury (mercury in steel). These particles will become a part of the sediments along the GEP route. The spreading of the mercury contaminated particles, and therefore the area contaminated and the concentration in that area will depend on the degree of burial of the GEP, water currents and particle size of detached material.

This section discusses estimates of this spreading of mercury contaminated particles and its consequences for mercury concentration in the sediments.

Table 8-20: Features associated with full degradation

	Zone 1: fully buried Length of section: 17.986 If shorter buried sections from zone 2 are included: 28.669 km	Zone 2: partially exposed Length of section: 20.831 km If shorter buried sections are excluded: 10.683 km	Zone 3: Fully exposed Length of section: 22.883 km
Scenario 4: Pipeline fully degraded and becomes a part of the sediment	Pipeline material is degraded to Iron(II) sulfide or Iron(III) oxide-hydroxide and mixed with sediment. The material is still buried under >120 cm sediment.	Pipeline material is degraded to Iron(II) sulfide or Iron(III) oxide-hydroxide and mixed with sediment. The material is still buried under 0 - 40 cm sediment.	Pipeline material is degraded to Iron(II) sulfide or Iron(III) oxide-hydroxide distributed around the pipeline route and mixed with sediment in the upper 10 cm of the seabed (the biologically active zone).

Deposition of new sediment over the GEP

Sedimentation and accumulation of new sediment can influence the degree of exposure of the GEP during degradation and the concentration of mercury in the sediment. This is caused by dilution of the contaminated particles by cleaner new sediment particles, and eventually the availability of mercury on the seabed by creation of a natural capping layer isolating the contaminated material from the surface sediment and the overlying water.

Unfortunately, not much information about the sedimentation rate is available for this area. However, based on one dated sediment core reported by Glenn, 1997, NGI, 2021 have made some assumptions about the sedimentation rate and its consequences for the seabed contamination after the GEP is degraded.

Glenn (1997) reports sedimentation rates of 22, 43 and 223 cm/y in three sections of one investigated core. This corresponds to 0.2 - 2.23 mm/y. The high values were found in the part of the core aged to be more than 11,000 years old. Based on this an estimated sedimentation rate of <1 mm/y around the GEP is derived. Closer to land, it is also likely that areas with locally much higher sedimentation rates can be found.

As described in previous Sections, over the next 70 to 100 years the GEP is likely to self-bury to approximately 60% - 90% of its diameter through the areas of soft seabed and the breakdown / corrosion of the GEP will occur post this period (refer Figure 8-4) (Atteris, 2014).

Distribution of mercury on the surface sediment

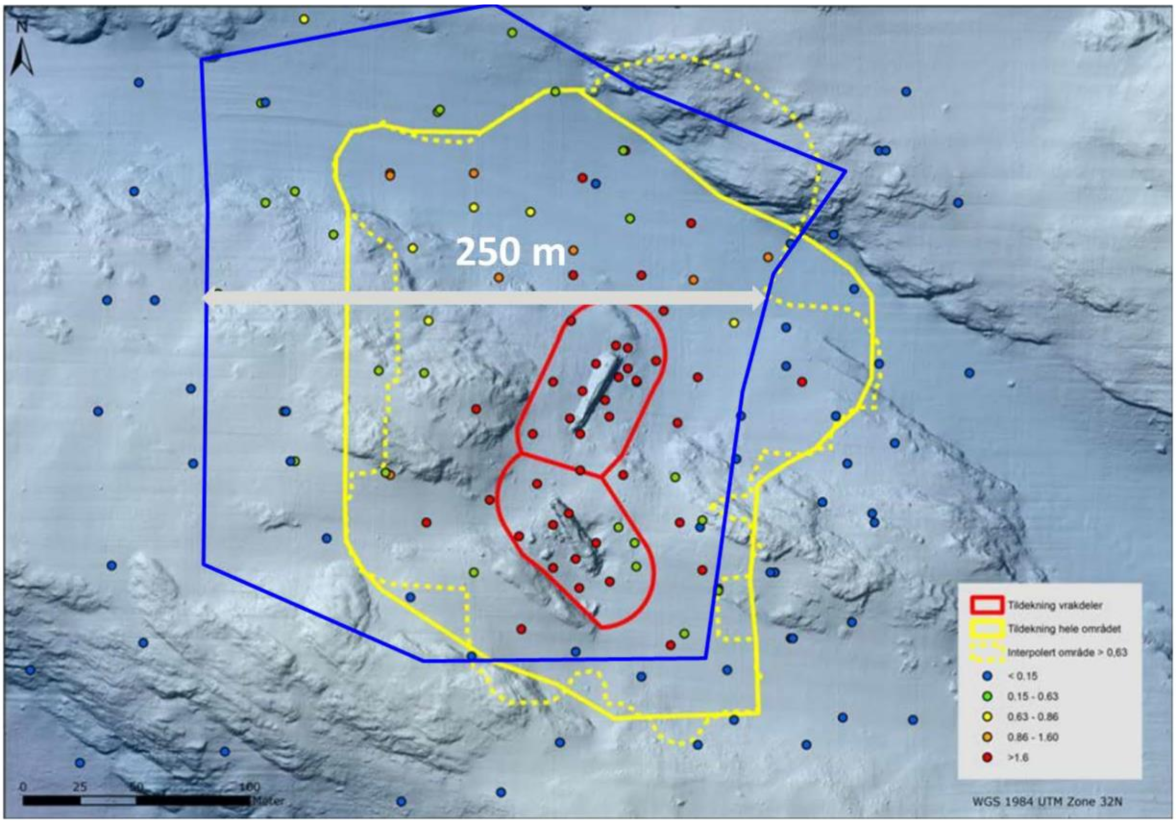
NGI, 2021 utilised information from existing mercury contaminated sites to estimate or constrain the potential distribution of the mercury in the seabed sediment following the degradation of the GEP. One particular case from offshore Norway where a German submarine (U-864) with its crew and a 67-tonn mercury cargo was sunk by a British submarine in 1945 at the end of World War II can potentially be relevant for this case.

The submarine case is relevant as it involves:

- High mercury concentration on the seabed.
- Exposed offshore environment with approximately 150 m water depth.
- Mercury was originally contained in steel constructions (canisters).
- The submarine wreck and the mercury has been exposed on the seabed for more than 75 years, which is the same order of magnitude as the time spans considered for degradation of the pipeline. Most of the sediment data were collected from 2005 – 2013 (60 – 68 years after the incident).

However, there is one important difference between the submarine with the mercury cargo and the GEP with the mercury contaminated steel. The submarine was sunk by a torpedo that as far as is known exploded inside or close to the submarine while in the water mass above the seabed. This means that a much more powerful force caused the initial spreading of the mercury than in any likely scenarios for the pipeline. After the wreck and what was left of the cargo sunk to the seabed, processes of degradation and spreading of mercury can be expected to be more similar between the two cases. It is suspected that the initial spreading had a substantial influence on the distribution of mercury on the seabed sediment, but also the actions of currents and other mixing and transporting mechanisms have contributed to the distribution that is found at the seabed today.

Due to this, the sediment mercury data from this case has been used as an upper constraint to what can be the distribution of mercury in the seabed after the degradation of the GEP. It is further worth noting that the amount of mercury in relation to the submarine is considerably higher compared to the GEP, with 67 tonnes distributed over a limited area (Figure 8-6).



Note: Legend in figure shows colour coding of the circles showing concentrations found in sediment samples in mg Hg/kg. Colour coding is according to Norwegian sediment quality classification system. The yellow line shows planned area for capping including safety margins to cap all contaminated sediment. Blue line is NGIs estimate of the perimeter of the contaminated area, including concentrations above 0.15 mg Hg/kg (green circles). The grey arrow indicates the representative width of this area (Norwegian Coastal Authorities (Kystverket), 2014).

Figure 8-6: Distribution of mercury at the seabed around the wreck of submarine U-864.

The estimated representative width of the contaminated area around the wreck of U-864 is 250 m (Figure 8-6). This is taken as the maximum width to which spreading of mercury from the GEP can contaminate the sediment around the pipeline when it is degraded. It is further assumed that the mercury will mix with the sediment in the upper 10 cm of the seabed (the biologically active zone), and distribute evenly outwards from the GEP, resulting in a linearly decreasing mercury concentration from a maximum at the GEP position each side (illustrated in Figure 8-7).

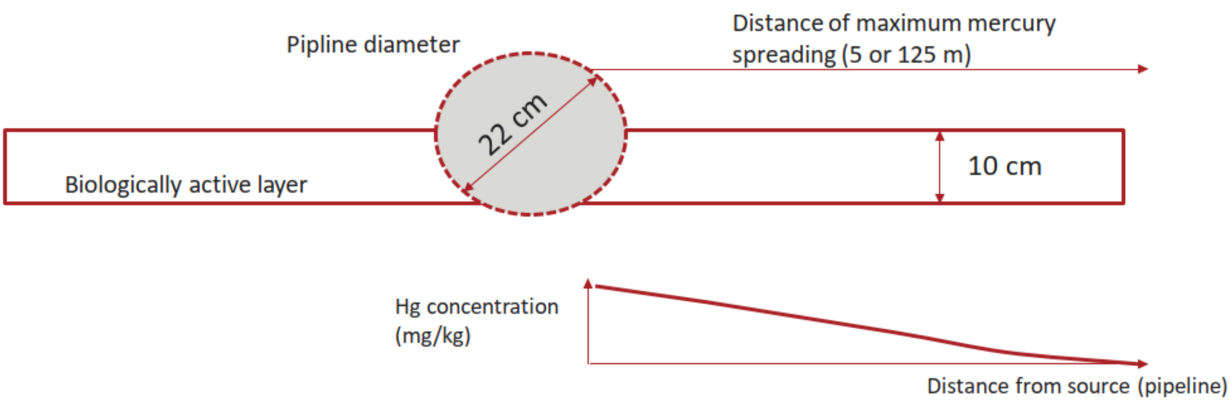


Figure 8-7: Illustration of pipeline dimension relative to thickness of biologically active layer and assumed concentration distribution in biologically active layer at maximum spreading of mercury.

Calculations of the concentration of mercury in the sediment in the biologically active zone were made by NGI, 2021 assuming the distribution of the mercury concentration described above and illustrated in Figure 8-7 and using the density and content of dry matter in the sediment from previous geotechnical investigations of the GEP route. NGI, 2021 then calculated mercury in sediment, based on a 95% mercury removal, described in Section 4.7. Only in cases when the GEP material spreads a small distance away from the GEP location (<5 m) sediment concentrations were determined to reach above a value of 0.15 mg Hg/kg (ISQG-low value) (Table 8-21). The average concentration in sediment (mg/kg) was determined 0.13 within 5 m of the GEP, potentially contaminating a surface area of 0.098 km^2.

Table 8-21: Calculated mercury concentration and contaminated areas after degradation and spreading of GEP material on seabed (NGI, 2021)

Sideways distribution of mercury	Cleaning (%)	Concentration in pipeline material (mg/kg)	Concentration at centre = maximum concentration (mg/kg)	Average concentration in sediment (mg/kg)	Potentially Contaminated surface area (km^2)
5 m	Cleaning 95%	98	0.26	0.13	0.098
125 m	Cleaning 95%	98	0.010	0.005	0

Table 8-22 summarises the risk assessment carried out for the Scenario 4 (full degradation) along the different GEP burial zones (1-3) (NGI, 2021), based on the results in Table 8-21.

Table 8-22: Pipeline condition summary (NGI, 2021)

Condition	Zone 1: fully buried	Zone 2: partially exposed	Zone 3: fully exposed
Pipeline fully degraded and becomes a part of the sediment (Scenario 4)	The mercury is fully isolated from the seabed surface. Diffusive transport will result in concentrations in the biologically active zone well below ISQG-low value.	The mercury is fully isolated from the seabed surface if buried deeper than 15 cm into the seabed. Diffusive transport will result in concentrations in the biologically active zone well below ISQG-low value.	Pipeline material will to some extent spread to the seabed around the pipeline location. Concentrations in the sediment will be dependent on the degree of cleaning and spreading. After a successful cleaning of the pipeline, average mercury concentrations within the dispersion zone (5m sideways) are expected to be below 0.15 mg Hg/kg (ISQG-low value). Mercury concentrations are expected to exceed the ISQG-low value only in the case of very limited spreading (refer Table 8-21).

In zones 1 and 2, where the GEP is buried or partially buried, diffusive transport will result in concentrations in the biologically active zone well below ISQG-low value.

In zone 3, there is a potential for a contaminated area of 0.098 km^2 at below the ISQG-low value (average at 0.13 mg/kg) (refer Table 8-21), however no associated adverse impacts to benthic organisms in sediments below or adjacent to the GEP are anticipated. The level of mercury may increase within the sediments adjacent (<5m from GEP) and below the GEP and contribute to a change in the long term sediment quality (along with the other releases from the GEP), however mercury concentrations are expected to exceed the guideline only in the case of very limited spreading (NGI, 2021) and an average concentration in sediment (mg/kg) of mercury within 5m of GEP is calculated below the ISQG-low value (refer Table 8-21). This local, minor change in mercury in sediment will not adversely impact the benthic organisms present nor lead to mercury accumulation in the food chain. It should be noted, that whilst the GEP in zone 3 is exposed, over the next 70 to 100 years the GEP is likely to self-bury to approximately 60% - 90% of its diameter through the areas of soft seabed (Atteris, 2019a). It is therefore likely that the contaminated area shown in Table 8-21 is reduced and concentrations in the biologically active zone will be well below ISQG-low value, as per zones 1 and 2, where the GEP is buried or partially buried (refer Table 8-22).

Given the lack on sensitive habitat on the seabed along the GEP (refer Section 5.4.1) impacts from the release of mercury as the GEP degrades are unlikely to result in an impact greater than a localised, minor long term change in sediment quality within the operational area. Sediment-burrowing infauna and surface epifauna invertebrates on or around the GEP may alter over time as the GEP breaks down, impacts, however these communities vary naturally through time and any impacts would be localised and minor.

Discharges from GEP Cutting

Given the lack on sensitive habitat on the seabed along the GEP (refer Section 5.4.1) and the very minor amount of material lost during cutting and recovery are unlikely to result in an impact greater than a localised, minor change in water and sediment quality within the operational area.

The operational area overlaps the Ancient Coastline at 125 m depth contour (refer Figure 5-4) and seabed metals and concrete discharge may directly change the quality of a very small, localised area of sediments over the KEF. However, no lasting effects are anticipated to the ecological properties of the KEF.

Species Recovery Plans and Threat Abatement Plans

BHP has considered information contained in relevant recovery plans and approved conservation advice for cetaceans and marine turtles that identify chemical discharges/pollution and plastics as a threat (Section 10). This includes the objectives and actions with the Recovery Plan for Marine Turtles in Australia 2017–2027 and the Threat Abatement Plan for the impacts of marine debris (which includes the release of plastics) on the vertebrate wildlife of Australia's coasts and oceans.

It is also noted that the National Plastics Plan (DAWE, 2021) recognises the issue of microplastics in the marine environment and includes supporting global action to address marine plastic debris, including the implementation of the Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia’s coasts and oceans.

8.7.4 Demonstration of As Low As Reasonably Practicable

The ALARP process for the environmental risk is summarised in Table 8-23. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 8-23: Subsea Discharges – As Low As Reasonably Practicable Assessment Summary

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
Eliminate	Removal of GEP	Reject	Section 3 determined that leaving the GEP *in situ* provides equal or better environmental outcomes compared to complete removal. Furthermore, GEP has the potential to provide a benefit due to the creation of a hard substrate habitat on a seabed predominantly comprised of soft sediment, even when partially buried. The removal of the GEP has been included as a contingent activity. Section 4.8 includes the GEP removal philosophy.	-
	Reduction of mercury in sediment below that from MerCure use	Reject	Atteris (Atteris, 2019b) and NGI (NGI, 2021) identified and ranked methods and technologies that could remove or reduce mercury from the GEP in the marine environment. Based on the outcomes, the use of MerCure was selected as the best means for achieving an acceptable level of mercury decontamination in the GEP. Other means of removal or reduction (e.g. use of other decontamination solutions and methods) have been investigated but offer inferior decontamination potential or have been discounted during the CEIA (Section 3). As described in Section 4.7, a MerCure pig has been developed to remove mercury from the GEP. BHP has conducted extensive work to design mercury removal activities for the highest practicable level of mercury removal (Qa3, 2021b, Qa3, 2021b). Trials were performed at increasing contact time intervals to determine the most appropriate pig pill length for the *in situ* decontamination of the GEP. The selected mercury removal activity and pigging program (Section 4.7.2) is designed to remove the mercury to an acceptable level (defined in Section 8.7.5). BHP have selected the most appropriate chemical solution and pigging runs to achieve an acceptable level of mercury removal. Other options were determined impracticable or do not achieve the required outcome.	-

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
Administrate	Environmental monitoring of the seabed to assess any impacts to the seabed from GEP breakdown	Reject	Studies have shown the degradation of the GEP will occur over a period of hundreds to thousands of years (refer Section 8.7.2), therefore the rate of change is predicted to be slow and unlikely to be easily detected over short to medium timeframes. Given the timeframe for breakdown of materials, ongoing monitoring is impractical. In addition the impact from the GEP breakdown is unlikely to result in an impact greater than a localised, long term and minor change in sediment quality. This impact is determined acceptable based on BHP environmental risk acceptability criteria (Section 7.3). Control grossly disproportionate. Monitoring will not reduce the consequence of any impacts to the seabed / sediment quality (which has already been determined localised and minor), and the costs associated with the level of monitoring required to accurately assess any impacts greatly outweighs the benefits. Whilst ongoing monitoring has been determined not to be required based on the ALARP assessment above, an as-left ROV survey will be undertaken along the GEP left, either left *in situ* or removed (refer Section 4.8). Further detail and justification on long term monitoring is provided in Section 12.4.2.	-
Engineering	Bury the GEP through backfill so all material as it degrades is buried.	Reject	Burying the GEP mechanically would ensure that during the degradation the material would remain within the seabed adjacent to the GEP. This would negate or reduce the release of microplastics within the water column from the breakdown of the HSS or FBE and mercury. Whilst it is possible to mechanically bury the GEP, it would require seabed excavation and multiple vessel use, resulting in vessel impacts and risks, seabed disturbance, and a reduction in local water quality. All which outweigh the discharges from GEP breakdown. The GEP is expected to self-bury through natural processes over a period over 70 – 100 years (Atteris, 2019a), which is prior to the degradation of the GEP itself and release of material. The control therefore would provide little benefit and is determined grossly disproportionate. It should also be noted that there is no guarantee that the GEP would stay buried if backfilled.	-

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
	Prior to decommissioning GEP *in situ*, mercury in GEP must be removed to an acceptable level, as defined in Section 8.7.5 and determined by the method in Section 4.7.4	Accept	The average mercury concentration in sediment (mg/kg) was determined 0.13 within 5 m of the GEP, potentially contaminating a surface area of 0.098 km^2 (Table 8-21). The concentration is below the value of 0.15 mg Hg/kg (ISQG-low value) and therefore is 'low risk' in sediments. Achieving an acceptable level of mercury removal, as defined in Section 8.7.5 has been determined to result in a minor change to the sediment quality adjacent and beneath the GEP (refer Section 8.7.3) and 'low risk' as defined by ANZECC (2000) and is acceptable. In the event that the resultant mercury concentration after cleaning is above the acceptable level, as defined in Section 8.7.5 the then GEP will not be decommissioned *in situ*. Whilst there are costs and environmental impacts (through vessels use and seabed disturbance) associated with undertaking the GEP removal if acceptable levels of mercury removal is not met, the environmental benefit outweighs any of these costs and minor impacts.	**PS 8.7.1**
	Less cuts during the GEP removal or completing GEP removal through s-lay reeling.	Reject	Less cuts will provide a minor reduction in the material discharges. The number of GEP cuts required will be determined through engineering assessments, which have not been completed yet. As included in Table 4-8, it is likely that GEP is cut into either 36m sections or 48 m sections. As described in Section 4.8, the information required to determine if the S-lay method can be used will not available until after the mercury cleaning and decontaminations pigging scope (Section 4.7) has been completed. Hence, the subsea cut and recovery option is the default method.	-

ALARP Summary

Impacts are considered localised and minor from subsea GEP discharges. Reasonable control measures were identified in Table 8-23 to further reduce impacts but rejected since the associated cost and sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

The decommissioning of GEP *in situ* will only proceed if mercury is removed to a level that is acceptable for mercury in sediments (refer Section 8.7.5) as verified through the method detailed in Section 4.7.4. The GEP will be removed as per Section 4.8 in the event that that the mercury acceptability is not met.

8.7.5 Demonstration of Acceptability

Subsea discharge impacts will not result in potential impacts greater than temporary and minor reduction in water and sediment quality. Further opportunities to reduce the impacts have been investigated in Table 8-23.

No concerns or objections regarding subsea GEP discharge impacts have been raised by relevant stakeholders. BHP has considered information contained in recovery plans and threat abatement plans (Section 10). The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act) (refer Table 8-24). The environmental impacts meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the impact to be managed to an acceptable level.

The following subsections provide further detail on the determination of acceptability for subsea discharges from the GEP breakdown or contingent GEP removal.

Principles of ESD Assessment

As outlined in Section 3A of the EPBC Act, the titleholder needs to ensure that the activity is undertaken in a manner not inconsistent with the ESD. The equal or better environmental outcomes evaluation assess the activity and impact against the relevant principles of ESD Table 8-24.

Table 8-24 Assessment of Impact Against the Principals of ESD

Principals of ESD	Assessment
Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations (the integration principle)	The impact assessment has assessed both the long-term and short-term, environmental, and social aspects associated with leaving the GEP *in situ*. In the short term the GEP is providing habitat for a number of commercial fish species and is likely to continue to do (refer Section 8.1). Given the timeline (Figure 8-4) of degradation of the GEP, over the short term there is limited environmental impact from the subsea discharge from its breakdown. The degradation of the GEP over the long term has been assessed by Atteris, 2019a. Over the next 70 to 100 years the GEP is likely to self-bury to approximately 60% - 90% of its diameter through the areas of soft seabed. Through areas of hard seabed, burial is unlikely though burial due to high sediment deposition rates that have been observed in GEP surveys (BHP, 2017b). Degradation of the GEP will occur after the next 800 years (Figure 8-4), when the GEP has significantly self-buried. The releases from GEP will largely be buried within the sediment adjacent and beneath the GEP. Where the GEP is exposed there will be releases into the marine environment of steel, concrete, plastics and mercury. Whilst these materials will largely remain local to the GEP there is the potential for larger exposed pieces of plastics to erode and fracture into microplastics. Given this degree of self-burial, lack on sensitive habitat on the seabed along the GEP (refer Section 5.4.1) and nature and volumes of the subsea releases as the GEP degrades over the long term, the releases are unlikely to result in an impact greater than a localised, minor long term change in sediment quality within the operational area. This is further expanded on in Section 8.7.3. Whilst there is a release of plastics (over hundreds of years, refer Section 8.7.2) from the GEP, the volumes relatively low quantity (refer to Table 8-15) and make up 0.3% of the overall GEP by weight). The release plastics will be predominately buried within the seabed as the GEP degrades. The contribution of microplastics from the GEP breakdown is not considered to result in an impact greater minor to a small number of marine fauna. Impacts will not be at the population level to marine fauna. It is however recognised that the plastic degradation does contribute to the overall volume of microplastics within the marine environment.
If there are threat of serious or irreversible damage lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (the 'precautionary principle')	The impact assessment has been supported by a number of studies including: • Atteris (2019a). Griffin *In situ* Decommissioning Scenario – Material Degradation Study. 00GA-BHPB-R00-0043. • NGI. (2021). Griffin Export Pipeline Decommissioning. Mercury Pipeline Release Study. DOC.NO. 20206029-R1-1. REV.NO. 1 / 2022-01-19 These along with the understanding of the seabed and habitat along the GEP (Refer to Table 5-4 for details of the surveys along the GEP) ensure that there is a level of scientific certainty in the risk assessment for the GEP degradation and associated impact.

Principals of ESD	Assessment
The principle of intergenerational equity- that the present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (the 'intergenerational principle')	Degradation of the GEP will occur over the next 800 years (Figure 8-4), when the GEP has significantly self-buried (burial described in Section 8.6). The releases from GEP will largely be buried within the sediment adjacent and beneath the GEP. Where the GEP is exposed there will be releases into the marine environment of steel, concrete, plastics and mercury. Whilst these materials / contaminants will largely remain local to the GEP there is the potential for larger exposed pieces of plastics to erode and fracture into microplastics. Given the release period of the plastics (over hundreds of years, refer Section 8.7.2) and the low quantity of plastics released (refer to Table 8-15) which will predominately be buried within the seabed as the GEP degrades, the contribution of microplastics from the GEP breakdown is not considered to compromise the marine environment for future generations. The average concentration in sediment (mg/kg) was determined 0.13 mg Hg/kg (below the ISQG-low value) within 5 m of the GEP, potentially contaminating a surface area of 0.098 km^2. This concentration will reduce as sediment moves overtime due to hydrodynamic forces. The productivity of the environment will be maintained should the mercury in sediment be below the ISQG-low value.
The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making ('the biodiversity principle')	The impact assessment has assessed both the long-term and short-term, environmental, and social aspects associated with leaving the GEP *in situ* and its degradation. The CEIA (Section 3) includes both biological diversity and ecological integrity in the decommissioning decision making. The CEIA demonstrates the abandonment *in situ* alternative will result in equal or better environmental outcomes compared to full removal, which is required by NOPSEMA's *Section 572 Maintenance and Removal of Property* policy (NOPSEMA, 2020b)

Mercury Removal Acceptability

Table 8-25 presents the mercury remaining in GEP Steel after an effective MerCure treatment.

Table 8-25: Mercury in GEP Steel after MerCure Treatments

Mercury Removal	Average Mercury Remaining in GEP Steel (mg/kg)
95%[1]	1.73

Note 1: provided as a conservative lower limit of removal efficiency

A post treatment concentration of mercury in GEP steel of 1.73 mg/kg must be achieved before decommissioning the GEP *in situ*. This is based on a removal efficiency of 95%, which provides a conservative upper limit of mercury in the GEP. In reality the Qa^3, 2021b and Qa^3, 2021c trials have achieved a higher level of mercury removal.

Based on a 95% level of mercury removal and a resultant GEP average mercury in steel of 1.73 mg/kg, mercury in sediment is determined to be below 0.15 mg Hg/kg as the GEP breakdown and disperse over the seabed, which is below the ANZECC ISQG-Low value (NGI, 2021) (a description on the process of GEP breakdown and how this determination has been made is provided in Section 8.7.3). As per ANZECC, 2000 below the ISQG-Low value denotes a concentration below which adverse effects to benthic organisms and presents a 'low risk' within sediments. Achieving an average concentration of mercury in sediment below the ISQG-Low value is determined to be an acceptable level of risk that meets the BHP environmental risk acceptability criteria (Section 7.3).

The level of mercury removal within the GEP is determined by the verification process as described in Section 4.7.4.

Monitoring to meet the requirements of NOPSEMA General Direction (832)

Whilst ongoing monitoring has been determined not to be required based on the ALARP assessment (refer Table 8-23) and the acceptability of the impact, an as-left ROV survey will be undertaken along the GEP left either left *in situ* or removed (refer Section 4.8). Footage will be provided to NOPSEMA to meet the requirements of NOPSEMA General Direction (832), which requires:

'Provide, to the satisfaction of NOPSEMA, for the conservation and protection of the natural resources in the title areas within 12 months after property referred to in direction 1 is removed'

and

'Make good, to the satisfaction of NOPSEMA, any damage to the seabed or subsoil in the title areas caused by any person engaged or concerned in the operations authorised by the titles within 12 months after property referred to in direction 1 is removed'.

Further detail on long term monitoring is provided in Section 12.4.2.

Acceptability against the Annex I(2) of the 1996 London Protocol

Annex I(2) of the 1996 London Protocol to the convention on the prevention of marine pollution by dumping of waste and other matter (update to London Convention and Protocol 1972) describes that material capable of creating floating debris or otherwise contributes to the pollution of the marine environment has to be removed.

Decommissioning GEP *in situ* as a whole does not constitute as a floating material and the GEP is currently providing a habitat for numerous commercial fish species (refer Section 5.7.1) As described in Table 4-3 the GEP is made up of an array of materials, a small portion of which is the plastics within the HSS and FBE. Whilst the GEP is fully intact these materials are contained within the GEP. Over the period of the GEP degradation (refer Figure 8-4) the HSS and FBE will degrade as per the events and process presented Table 8-16 and Table 8-17 respectively. As described in Section 8.7.3 where the FBE and HSS are exposed above the regional scour, they have the potential to degrade into microplastics and be dispersed within the marine environment. Whilst this release constitutes marine pollution, the CEIA (Section 3) demonstrates the abandonment *in situ* approach will result in equal or better environmental outcomes compared to full removal, which is required by NOPSEMA's Section 572 Maintenance and Removal of Property policy (NOPSEMA, 2020b).

8.7.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

The ALARP process for the environmental aspect is summarised in Table 8-26. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 8-26: Subsea Discharges from GEP – As Low As Reasonably Practicable Assessment Summary

Performance Outcome	Performance Standard	Measurement Criteria
Mercury in GEP is removed to an acceptable level, as defined in Section 8.7.5 and determined by the method in Section 4.7.4 prior to decommissioning *in situ*.	**PS 8.7.1** Prior to decommissioning GEP *in situ*, mercury in GEP must be removed to an acceptable level, as defined in Section 8.7.5 and determined by the method in Section 4.7.4.	Records show that the concentration of mercury in the GEP is at an acceptable level, as defined in Section 8.7.5 and determined by the method in Section 4.7.4 prior to decommissioning *in situ*.

8.8 Waste Generation

8.8.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Hazard	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Waste Generation	Waste (hazardous and non-hazardous) generated during vessel activities	Increase waste to landfill. Additional usage of onshore waste reception facilities.	10	N/A	-	Type A Low Order Impact	Tolerable
	Mercury decontamination chemicals	Increase waste to landfill. Additional usage of onshore waste reception facilities.	10	N/A	-	Type A Low Order Impact	Tolerable
	GEP recovered as waste (contingent GEP removal)	Increase waste to landfill. Additional usage of onshore waste reception facilities.	10	N/A	-	Type A Low Order Impact	Tolerable

8.8.2 Source of Hazard

Project Vessel Waste

Project vessels generate a variety of solid wastes, including domestic and industrial wastes. These include aluminium cans, bottles, paper and cardboard, scrap steel, chemical containers, batteries and medical wastes.

Waste is segregated on-board the project vessels and stored in designated skips and waste containers. Wastes are segregated into the categories of:

- non-hazardous waste (or general waste)
- hazardous waste
- recyclables (further segregation is conducted in line with practices at existing BHP operations in the region).

General non-hazardous waste includes domestic and galley waste, and recyclables such as scrap materials, packaging, wood and paper and empty containers. Volumes of non-hazardous waste generated on vessels are generally minor.

Hazardous wastes are defined as those that are or contain ingredients harmful to health or the environment. Hazardous wastes likely to be generated on-board the project vessels include oil-contaminated materials (such as sorbents, filters and rags), chemical containers and batteries.

Mercury Decontamination Chemicals

Mercury and hydrocarbon decontamination chemicals (MerCure and HyDex) are captured during the mercury removal activities (Section 4.7). Mercury decontamination chemicals are captured onshore and is managed in accordance with an appropriate State Environment Plan, submitted in accordance with the Petroleum (Submerged Lands) (Environment) Regulations 2012 and Petroleum Pipelines (Environment) Regulations 2012.

Waste management practices specific to the decontamination chemical waste includes:

- After use, the spent chemicals will be neutralized and filtered. Spent MerCure chemical needs to be treated with a reciprocal amount of the neutralization chemical (unless specified otherwise, Sodium Hydroxide (NaOH)).

- Stabilised chemical waste will be reduced using THIS FAR-CH filtration system. All fluid waste (spent chemicals, etc.) will be neutralised and filtered utilizing the THIS FAR-CH filter system to meet compliance for the desired method of disposal. Contaminant levels must be met for each stage of the process in compliance with Government specified criteria. Level of Acceptance Disposal Oil & Grease Total Petroleum Hydrocarbons (TPH) ≤15ppm Mercury (Hg) ≤0.005ppm (≤5ppb) pH 5.5 - 9.0 Temperature (℃) ≤40℃ Total Suspended Solids (TSS) ≤50mg/L This results in all Mercury being extracted as a mercury compound dry scale/sludge for licensed treatment and disposal. The majority of the waste fluid (typically 90-95%) being compliant for normal disposal. The highly concentrated sludge will be packaged onshore and transported by THIS to a licensed final disposal facility for treatment

The total volume of decontamination chemical waste is approximately 350 m^3.

GEP Recovered as Waste (contingent GEP removal)

Table 4-3 presents the weights and materials within the GEP. Table 8-27 presents the total waste material from GEP within Commonwealth waters by weight.

Table 8-27: GEP Material and Approximate Weight – Commonwealth waters only

Material	Weight (tonnes)
Steel	1,700
Plastics	15
Concrete	2,500
Mastic	85

Recovered GEP will be removed from the title area and disposed of in accordance with the waste management plan developed during the contracting phase. The waste management plan will address the waste management hierarchy and disposal methods and appropriate transfer of ownership of recovered equipment.

Recovered GEP may be managed through the following, in accordance with the waste management hierarchy:

- Reduce (note, there are no opportunities to reduce the GEP waste)
- Reuse (note, there are no opportunities to reuse the GEP waste)
- Recycle
- Treatment
- Disposal to landfill

Recycling of the GEP is the preferred waste management approach given reduce and reuse is not feasible. Recycling of GEP may involve stripping the infrastructure in order to separate the individual materials. The material can then be segregated and sent to a recycling facility.

In instances where it is not feasible to separate the material within GEP or the material is contaminated and cannot be treated, then the subsea infrastructure is sent to landfill.

The final waste management strategy for the GEP is still to be defined. The waste management hierarchy preferences has been provided to the waste management contractors during the tendering process.

The following preferences are made during the waste management contractor tender evaluation:

- Preference for waste management contractors who are able to follow the waste management hierarchy philosophy, to reduce waste disposal to landfill.

8.8.3 Environmental Impact Assessment

Project Vessels

All waste generated during the petroleum activity will be transported to and managed appropriately by third-parties. Environmental impacts associated with onshore disposal relate to the small incremental increase in waste volumes received at the onshore licensed waste recycling and disposal sites. The environmental impacts associated with waste disposal onshore are anticipated to be minor, based on the minor quantities involved and recycling of some materials.

Recovered GEP

Environmental impacts associated with onshore disposal of the GEP will depend on the waste management approach:

- Recycling of GEP materials requires energy use associated with separating the materials within the GEP and recycling processes (e.g. use of heat etc). The use of energy has no or very minor environmental impact.
- The disposal of GEP materials to landfill contributes to the overall volume of waste going to landfill each year.

Whilst the volumes of waste material (Table 8-27) associated with the GEP are relatively minor compared to the volume of waste going to landfill in Australia each year (estimated at 20 million tonnes each year (Australian Bureau of Statistics, 2022)), the exploration of reducing waste to landfill through recycling and other waste management practices is part of the 2019 National Waste Action Plan (DAWE, 2019). In addition BHP utilise an ALARP approach to waste impact reduction and follow the waste management hierarchy.

Whilst BHPs waste management philosophy follows the waste management hierarchy, in some instances it is not always feasible to reuse and recycle GEP waste. In the event that some GEP waste goes to landfill the environmental impacts are anticipated to be minor, based on the relatively minor quantities involved.

Hazardous waste materials, including that contaminated with Mercury, will be classified and managed in accordance with the waste management procedures and the NORMs Management Plan (00GA-BHPB-N00-0015). This will include ensuring hazardous materials are disposed of by suitable waste management facilities.

8.8.4 Demonstration of As Low As Reasonably Practicable

The ALARP process for the environmental aspect is summarised in Table 8-28. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 8-28: Waste Management – As Low As Reasonably Practicable Assessment Summary

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
Administrate	Hazardous and non-hazardous waste generated on project vessels will be segregated in accordance with Marine Order 95 and disposed of onshore by a licensed waste management contractor (excluding putrescible waste and sewage).	Approve	Securely segregating and isolating the hazardous and non-hazardous waste in accordance with Marine Order 95 will reduce the likelihood of it being lost to the marine environment. Minor cost involved in segregating the hazardous and non-hazardous waste before disposal onshore by a licensed Waste Management Contractor (excluding putrescible waste and sewage).	**PS 8.8.1**
	GEP waste will be managed in accordance with a waste management plan. Preference for waste management follows the waste management hierarchy: • Elimination and reduction • Re-use • Recycling • Treatment	Approve	The development of the waste management plan will aim to reduce the volume of waste to landfill. Minor cost involved in waste management practices. Environmental benefit outweighs cost sacrifice.	**PS 8.8.2**

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
	The waste management plan includes details on: • Storage of waste • Transport and disposal of waste • Waste legislation and standards • Waste monitoring and reporting			
	GEP waste management contractor evaluation and selection will include a preference for: • Contractors who are able to follow the waste management hierarchy philosophy, to reduce waste disposal to landfill	Approve	During the contractor evaluation BHP will assess the contractors ability to follow the waste management hierarchy. By including in the selection process a preference for: • Contractors who are able to follow the waste management hierarchy philosophy, to reduce waste disposal to landfill It is anticipated that waste to landfill can be reduced to ALARP levels. Minor cost involved in waste management practices and contract evaluation. Environmental benefit outweighs cost sacrifice.	**PS 8.8.3**

ALARP Summary

The risk assessment and evaluation has identified a range of controls (Table 8-28) that when implemented are considered to manage the impacts of waste generation from the project vessels to ALARP.

BHP considers the control measures described above are appropriate to reduce the potential impacts of waste generation from the project vessels. Additional reasonable control measures were identified in Table 8-28 to further reduce impacts, but rejected since the associated cost or sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

8.8.5 Demonstration of Acceptability

Further opportunities to reduce the impacts have been investigated in Table 8-28.

The adopted controls are considered good oil-field practice/industry best practice. No concerns or objections regarding the routine vessel discharges from the project vessels have been raised by relevant stakeholders. The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). The environmental impacts meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the impact to be managed to an acceptable level.

8.8.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Performance Standard	Measurement Criteria
Waste generated is segregated and disposed of onshore in accordance with relevant legislation	**PS 8.8.1** Hazardous and non-hazardous waste generated on project vessels will be segregated in accordance with Marine Order 95 and disposed of onshore by a licensed Waste Management Contractor (excluding putrescible waste and sewage).	Hazardous and non-hazardous waste transfer records show wastes have been segregated in accordance with Marine Order 95 and disposed of onshore by a licensed Waste Management Contractor.
	PS 8.8.2 Waste will be managed in accordance with a waste management plan which explores opportunities for waste: • Elimination and reduction • Re-use • Recycling And includes details on: • Storage of waste • Transport and disposal of waste • Waste legislation and standards • Waste monitoring and reporting.	Records show that a waste management plan and includes details on: • Storage of waste • Transport and disposal of waste • Waste legislation and standards And that wastes have been assessed for: • Elimination and reduction • Re-use • Recycling.
	PS 8.8.3 Waste management contractor evaluation and selection will include a preference for: • Contractors who are able to follow the waste management hierarchy philosophy, to reduce waste disposal to landfill.	Records show that a waste management contractor evaluation and selection has included a preference for: • Contractors who are able to follow the waste management hierarchy philosophy, to reduce waste disposal to landfill.

8.9 Hydrocarbon Response Operations

8.9.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Hazard	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Hydrocarbon Response Operations	Hazards associated with implementation of response	Impacts associated with the following: • Vessel movements / physical presence • Light emissions • Noise emissions • Atmospheric emissions • Disturbance to natural habitat • Routine vessel discharges	10	N/A	-	Type A Low Order Impact	Tolerable

8.9.2 Source of Hazard

The response strategies appropriate to a hydrocarbon response are detailed in the petroleum activity OPEP (GV-HSE-ER-0011) (Appendix E) and include:

- operational monitoring
- oiled wildlife response
- scientific monitoring.

Response strategies are intended to reduce the environmental consequence of a hydrocarbon spill. However, hydrocarbon response strategies may result in environmental impacts themselves (for example, those requiring vessel use). In addition, lack of planned and coordinated response activities or guidance can result in inadequate response implementation causing further environmental impact.

Environmental impacts associated with vessel use have been described within this EP in the following sections:

- Section 8.1 (physical presence)
- Section 8.2 (light emissions)
- Section 8.3 (noise emissions)
- Section 8.4 (atmospheric emissions)
- Section 8.5 (routine vessel discharges)

Specific impacts relating to response operations are described further below.

8.9.3 Environmental Impact Assessment

Spill response activities may take place in nearshore and on shorelines. The receptors considered most sensitive to vessel activities near shorelines are seabirds and marine turtles. The Ningaloo coast has a number of turtle nesting beaches. During the nesting period (November to January) and hatching periods (December to March) turtle sensitivity to light will be greater.

Given the scale of the response (refer to the petroleum activity OPEP) required any impacts are expected to be temporary and minor. Impacts will also be considered in the operational NEBA process during the response.

8.9.4 Demonstration of As Low As Reasonably Practicable

The NEBA process is the primary tool used during spill response to evaluate response strategies with the goal of selecting strategies that result in the least net impact to key environmental sensitivities. The NEBA process will identify and compare net environmental benefits of alternative spill response options during the hydrocarbon response. The NEBA will effectively determine whether an environmental benefit will be achieved through implementing a response strategy compared to undertaking no response. This will ensure that at the hydrocarbon response operations reduce additional environmental impacts to ALARP (refer Section 11).

The ALARP assessment process for oil spill strategies is presented in Section 7.2.2. An ALARP assessment for resourcing for each spill response strategy is presented within Appendix I.

8.9.5 Demonstration of Acceptability

In the event of a hydrocarbon spill, response operations cannot be eliminated. No concerns or objections regarding hydrocarbon response operations have been raised by relevant stakeholders. The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). The environmental impact meets the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the impact to be managed to an acceptable level.

8.9.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

EPOs, EPSs and MCs for the effectiveness of the response strategy implementation are detailed within the petroleum activity Oil Pollution Emergency Plan (OPEP) (GV-HSE-ER-0011) (Appendix E).

9 Environmental Risk Assessment and Evaluation: Unplanned Events

The purpose of this section is to address the requirements of Regulations 13(5) and 13(6) of the Environment Regulations by assessing and evaluating all the identified impacts and risks associated with the petroleum activity and associated control measures that will be applied to reduce the impacts and risks to ALARP and an acceptable level. This section presents the environmental impacts and risks associated with unplanned events of the petroleum activity.

Table 9-1 summarises the impact and risk analysis for the aspects associated with the unplanned events. A comprehensive risk and impact assessment for each of the unplanned events, and subsequent control measures proposed by BHP to reduce the risk and impacts to ALARP and acceptable levels, are detailed in the subsections.

Table 9-1: Summary of the Unplanned Events, Aspects Potentially Affected and Risk Assessment and Evaluation

Activity		Environmental								Socio-Economic				Risk Assessment & Evaluation			
		Marine Mammals	Marine Turtles	Fish	Seabirds/ Shorebirds	Seabed	Water Quality	Marine Protected Areas	Key Ecological Features	Commercial Fisheries	Shipping Activities	Tourism and Recreation	Air Quality	Severity Factor	Likelihood Factor	Residual Risk	Acceptability
Unplanned Events																	
9.2	**Hydrocarbon Release – Marine Diesel**																
	Surface release of MDO from a vessel as a result of an external impact (vessel collision) which ruptures an MDO tank	x	x	x	x		x			x	x	x		100	0.1	10	Tolerable
	Release of MDO during a bunkering incident	x	x	x	x		x							10	0.3	3	Tolerable
9.3	**Interaction with Marine Fauna**																
	Accidental collision between project vessel and marine fauna	x	x											30	0.1	3	Tolerable
9.4	**Introduced Marine Species**																
	Introduction of introduced marine species			x			x			x	x	x		100	0.1	10	Tolerable
9.5	**Minor Spills and Leaks of Chemicals and Hydraulic Fluid**																
	Minor spills and leaks of chemicals and hydrocarbons on the vessel deck reaching the marine environment and from subsea equipment (such as ROVs)			x			x							10	0.3	3	Tolerable
	Leak or loss HyDex from a downline leak fails or failure			x			x							10	0.3	3	Tolerable
	Release of water and dye from decontamination runs #3 and #4			x			x							10	0.3	3	Tolerable
9.6	**Loss of Solid Hazardous and Non-Hazardous Wastes (including Dropped Objects)**																
	Loss of waste (hazardous and non-hazardous)	x	x	x	x	x	x			x	x	x		10	0.3	3	Tolerable
	Dropped object					x	x			x				10	0.3	3	Tolerable

9.1 Quantitative Spill Risk Assessment Methodology

The worst-case credible release scenario for this EP is defined as a vessel collision resulting in the release of marine diesel into the marine environment and is presented in Section 9.2.

Quantitative hydrocarbon spill modelling was performed by RPS (2021) on the worst-case credible release scenario using a three-dimensional (3D) hydrocarbon spill trajectory and weathering model, SIMAP (Spill Impact Mapping and Analysis Program). SIMAP is designed to simulate the transport, spreading and weathering of specific hydrocarbon types under the influence of changing meteorological and oceanographic forces.

The stochastic model within SIMAP performs a large number of simulations for a given release site, randomly varying the release time for each simulation. The model uses the spill time to select samples of current and wind data from a long time series of wind and current data. Hence, the transport and weathering of each slick will be subject to a different sample of wind and current conditions. More simulations will tend to use the most commonly occurring conditions, while conditions that are more unusual will be represented less frequently.

Results of the replicate simulations are statistically analysed and mapped to define contours of percentage probability of contact at identified thresholds around the hydrocarbon release point. The stochastic approach captures a wide range of potential weathering outcomes under varying environmental conditions, which is reflected in the aggregated spatial outcomes showing the areas that might be affected by sea surface and subsurface hydrocarbons.

The modelling outcomes are presented in Section 9.2 and provide a conservative understanding of where a large-scale marine diesel release could travel in any metocean condition. The modelling does not consider any of the spill prevention, mitigation and response capabilities that would be implemented in response to the spill. Therefore, the modelling results represent the maximum extent that may be affected.

A 1,000 m³ marine diesel release was modelled at the PLEM (closest location of project vessel use within the operational area) for summer, winter and transitional seasons and is considered appropriate, although conservative, for informing the approximate spatial extent of potential impacts from a worst-case credible release from a vessel collision event during the petroleum activity.

Environmental receptors selected for the modelling are chosen based on protected area status, sensitivity of habitats to impact, societal values. Appendix H presents the locations of the environmental receptors used in the modelling.

Table 9-2 presents the parameters and justification used in the modelling.

Table 9-2: Summary of Parameters and Justifications for Marine Diesel Spill Modelling at the Griffin Pipeline End Manifold Location

Parameter	Description
Number of spill simulations	100 for each season (summer, transitional, winter) (300 simulations total)
Hydrocarbon type	Marine diesel oil
Release type	Surface release
Total spill volume	1,000 m^3
Spill volume justification	Largest tank of a project vessel (refer Section 4.10)
Release duration	Instantaneous

9.1.1 Hydrocarbon Properties

The worst-case credible release scenario for this EP is a vessel collision resulting in the release of MDO into the marine environment, as presented in Section 9.2. MDO is categorised as a Group II oil (light-persistent) based on categorisation and classification derived from AMSA (2015a) guidelines. It has a density of 829.1 kg/m³ (API of 37.6) and a low pour point of -14°C. The low viscosity (4 cP) indicates this oil will spread quickly when released and will form a thin to low thickness film on the sea surface, increasing the rate of evaporation. Generally, about 6.0% of the MDO mass should evaporate within the first 12 hours (BP <180°C). About 40.6% of the MDO mass should evaporate within the first 24 hours (180°C < BP <265°C). After several days 95% of the MDO mass should evaporate (265°C < BP <380°C). Around 5% (by mass) of MDO will not evaporate at atmospheric temperatures and will persist in the environment.

Some heavy components contained in MDO have a strong tendency to physically entrain into the upper water column in the presence of moderate winds (in other words, >12 knots) and breaking waves, but can re-float to the surface if these energies abate (RPS, 2021).

The MDO properties are summarised in Table 9-3.

Table 9-3: Marine Diesel Characteristics

Hydrocarbon Type	Initial Density (g/cm^3)	Viscosity (cP)	Component BP (°C)	Volatiles <180°C	Semi volatiles 180–265°C	Low Volatility (%) 265–380°C	Residual (%) >380°C	Aromatic (%) of whole oil <380°C BP
				Non-Persistent			Persistent	
Marine diesel	0.829 @ 25°C	4.0 @ 25°C	% of total	6.0	34.6	54.4	5.0	3.0
			% aromatics	1.8	1.0	0.2	-	-

9.1.2 Hydrocarbon Exposure Values

As described in Section 5.1, the spatial extent of the EMBA has been derived using stochastic hydrocarbon fate and transport modelling of the worst-case credible release scenario. To present this large amount of simulated data in a meaningful way and to inform the impact and risk assessment and environmental management actions, appropriate hydrocarbon exposure values were applied to each of the hydrocarbon components (refer Table 9-4). NOPSEMA Bulletin #1 Oil Spill Modelling (2019) recommends selecting hydrocarbon exposure values that broadly reflect the range of consequences that could occur at various concentrations.

The EMBA presented in Figure 5-1 was defined using exposure thresholds values presented in Table 9-4.

As the weathering of different components of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean conditions, the EMBA combines the potential spatial extent of the different hydrocarbon components. The EMBA also includes areas that are predicted to experience shoreline contact with hydrocarbons above threshold concentrations.

Hydrocarbon contact below the defined thresholds may occur outside the EMBA; however, the effects of these low exposure values will be limited to temporary exceedance of water quality triggers.

Table 9-5 presents justification for the exposure thresholds used to define the EMBA. The table also details how different exposure threshold values are relevant to the impact assessment for an MDO release (Section 9.2).

Table 9-4: Summary of Exposure Thresholds Used to Define the Environment that May Be Affected

Hydrocarbon components	Units	EMBA exposure value
Surface Hydrocarbons	g/m^2	1
Shoreline hydrocarbons	g/m^2	10
Entrained hydrocarbons	ppb	100
Dissolved aromatic hydrocarbons	ppb	50

Table 9-5: Summary of Exposure Hydrocarbon Exposure Thresholds Applied in this Environment Plan

Threshold exposure value	Description
Surface hydrocarbons	
1 g/m²	**Low:** It is recognised that 1 g/m² represents the practical limit of observing hydrocarbon sheens in the marine environment. This exposure value is below the levels that would cause ecological impacts, but is considered relevant to approximate the area of effect to socio-economic receptors. This exposure value has been used to define the spatial extent of the EMBA from surface hydrocarbons.
10 g/m²	**Moderate:** This value is considered appropriate to assess ecological impact risk, as it is the estimate for the minimum thickness of oil that will result in harm to seabirds through ingestion from preening of contaminated feathers, or the loss of thermal protection of their feathers. This has been estimated by at 10 to 25 g/m² (Koops et al., 2004; French, 2009). Furthermore, based on literature reviews on aquatic birds and marine mammals (Engelhardt, 1983; Clark, 1984; Geraci and St. Aubin, 1988; and Jenssen, 1994), the exposure value for harmful impacts is 10 g/m². This exposure value is used to determine the risk of exposure that can cause adverse impact to turtles, seasnakes, marine mammals and seabirds (NRDAMCME, 1996). This threshold was selected as a reasonable and conservative value to apply to the risk evaluation with respect to surface hydrocarbons.
50 g/m²	**High:** This high exposure value for surface oil is above the minimum threshold observed to cause ecological effect. At this concentration surface hydrocarbons would be clearly visible on the sea surface.
Shoreline hydrocarbons	
10 g/m²	**Low:** This low exposure value defines the area for potential socio-economic impacts (for example, reduction in aesthetic value of the area). This exposure value has been used to define the spatial extent of the EMBA from shoreline hydrocarbons.
100 g/m²	**Moderate:** The concentration for exposure to hydrocarbons stranded on shorelines is derived from levels likely to cause adverse impacts to intertidal habitats and associated fauna. Studies have reported oil thicknesses of 0.1 mm (100 g/m²) as the lethal exposure values for benthic epifaunal invertebrates on intertidal habitats (rock, artificial or human-made) and in intertidal sediments (mud, silt, sand and gravel) (French-McCay et al., 2003; French-McCay et al., 2004; French-McCay, 2009). It is also the impact threshold assumed for oiling of birds (French-McCay et al., 2004). This exposure value has been used to inform the risk evaluation with respect to accumulated shoreline hydrocarbons and the threshold for shoreline response, based on possible clean-up options.
1000 g/m²	**High:** This low exposure value predicts the area likely to require intensive clean-up effort.
Entrained hydrocarbons	
10 ppb	**Low:** Total submerged hydrocarbons, also referred to as 'total water-accommodated fraction' or entrained hydrocarbons, encompass oil droplets in the water column. Much of the published scientific literature does not provide sufficient information to determine if toxicity is caused by the dissolved or the entrained hydrocarbon component, but rather the toxicity of total submerged hydrocarbons. Variation in the methodology of the water-accommodated fraction may account for much of the observed wide variation in reported threshold values, which also depend on the test organism, duration of exposure, oil type and the initial oil concentration. The 10 ppb exposure value represents the very lowest concentration and corresponds with the lowest trigger levels for total hydrocarbons in water recommended in the Australian & New Zealand Environment and Conservation Council water quality guidelines for Australia (ANZECC, 2000).

Threshold exposure value	Description
100 ppb	**Moderate:** This exposure value is considered conservative in terms of potential sub-lethal impacts to most species and lethal impacts to sensitive species based on literature for toxicity testing. Total oil toxicity acute effects of total oil as LC50 for molluscs range from 500 to 2000 ppb. A wider range of LC50 values have been reported for species of crustacea and fish from 100 to 258,000,000 ppb (Gulec et al., 1997; Gulec and Holdway, 2000; Clark et al., 2001) and 45 to 465,000,000 ppb (Gulec and Holdway, 2000; Barron et al., 2004) respectively. This exposure value has been used to define the spatial extent of the EMBA from total submerged hydrocarbons, and used to describe environmental sensitivities within the EMBA. This exposure value has been used to inform the risk evaluation with respect to entrained hydrocarbons, and used to describe environmental sensitivities within the EMBA.
Dissolved aromatic hydrocarbons	
10 ppb	**Low:** This low exposure value establishes the planning area for scientific monitoring (based on potential for exceeding water quality triggers).
50 ppb	**Moderate:** This exposure value approximates toxic effects, particularly sub-lethal effects to sensitive species (NOPSEMA, 2019). French-McCay (2002) indicates an average 96-hour LC50 of around 50 ppb could serve as an acute lethal threshold. For most marine organisms, a concentration of between 50 and 400 ppb is considered to be more appropriate for risk evaluation. This exposure value has been used to inform the risk evaluation with respect to dissolved hydrocarbons, and used to describe environmental sensitivities within the EMBA.

9.1.3 Scientific Monitoring

A planning area for scientific monitoring is defined with reference to the low-exposure entrained value of 10 ppb detailed in NOPSEMA Bulletin #1 Oil Spill Modelling (2019). This low exposure threshold is based on the potential for exceeding water quality triggers.

The scientific environmental monitoring program would be activated in accordance with the petroleum activity OPEP (GV-HSE-ER-0011) (Appendix E), or any release event with the potential to contact sensitive environmental receptors.

9.2 Hydrocarbon Release – Marine Diesel

9.2.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Hazard	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Unplanned surface release of marine diesel oil	Surface release of MDO from a project vessel as a result of an external impact (vessel collision) which ruptures an MDO tank.	Temporary and localised reduction in water quality with potential for toxicity effects to marine fauna and flora, oiling of offshore, nearshore and shoreline habitats. Impacts to socio-economic receptors.	100	0.1	10	Type A Lower Order Risk	Tolerable
	Release of MDO during a bunkering incident.		10	0.3	3	Type A Lower Order Risk	Tolerable

9.2.2 Source of Hazard

Surface Release of Marine Diesel Oil from a Project Vessel as a Result of an External Impact (Vessel Collision) Which Ruptures a Marine Diesel Oil Tank

Project vessel fuel oil capacities are presented in Section 4.10. MDO on the project vessels is distributed into multiple single tanks on the project vessels. The largest single fuel tank is 1,000 m³ on a project vessel used for infrastructure removal activities (Table 4-9) and presents the maximum credible release volume that could be released in the event of a vessel collision. A 1,000 m³ marine diesel release was modelled at the PLEM. During the as-left survey a hydrocarbon release could occur closer to the coastline (at the State / Commonwealth waters boundary) as a result of vessel collision. However, the project vessel used for the as-left survey has a single fuel tank volume of 100 m³ (Table 4-9), substantially lower than the project vessel used for mercury removal activities. Therefore, the release from of 1,000 m³ of MDO at the PLEM is considered the worst case MDO release for this EP.

The likelihood of a vessel collision is unlikely, given slow-moving vessel operations associated with the petroleum activity as well as the controls in place to prevent collision at sea.

Project vessels presence will result in a navigational hazard for other marine users within the immediate area of the vessel, as detailed in Section 8.1. A review of the potentially active commercial fisheries (Section 5.7.1) along with consultation feedback (Section 6), determines it unlikely there will be active commercial fishing in the area. In addition, there are no recognised shipping routes in or near the operational area, with the nearest shipping fairway designated by AMSA located more than 80 km to the north-west (Figure 5-14). Analysis of shipping traffic data indicates commercial vessels do use the general area.

Release of Marine Diesel Oil due to Leaking or Ruptured Bunker Transfer Equipment

Refuelling and bunkering at sea may occur during the mercury removal activities. Bunkering incidents may occur as the result of a damaged refuelling hose, coupling failures, loss of connection, vessel collision or loss of vessel position. Spills resulting from overfilling will be contained within the vessel drains and slops tank system. If the refuelling hose is ruptured, the fuel bunkering activity will cease by turning off the pump; the fuel remaining in the transfer line will escape to the environment in addition to the fuel that was released before stopping the transfer operation.

The guidance provided by AMSA (2013) for a bunkering spill under continuous supervision is considered appropriate, given bunkering will be constantly supervised. The maximum credible release volume during refuelling is calculated as transfer rate multiplied by 15 minutes of flow. The detection time of 15 minutes is seen as conservative but applicable after failure of multiple barriers followed by manual detection and isolation of the fuel supply. Based on an expected pumping rate of 150 m³/hour and a conservative time of 15 minutes to shut down the pumping operation once the fuel spill had been identified, a total release volume of around 37.5 m³ is proposed as the worst-case credible volume for a bunkering incident.

9.2.3 Oil Spill Modelling Results

The EMBA for the worst-case MDO release is presented in Figure 5-1. The outer extent of the EMBA is derived from the oil spill modelling defined using the hydrocarbon exposure thresholds in Table 9-4 and is based on the combined area of contact for all hydrocarbon components (surface, shoreline dissolved and entrained hydrocarbons). The modelling results below are presented for each hydrocarbon component at the hydrocarbon exposure thresholds defined in Table 9-5.

Surface Hydrocarbons

Low exposure (>1 g/m²)

Surface hydrocarbons at the low exposure value are predicted to travel up to 123 km to the northeast and up to 90 km to the southwest of the release location. Receptors with the potential to be contacted at the low exposure value are:

- Gascoyne Australian Marine Park (AMP)
- Ningaloo AMP
- Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF

- Commonwealth waters adjacent to Ningaloo Reef KEF
- Continental Slope Demersal Fish Communities KEF
- Muiron Islands Marine Management Area (MMA)
- Western Australia State Waters.

Moderate exposure (>10 g/m²)

Surface hydrocarbons at the moderate exposure value are predicted to travel up to 57 km to the southwest of the release location. Receptors with the potential to be contacted at the moderate exposure value are:

- Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF
- Continental Slope Demersal Fish Communities KEF.

High exposure (>50 g/m²)

Surface hydrocarbons at the high exposure value are predicted to travel up to 27 km to the northeast of the release location. No receptors are contacted at this threshold.

Table 9-6 summarises receptors with the potential to be contacted at low, moderate and high surface hydrocarbon exposure thresholds.

Table 9-6: Summary of Receptors with the Potential to be Contacted at the Low, Moderate and High Surface Hydrocarbon Exposure Thresholds

Receptor	Probability of Surface Hydrocarbon Exposure (%)			Minimum Time Before Surface Hydrocarbon Exposure (days)		
	Low	Moderate	High	Low	Moderate	High
Gascoyne AMP	1	NC	NC	3.54	NC	NC
Ningaloo AMP	2	NC	NC	2.5	NC	NC
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF	17	3	NC	0.63	1.33	NC
Commonwealth waters adjacent to Ningaloo Reef KEF	2	NC	NC	2.5	NC	NC
Continental Slope Demersal Fish Communities KEF	21	1	NC	0.38	0.5	NC
Muiron Islands MMA	1	NC	NC	1.88	NC	NC
Western Australia State Waters	1	NC	NC	1.79	NC	NC

NC = no contact

Shoreline Accumulated Hydrocarbons

Low exposure (>10 g/m²)

The probability of shoreline-accumulated hydrocarbons at the low threshold is 2% (summer), 1% (transitional) and 4% (winter) and may occur at Exmouth, Flat Island, Muiron Islands and Peak Island. The minimum time before oil accumulation at or above the low threshold ranged between two days (winter) at the Muiron Islands and 5.5 days (transitional) at Peak Islands. The maximum shoreline accumulation was 15.9 m³ during the summer season at Exmouth.

Moderate exposure (>100 g/m²)

Shoreline-accumulated hydrocarbons at or above the moderate exposure value were predicted to occur only at Exmouth and Muiron Islands at a probability of 1%. The maximum shoreline oil length is 3 km at Exmouth.

High exposure (>1000 g/m²)

Shoreline-accumulated hydrocarbons are not predicted at the high exposure value.

Table 9-7 summarises receptors with the potential to be contacted at low and moderate shoreline accumulation hydrocarbon exposure thresholds.

Table 9-7: Summary of Receptors with the Potential to be Contacted at the Low and Moderate Shoreline Accumulation Hydrocarbon Exposure Thresholds

Receptor	Maximum probability of shoreline loading (%)		Minimum time before shoreline accumulation (days)		Volume on shoreline (m^3)	Maximum length of shoreline contacted (km)	
	Low	Moderate	Low	Moderate	Peak	Low	Moderate
Exmouth	1	1	4.63	4.96	15.9	24	3
Flat Island	1	NC	4.79	NC	0.2	1	NC
Muiron Islands	3	1	1.96	5.5	3.1	6	1
Peak Island	2	NC	3.50	NC	0.4	1	NC

NC = no contact

Dissolved Hydrocarbons

Low exposure (10 ppb)

No contact at the low exposure threshold was predicted.

Moderate exposure (>50 ppb)

Dissolved hydrocarbons at the moderate exposure value were predicted to travel up to 38 km to the northeast and 34 km to the southwest of the release location.

Table 9-8 summarises receptors with the potential to be contacted at the moderate dissolved hydrocarbon exposure thresholds.

Table 9-8: Summary of Receptors with the Potential to be Contacted at the Moderate Dissolved Hydrocarbon Exposure Thresholds

Receptor	Maximum instantaneous dissolved hydrocarbon concentration (ppb)	Probability of instantaneous dissolved hydrocarbon exposure
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF	72	1
Ancient coastline at 125 m depth contour KEF	367	48
Continental Slope Demersal Fish Communities KEF	58	1

NC = no contact

Entrained Hydrocarbons

Low exposure (10 ppb)

No contact at the low exposure threshold was predicted.

Moderate exposure (>100 ppb)

Entrained hydrocarbons at the moderate exposure value were predicted to travel up to 454 km to the southwest, and 386 km to the southwest of the release location.

Table 9-9 summarises receptors with the potential to be contacted at moderate entrained hydrocarbon exposure thresholds.

Table 9-9: Summary of Receptors with the Potential to be Contacted at the Moderate Entrained Hydrocarbon Exposure Thresholds

Receptor	Maximum instantaneous entrained hydrocarbon concentration (ppb)	Probability of instantaneous entrained hydrocarbon exposure
Gascoyne AMP	1007	24
Montebello AMP	851	6
Ningaloo AMP	1321	24
Cape Range	897	5
Glomar Shoals KEF	145	2
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF	3477	40
Ancient coastline at 125 m depth contour KEF	29426	96
Exmouth Plateau KEF	362	5
Commonwealth waters adjacent to Ningaloo Reef KEF	1772	24
Continental Slope Demersal Fish Communities KEF	4690	31
Barrow Island MMA	237	1
Muiron Islands MMA	1481	14
Barrow Island Marine Park	149	1
Ningaloo Marine Park	1012	15
Tryal Rocks	559	5
Ningaloo Reef	718	5
Exmouth Reef	105	1
Dailey Shoal	163	2
Western Australia State Waters	1,631	15

9.2.4 Environmental Impact Assessment – Vessel Collision

The potential impacts of surface, shoreline, entrained and dissolved hydrocarbons on sensitive receptors occurring within the EMBA, and along the stretch of coastline where shoreline accumulation of hydrocarbons above 10 g/m² could occur from a worst-case MDO release, is provided in Table 9-10.

A worst-case MDO release to the marine environment would result in a localised and temporary reduction in water quality in the upper surface waters of the water column. While MDOs are generally considered to be non-persistent oils, they a small percentage by volume of hydrocarbons that are classified as persistent (refer Section 9.1.1).

When released at sea, MDO will spread and thin out quickly and more than half of the volume can be lost to evaporation. There is a low probability (1%) of relatively low volumes (<16 m³) reaching the Ningaloo/Exmouth shoreline at about five days at the moderate threshold (refer Table 9-7).

A number of BIAs overlap the EMBA (identified in Section 5.6.2). The impacts to these species have been discussed in Table 9-10.

Deteriorating water quality and chemical and terrestrial discharge is identified as a potential threat to turtles in the marine turtle recovery plan, and recovery plans / conservation management plans for some bird and shark species (Table 5-12). Habitat modification, degradation and disruption, pollution and loss of habitat are also identified as threats to sharks, birds, cetaceans and turtles in conservation management plans. Given the location of the release and worst-case credible release volume, there is the potential for modification to or a decrease in the availability of quality habitat (shorelines and subsurface) for a period. However, given the low persistence of MDO, high evaporation and low stickiness, the quality of habitat will recover over a period of one to three years.

The Gascoyne, Montebello and Ningaloo AMPs are within the EMBA and have the potential to receive concentrations of entrained oil (at 100 ppb). Potential impacts may include impacts to benthic fauna and habitats and associated impacts to demersal fish populations and reduced biodiversity. However, given the low maximum concentrations reaching the AMPs, it is not anticipated that the AMP values detailed in Appendix D, Section 2.10.1 will be compromised.

A worst-case release of MDO from a vessel collision has the potential to have an impact to the environment within the EMBA, lasting a period of one to three years. Given the extent, the worst-case severity is considered to be substantial.

Species Recovery Plans and Threat Abatement Plans

BHP has considered information contained in relevant recovery plans for marine fauna that identify marine pollution as a threat (Section 10).

Table 9-10: Impacts of a 1000 m³ Marine Diesel (MDO) Release on Sensitive Receptors

Receptor	Impacts of a 1000m³ MDO release on sensitive receptors
Marine fauna	
Plankton (including zooplankton; coral larvae and benthic invertebrates)	• Plankton could include the eggs and larvae of marine invertebrates (including coral) and fish. Physical contact of small hydrocarbon droplets may impair plankton mobility, feeding and respiration. • There is potential for localised mortality of plankton due to reduced water quality and toxicity. • The likelihood of impacts to plankton would be determined by the extent and timing of the spill; for example, hard coral spawning occurs primarily in March/April, so there is a heightened potential for impacts to coral eggs and larvae to occur during this period. • The different life stages of plankton often show widely different tolerances and reactions to oil pollution (Harrison, 1999). Usually the eggs, larval and juvenile stages will be more susceptible than the adults. Surface and entrained oil could impact fish eggs and larvae due to entrainment in surface slicks. However, fish eggs and larvae are highly dispersive and are carried significant distances by ocean currents. Any impacts to fish eggs and larvae are not anticipated to significantly impact on fish populations. • The abundance and diversity of epi-benthic invertebrates is likely to be highest in shallow subtidal habitats such as hard corals, seagrasses and macroalgae, which are present along the Ningaloo coastline.
Fish, sharks and rays (including commercial species)	• A whale shark foraging BIA lies over the operational area and a BIA for aggregation events off the Ningaloo coast is around 25 km from the operational area and within the EMBA. Whale sharks are oceanic, but also come into shallower coastal waters to feed in surface waters which often coincide with specific productivity events that are a focus of feeding for the animals. • Whale sharks feed on plankton, krill and fish bait near or on the water surface and they are often observed swimming near the surface during seasonal aggregations. It is possible they may come into direct contact with surface hydrocarbons or hydrocarbons in the water column during their known aggregation around Ningaloo coast. • The most likely impact to fish, shark and rays is from the dissolved aromatic hydrocarbons or entrained hydrocarbon droplets, particularly when through the pathways of ingestion or the coating of gill structures. This could lead to respiratory problems (reduction in oxygen exchange efficiency) or an accumulation of hydrocarbons in tissues. • The shallower intertidal reef areas around the Ningaloo Reef and Muiron Islands are considered to include fish habitats most sensitive to surface oil. Potential direct impacts may include gill contamination, enlarged livers, fin erosion, metabolic stress, reduced production survival of eggs and larvae and reduced survival and growth of recruits (Giari et al., 2012; Theodorakis et al., 2012). • Near the sea surface, fish are likely to be able to detect and avoid contact with surface slicks and as a result, fish mortalities rarely occur in open waters from floating oils (Scholz et al., 1992; Kennish, 1997). Pelagic fish species are therefore generally not highly susceptible to impacts from hydrocarbon spills. Demersal fish species living and feeding on or near the seabed in deeper waters are not likely to be affected by surface and entrained oil in open waters. Likewise, most reef fish are expected to occur at water depths significant enough to be unaffected by surface oil, whereas reef fish in shallow waters (<10 m) and sheltered embayments are at greatest risk from surface oil (Law et al., 2011), particularly if they are territorial and unlikely to leave their habitat. • While fish, sharks and rays do not generally break the sea surface, individuals may feed near the surface for short periods. The probability of prolonged exposure to a surface slick by fish, shark and ray species is unlikely.
Marine mammals	• Twelve marine mammals were identified by the EPBC Protected Matters search for the EMBA (Section 5.6.1). BIAs overlapping the EMBA include: ○ humpback whale – migration (north and south) and resting ○ pygmy blue whale – foraging, migration and distribution ○ dugong – breeding, foraging (high density seagrass beds), nursing and calving.

Receptor	Impacts of a 1000m^3 MDO release on sensitive receptors
	• Humpback whale migration in this region is characterised by three directional phases, being: ○ northbound phase – starts June, peaks July and tapers off by early August ○ transitional phase (peak numbers expected at this time) – occurring late August and early September ○ southbound phase – occurring early August until the end of November (this phase is segmented by a two- to three-week delay in appearance of peak numbers of cow/calf pods after the main migratory body has passed). • Marine mammals (whales, dolphins and dugongs) come to the sea surface to breathe air. They are therefore theoretically vulnerable to impacts caused by contact with hydrocarbons at the sea surface. Whales and dolphins are smooth-skinned, hairless mammals so oil tends not to stick to their skin and since they do not rely on fur for insulation, they are therefore not as sensitive to the physical effects of oiling. • Ingested oil, particularly the lighter fractions, can be toxic to marine mammals. Ingested oil can remain within the gastro-intestinal tract and be absorbed into the bloodstream and thus irritate and destroy epithelial cells in the stomach and intestine. • The way whales and dolphins consume their food may affect the likelihood of their ingesting oil. Baleen whales (such as humpback whales), which skim the surface, are more likely to ingest oil than toothed whales, which are 'gulp feeders' (Etkin, 1997). Spilled oil may also foul the baleen fibres of baleen whales, thereby impairing food-gathering efficiency or resulting in the ingestion of oil or oil-contaminated prey. Baleen whales may therefore be vulnerable to oil if feeding. Weathered oil residues from an oil spill event may persist for long periods, causing a potential risk to baleen whales' feeding systems. It should be noted that adult humpback whales, which are seasonally present and relatively abundant in the region, are not thought to be feeding during their migration through the region. • Dugongs are common in several locations along the Ningaloo coastline and the Muiron Islands where there are seagrass beds. • Dugongs may be indirectly impacted via habitat loss due to reduction in seagrass from contact with entrained hydrocarbons. Direct impacts to dugongs could occur through foraging or ingesting seagrass coated with hydrocarbon. Additionally, where surface slicks are expected to extend into shallower coastal waters, impacts from contact with surface hydrocarbons may also occur as they surface to breathe.
Marine reptiles	• BIAs for the flatback turtle, green turtle, hawksbill turtle and loggerhead turtle all are within the extent of the EMBA (Section 5.6.2). • Important areas for marine turtles that may be exposed to hydrocarbons include the North West Cape of the Ningaloo coast and the Muiron Islands. • Direct contact of marine turtles with hydrocarbons and exposure from hydrocarbon components may lead to: ○ digestion and absorption of hydrocarbons through food contamination or direct physical contact, leading to damage to the digestive tract and other organs ○ irritation of mucous membranes (such as those in the nose, throat and eyes), leading to inflammation and infection ○ eggs possibly contaminated and their development inhibited or lead to developmental defects in hatchlings, either due to oil on the nesting beach or through transference from the adult turtles while laying the eggs ○ oiling of hatchlings, after emerging from the nests, as they make their way across the beach to the water. • The greatest potential for impact to turtles or seasnakes is likely to be in feeding areas where surface and entrained hydrocarbons have contacted shallow water foraging habitats (such as seagrass, hard coral and macroalgae) or, in the case of turtles, at any turtle nesting beaches that have been contacted. • Marine turtles are vulnerable to the effects of hydrocarbon spills at all life stages (eggs, post hatchlings, juveniles and adults) while in the water or onshore (NOAA, 2010). • Green, hawksbill, flatback and loggerhead turtles use shallow waters and nesting beaches along coastlines of the Ningaloo Coast and Muiron Islands. The risk at these nesting beaches is for hydrocarbons to contact adult females during nesting season or when newly hatched turtles enter the water from nesting beaches. Hatched turtles are likely to be highly susceptible to oiling from either shoreline-accumulated oil or surface oil; however, impacts would be highly seasonal and limited to the periods when hatchlings emerge from the nests six to eight weeks after nesting by adults.

Receptor	Impacts of a 1000m^3 MDO release on sensitive receptors
	• Several species of seasnake are known to occur in the EMBA. The sensitivity of seasnakes to hydrocarbon spills has been poorly studied. It is expected that susceptibility will be due to their need to surface in order to breathe. Seasnakes may also be susceptible to toxic effects through ingestion of contaminated prey items.
Seabirds and shorebirds	• Birds exposed to hydrocarbons may suffer a range of internal and external health effects. Direct contact with hydrocarbons and exposure from hydrocarbons has the potential to cause: ○ oiled feathers affecting the ability of the birds to fly and those birds on the sea surface may suffer from loss of buoyancy and drown or die from hypothermia ○ skin irritation or ulceration of eyes, mouth or nasal cavities ○ internal effects from poisoning or intoxication through ingestion, preening and ingestion of oil via their prey items ○ reduced reproduction ability ○ reduction in the number of eggs laid ○ decreased shell thickness ○ disruption of the normal breeding and incubating behaviours. • The operational area overlaps with the wedge-tailed shearwater and lesser crested tern BIAs (breeding) (Section 5.6.2). The nearest colony of wedged-tailed shearwaters is the Thevenard Island, 20 km to the southwest of the operational area. A number of other seabird BIAs have been identified within the EMBA (Section 5.6.2). • The surface oil component poses the greatest risk of impact to seabirds due to the amount of time they spend on or near the sea surface. Individuals are at risk of lethal or sub-lethal physical and toxic effects due to external exposure (oiling of feathers) and ingestion, especially those close to the source point where concentrations are at their highest. Even small quantities of feathers contaminated by oil can be lethal, causing hypothermia and reduced buoyancy (O'Hara and Morandin, 2010). Seabirds are less likely to be affected by entrained and dissolved hydrocarbons, except through the ingestion of contaminated prey. • The waters of the North West region of Western Australia support large populations of seabirds, predominantly tern species, and the EMBA includes important breeding, feeding, foraging and refuge sites for a number of EPBC Act-listed migratory and threatened seabirds. The seabirds that most commonly occur within the EMBA include albatross, petrels, terns and shearwaters (refer Table 5-9). Seabirds spend most of their time at sea, travelling over large distances to forage over the open ocean, returning to land during breeding only; therefore, some seabirds may transit the offshore waters of the EMBA and come into contact with surface oil. While individual seabirds may be affected, it is not predicted that large numbers of seabirds will be impacted from surface oil as they are unlikely to be present in significant numbers due to their vast distribution area. The risk of impact is greater should a release occur within the chick-rearing period, where adults forage closer to breeding colonies. • Shoreline-accumulated oil is predicted at Exmouth, Muiron Islands, Flat Island and Peak Island. These habitats (particularly those with intertidal mud flats and sandy beaches) are important staging sites for migratory shorebirds and important breeding sites. Given the low volume of shoreline accumulation (refer Table 9-7) and the low persistent nature of MDO, significant impacts from shoreline accumulation is not anticipated.
Intertidal/subtidal habitats	
Intertidal sandy beaches/ mud flats	• Sandy beaches and intertidal sediments occur extensively along the Ningaloo coast, the western side of Exmouth Gulf, and are also found along the Muiron Islands. • The above represents an important habitat that supports burrowing fauna of crabs, mainly ghost crabs, and burrowing bivalve molluscs, as well as a diverse community of benthic infauna comprising polychaetes, crustaceans and gastropods. In addition, the beaches provide seasonally important habitat for turtle nesting, breeding seabirds and migratory wading birds. The impacts from hydrocarbons are described previously above. • Temporary declines in infauna and epifauna populations may have indirectly affect feeding shorebirds, seabirds and migratory wading birds.

Receptor	Impacts of a 1000m^3 MDO release on sensitive receptors
	• Given the low volume of shoreline accumulation (refer Table 9-7) and the low persistent nature of MDO, significant impacts from shoreline accumulation are not anticipated.
Macroalgal and seagrass beds	• Macroalgal beds occur both intertidally and subtidally within the moderate exposure value area of the EMBA, particularly along the western shores of the North West Cape and around the Muiron Islands. Macroalgae on reef fronts and reef edges would not be exposed to direct surface hydrocarbons but may be exposed to entrained hydrocarbons. • Impact of hydrocarbons on macroalgae, particularly on intertidal shores, largely depends on the degree of exposure, the degree of wave and tidal action and how much of the hydrocarbon adheres to the seagrass or macroalgae. Macroalgae is predicted to recover quickly as a result of wind, wave and tidal-driven coastal processes that naturally flush the hydrocarbons. • Impacts could include reduced capability for photosynthesis if the seagrass or macroalgae were smothered, or toxic effects could occur from contact with the hydrocarbon. • Impacts to seagrass may present secondary impacts to species reliant on the habitat, such as dugongs.
Coral reefs	• Potential exists for corals to be contacted by entrained hydrocarbons along the Ningaloo coastline and Muiron Islands. • Direct contact by dissolved hydrocarbons can cause lethal and sub-lethal effects in corals, depending on the time and duration of exposure of the concentrations, with sub-lethal effects including decreased growth rates and reduced reproductive success (IPIECA, 1992). In the worst-case instance, irreversible tissue necrosis and death could occur. • Corals on reef fronts, reef edges and in deeper lagoonal areas will come into contact with entrained oil through dispersion or by dissolution of toxic hydrocarbons into the water column. • Given MDO has a relatively low persistence and is not considered a sticky oil, coral exposure to the worst-case MDO release is expected to be temporary.
Mangroves	• Potential exists for mangroves to be contacted by hydrocarbons along the Ningaloo coastline and Muiron Islands. • Mangrove root systems (including pneumatophores) are sensitive to physical oiling from surface hydrocarbons. Impacts to mangroves include yellowing of leaves, defoliation, reduced reproductive output and success, mutation and increased sensitivity to other stresses (NOAA, 2010). There is the potential for stands of mangroves at shorelines, notably along the Ningaloo Coastline (such as at Mangrove Bay and at Yardie Creek) to be contacted. • Given MDO has a relatively low persistence and is not considered a sticky oil, mangrove exposure to the worst-case MDO release is expected to be temporary.
Shoreline habitat	
Shoreline Habitats	• There is a very low probability of volumes of MDO to accumulate on shorelines at Ningaloo, Exmouth and the Muiron Islands. • The Ningaloo/Exmouth coast is important for green turtles, and to a lesser extent hawksbills turtles, while Muiron Islands have a regionally important nesting site for loggerhead turtles. • Impacts to turtles could occur from shoreline accumulated hydrocarbons, as described above.
Socio-economic	
Fisheries	• The EMBA overlaps Commonwealth- and State-managed fisheries. • Hydrocarbons in the water column can have toxic effects on fish (as outlined above) and cause ‘tainting’, reducing catch rates and rendering fish unsafe for consumption. • Exclusion zones surrounding a spill can directly impact fisheries by restricting access for fishermen.

Receptor	Impacts of a 1000m^3 MDO release on sensitive receptors
Tourism and recreation	• There is a wide variety of nature-based tourism and recreational activities, including recreational fishing, that occurs in the EMBA. Much of this occurs in the Ningaloo/Exmouth area during the peak tourism season from April to October, although some of the offshore islands also attract visitors such as the Muiron Islands. In an oil spill, there is the potential for temporary closure of all recreational activities, including diving, due to the risk to public health and safety. Similar impacts arising from the shoreline stranding of hydrocarbons will add a visual impact and potentially restricted access to shorelines. • Impacts to recreational fishing may also occur due to impacts to fish as described for fisheries above.
Defence	• Military exercise areas are located at Exmouth associated with Royal Australian Air Force Base Learmonth (refer to Section 5.7.6). These training zones overlap the operational area and EMBA. However, they are designated for aerial training and are unlikely to be impacted by a hydrocarbon release.
Shipping	• The impact on shipping in the event of a worst-case discharge is likely to be limited to the potential for minor modification of shipping routes through the implementation of exclusion zones to avoid the spill. Shipping operations may be affected by spill response efforts by way of a 'Notice to Mariners' being issued to avoid the area, leading to the potential diversion from normal shipping routes.
Oil and gas activities	• Multiple oil and gas operators have operations within the EMBA. In a large-scale release, petroleum production operations in the region would likely remain unaffected, unless a surface slick was within the vicinity and considered to represent a safety hazard, at which time the likely response would be to cease production activities. A potential second order effect that may also cause production to cease is a closure of the surrounding areas, such as for safety or navigation control, preventing offtake tankers or support vessels from operating in the area. The impact of ceasing production would be the postponement of income from sales.
Indigenous	• Any oil that reaches the shoreline has potential to impact on registered sites and indigenous heritage places along the coastline. In the unlikely event of a hydrocarbon release, shoreline accumulation may affect sensitive artefacts or areas, which could damage their heritage value.
Maritime heritage	• There are a number of shipwrecks in the EMBA. Notable shipwrecks include three historic shipwrecks at Pt Cloates along the Ningaloo Coast (Fin, Perth and Zvir) and one historic shipwreck at North West Cape (Fairy Queen). It is unlikely contact would have any lasting impact on these sites, apart from a possible temporary reduction in aesthetic value for a period. • Surface hydrocarbons will have no impact on shipwrecks. • Hydrocarbons in the water column may potentially impact those microbial and encrusting communities that may in turn affect the structural integrity of the shipwreck.
Protected/ Significant Areas	
World Heritage and National Heritage	• The Ningaloo Coast with World Heritage and National Heritage listings falls within the EMBA (Section 5.5.2 and 5.5.3). • The environmental values and sensitivities of the Ningaloo coast are described in Appendix D, Section 2.4. The potential impacts to these are described in the relevant sections of this table.

Australian and State Marine Parks	The EMBA overlaps several Marine Parks (refer to Sections 5.5.2):
	• Australian Marine Parks:
	  ○ Gascoyne
	  ○ Montebello
	  ○ Ningaloo.
	• State Marine Parks:
	  ○ Muiron Islands Marine Management Area
	  ○ Barrow Island Marine Management Area

Receptor	Impacts of a 1000m^3 MDO release on sensitive receptors
	○ Ningaloo Marine Park ○ Barrow Island Marine Park ○ Montebello Islands Marine Park • The environmental values and sensitivities of these Marine Parks are described in Appendix D, Section 2.10.1. The potential impacts to these values are described in the relevant sections of this table.
Key ecological features	The EMBA overlaps several KEFs (refer to Section 5.5.1): • Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF • Ancient coastline at 125 m depth contour KEF • Exmouth Plateau KEF • Commonwealth waters adjacent to Ningaloo Reef KEF • Continental Slope Demersal Fish Communities KEF • Glomar shoals KEF. The environmental values and sensitivities of these KEFs are described in Appendix D, Section 2.10.3 and the potential impacts are described in the relevant sections of this table. The ancient coastline at 125-m depth contour, the canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula, and the continental slope demersal fish communities KEFs are entirely subtidal. The benthic communities and habitats associated with these KEFS, such as filter-feeding communities and demersal fish assemblages, are not predicted to be impacted by hydrocarbons in the event of a hydrocarbon release, based on the water depths at which they occur. However, the pelagic marine faunal assemblages that are attracted to the nutrient-rich waters, such as whales, whale sharks, large pelagic fish and seabirds, are at risk of impacts from surface and entrained hydrocarbons.

9.2.5 Environmental Impact Assessment – Bunkering Incident

Potential impacts to receptors found within the EMBA are described in Table 9-10. A release of MDO during bunkering will be much reduced in terms of spatial and temporal scales compared to a worst-case MDO release from a vessel collision (assessed above).

It is considered that there is no potential for contact with shorelines from a bunkering incident within the operational area. Impacts are considered to be confined to the local environment only.

For marine mammals that may be exposed to the more toxic aromatic components of the minor release of MDO, toxic effects are considered unlikely, since these species are mobile and therefore will not be constantly exposed for extended durations that would be required to cause any major toxic effects. Any impacts will be minor and temporary.

A number of BIAs overlap the operational area (identified in Section 5.6.2), including humpback whale migration, pygmy blue whale distribution, whale shark foraging, flatback, green and hawksbill turtle internesting buffers. Given the low volume of MDO release from a bunkering incident, the release will not interfere with humpback migration activity.

It is possible individual turtles may be encountered and come into contact with the release; however, considering the water depths of the operational area compared to observed water depths of internesting turtles, large numbers of the species are not expected, and any impacts will be minor and temporary.

9.2.6 Demonstration of As Low As Reasonably Practicable

The ALARP process for the environmental aspect is summarised in Table 9-11. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 9-11: Marine Diesel Release – As Low As Reasonably Practicable Assessment Summary

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
Engineer	Navigation (including lighting, compass/radar), bridge and communication equipment will be compliant with appropriate marine navigation and vessel safety requirements in compliance with Marine Order 21 (safety and emergency arrangements).	Accept	Legislative requirements to be followed which reduces the risk of vessel collisions due to ensuring safety and navigation requirements are fulfilled. The control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.2.1**
Separate	Establishment of a 500 m exclusion zone around the project vessels.	Accept	Control is based on legislative requirements and must be accepted; reduces likelihood of vessel collision with third-parties. Third-party vessels must navigate the exclusions zone to reduce the risk. The control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.2.2**
Administrate	Collision prevention measures and vessel safety requirements in compliance with Marine Order 30 (prevention of collisions).	Accept	Legislative requirement to reduce the likelihood of interference with other marine users, resulting in a collision. The control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.2.3**
	Notification of details (such as location, duration of activities) of the petroleum activity to AMSA and the AHO.	Accept	Ensure other marine users are aware of the presence of the project vessels and are provided with information about timings of the petroleum activity, including project vessel arrival and	**PS 9.2.4** **PS 9.2.5**

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
			departure, so the maritime industry is aware of the petroleum activity and to reduce risk of vessel collision. Control based on BHP requirements, must be accepted. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice	
	Consultation with relevant stakeholders.	Accept	Control based on BHP requirements, must be accepted. Control ensures other users are informed and aware of the petroleum activity, thereby reducing the likelihood of interference. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.2.6**
	Establish and maintain a Community Engagement Program by regular meetings with the CRG.	Accept	Control based on BHP requirements, must be accepted. Control ensures other users are informed and aware of the petroleum activity, thereby reducing the likelihood of interference. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.2.7**
	Project vessel contractor bunkering equipment requirements.	Accept	Provides details about the fuel bunkering equipment requirements which reduces the potential for release during bunkering. Requires use of dry break coupling (bunkering hose) and break-away coupling to limit the MDO losses in an emergency. Control based on BHP requirements, must be accepted. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.2.8**
	Project vessel contractor bunkering procedure implemented for all vessel bunkering.	Accept	Provides details on the fuel bunkering process to be followed. Control based on BHP requirements, must be accepted. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.2.9**
	The project vessels will run on MDO; no intermediate or heavy fuel oils will be used.	Accept	MDO is a light fuel oil and is less persistent in the marine environment than intermediate or heavy fuel oils. Limiting project vessels to MDO reduces the risk to the marine environment in the event of a spill. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.2.10**
Pollution Control	Vessel has a Shipboard Oil Pollution Emergency Plan (SOPEP) compliant Marine Order 91 (marine pollution prevention – oil).	Accept	Implement response plan to quickly and efficiently deal with unplanned hydrocarbon spills to reduce impacts to the marine environment. Control is legislative requirement. The control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.2.11**
	Dedicated resources (such as spill response equipment) on location to enable rapid response and employment.	Reject	Control may enable faster response time by having dedicated equipment resources on standby and in proximity during the petroleum activity. Significant cost associated with this control. It is considered that the cost is	-

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
			grossly disproportionate to the benefit that may be gained, particularly given low volume of shoreline accumulation.	
Eliminate	Eliminate use of vessels.	Reject	The use of vessels is required to conduct the petroleum activity. Control not feasible.	-

ALARP Summary

The risk assessment and evaluation has identified a range of controls (Table 9-11) that when implemented are considered to manage the risks of a marine diesel hydrocarbon release to ALARP.

BHP considers the control measures described above are appropriate to reduce the potential risks of a marine diesel hydrocarbon release. Additional reasonable control measures were identified in Table 9-11 to further reduce impacts but rejected since the associated cost or sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

9.2.7 Demonstration of Acceptability

Given the adopted controls, the risk of a marine diesel hydrocarbon release will be reduced to a tolerable level. Further opportunities to reduce the risk have been investigated in Table 9-11.

The adopted controls are considered good oil-field practice/industry best practice. No concerns or objections regarding the risk of a marine diesel hydrocarbon release have been raised by relevant stakeholders. The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). BHP has considered information contained in recovery plans and threat abatement plans (Section 10). The environmental risks meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the risk to be managed to an acceptable level.

9.2.8 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria
No accidental release of hydrocarbons to the marine environment	**PS 9.2.1** Project vessel compliance with *Navigation Act 2012*; International Convention of the Safety of Life at Sea (SOLAS) 1974; Marine Order 30 – prevention of collisions, Issue 8; Marine Order 21, Issue 8 (Safety of Navigation and Emergency Procedures); and International Convention of Standards of Training, Certification and Watch-keeping for Seafarers (STCW95), which specifies: • navigation (including lighting, compass/radar), bridge and communication equipment will comply with appropriate marine navigation and vessel safety requirements • AIS is fitted and maintained in accordance with Regulation 19-1 of Chapter V of SOLAS • crew performing vessel bridge-watch will be qualified in accordance with International Convention of STCW95, AMSA Marine Order – Part 3: Seagoing Qualifications or certified training equivalent • maintenance of navigation equipment in efficient working order (compass/radar).	Vessel audit and inspection records demonstrate compliance with standard maritime orders and equipment requirements.

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria
	PS 9.2.2 Establishment of a 500 m exclusion zone around the project vessels.	Breaches of vessel access within 500 m safety exclusion zone recorded in Marine Logbook and reported via Incident Report Form and documented in Environmental Performance Report.
	PS 9.2.3 Project vessel compliance with Marine Order 30 (prevention of collisions) 2016, including adherence to: • steering and sailing rules, including maintaining lookouts (such as visual, hearing, radar), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar) • navigation light display requirements, including visibility, light position/shape appropriate to activity • navigation noise signals as required.	Vessel audit and inspection records demonstrate compliance with standard maritime orders and equipment requirements.
	PS 9.2.4 The AMSA RCC (as part of marine safety division) will be notified of the petroleum activity four weeks before mobilisation to ensure navigation AUSCOAST warnings can be issued and kept up to date.	Records demonstrate AMSA RCC was notified at least four weeks before commencing the petroleum activity to enable the 'Notice to Mariners' to be published.
	PS 9.2.5 The AHO is notified at least four weeks before commencing the petroleum activity so they can then issue a Notice to Mariners.	Records demonstrate AHO was notified at least four weeks before commencing the petroleum activity to enable the 'Notice to Mariners' to be published.
	PS 9.2.6 WA APU Community Stakeholder Management Plan: The CRG is advised of and updated of the petroleum activity and timing.	Meeting minute records maintained of CRG meetings, which includes summary of proposed petroleum activity.
	PS 9.2.7 BHP consultation with relevant stakeholders to advise them of the petroleum activity.	Stakeholder communication recorded in database, demonstrating assessment of stakeholder feedback received and BHP response.
	PS 9.2.8 Project vessel contractor bunkering equipment includes: • all bulk transfer hoses shall be tested for integrity before use • dry-break couplings and flotation on fuel hoses • adequate number of appropriately stocked, located and maintained spill kits	Records demonstrate the contractor bunkering project vessel bunkering equipment includes • all bulk transfer hoses shall be tested for integrity before use • dry-break couplings and flotation on fuel hoses • adequate number of appropriately stocked, located and maintained spill kits
	PS 9.2.9 Project vessel contractor bunkering procedure is implemented for all hydrocarbon vessel bunkering activities, and will include: • a completed PTW and/or JSA shall be implemented for the hydrocarbon bunkering and refuelling operation • visual monitoring of gauges, hoses, fittings and the sea surface during the operation • hose checks before commencement.	Records demonstrate refuelling performed in accordance with contractor bunkering procedures.

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria
	PS 9.2.10 The project vessels will run on MDO; no intermediate or heavy fuel oils will be used.	Fuel records show that all vessels are run on MDO.
	PS 9.2.11 Project vessels have a SOPEP (as appropriate to vessel class) in compliance with Marine Order 91 (marine pollution prevention – oil) and contains plans in case of an oil spill to prevent spills reaching the marine environment, as appropriate to vessel class.	Approved SOPEP is available onboard project vessels, as appropriate to vessel class.

9.3 Marine Fauna Interaction

9.3.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Hazard	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Interaction with marine fauna	Accidental collision between project vessel and marine fauna.	Potential lethal impact or injury to protected marine fauna species.	30	0.1	3	Type A Lower Order Risk	Tolerable

9.3.2 Source of Hazard

The physical presence and movements of the project vessels in and around the operational area for the duration of the petroleum activity may present a potential hazard to slow-moving marine megafauna (cetaceans, marine turtles or whale sharks).

Project vessels will be stationary or moving at low speeds during the petroleum activity; however, movements can result in collisions between the vessel (hull, propellers) and marine fauna, with potential impacts ranging from minor behavioural interferences (such as avoidance) to severe impacts such as injury and mortality through vessel strikes.

9.3.3 Environmental Impact Assessment

Vessel collisions have been known to contribute to the mortality of marine fauna, including resident and migrating turtles (Hazel and Gyuris, 2006; Hazel et al., 2007) and migratory whales (Laist et al., 2001; Jensen and Silber, 2003). For cetaceans, whale sharks and turtles, the risk of lethal collision is a function of abundance of animals in the operational area, probability of a collision and the probability of that collision being fatal.

Cetaceans

The likelihood of vessel-whale collision being lethal is influenced by vessel speed. The risk of a collision causing mortality of the whale increases as the vessel speed increases (Laist et al., 2001; Jensen and Silber, 2003). Vanderlaan and Taggart (2007) found that the chance of lethal injury to a large whale as a result of a vessel strike declines from 80% at 15 knots to about 20% at 8.6 knots.

The project vessels will be either stationary or moving slowly (around four knots) in the operational area; hence, the chance of a vessel-whale collision resulting in lethal outcome within these waters is much reduced. Vanderlaan and Taggart (2007) estimated the risk is less than 10% at a speed of four knots. Vessel-whale collisions at this speed are uncommon and, based on reported data contained in the United States of America National Ocean and Atmospheric Administration database (Jensen and Silber, 2003), there only two known instances of collisions when the vessel was travelling at less than six knots, both from whale-watching vessels that were deliberately placed among whales. Collisions between vessels and marine mammals occur more frequently in areas where high vessel traffic and important habitat coincide (WDCS, 2006).

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 known to be curious and often approach vessels that have stopped or are slow-moving, although they generally do not approach, and sometimes avoid, faster moving vessels (Richardson et al., 1995). Species may also show avoidance to vessel noise as the vessel approaches (as described to Section 8.3).

Five listed threatened and migratory species of cetacean were identified as potentially occurring in or having habitat in the operational area: the sei whale, pygmy blue whale, fin whale, southern right whale and humpback whale. The operational area intercepts a BIA for the humpback whale (migratory) and a pygmy blue whale distribution BIA (refer Section 5.6.2). The worst-case consequence from a vessel strike would be the fatality of a single EPBC Act-listed individual species; however, as they would represent an individual within the local population, it is not expected to result in a decreased population size.

Whale Sharks

Whale sharks are at risk from vessel strikes as they spend time feeding at the sea surface. Whale sharks have been shown to spend approximately 25% of their time less than 2 m from the surface and greater than 40% in the upper 15 m of the water column (Wilson et al., 2006; Gleiss et al., 2013). Whale sharks may traverse offshore North West Shelf waters, including the operational area, during their migrations to and from aggregation areas along the Ningaloo coast, and the operational area intercepts the foraging BIA for the species. Seasonal aggregations along the Ningaloo coast can be variable, although usually between March and July, with peak numbers recorded in April and May (Sleeman et al., 2010). Outside of this period, individuals may still be present. Given the slow speeds at which project vessels operate, collisions with individual whale sharks are considered unlikely.

Turtles

Marine turtles are at potential risk from vessel collision. There is limited data about the incidence of marine turtle vessel strikes. Hazel and Gyuris (2006) note that at least 65 turtles were killed annually from 1999 to 2002 as a result of collisions with vessels on the Queensland east coast. Green turtles, followed by loggerhead turtles, comprised the majority of vessel-related records (Hazel and Gyuris, 2006); however, all species of marine turtle have been involved in vessel strikes (Commonwealth of Australia, 2017). It is reasonable to assume the higher the speed of collision, the greater the risk of mortality, but contact with the propeller would be lethal at almost all speeds. Studies have shown turtles are less likely to flee from a fast-moving vessel, presumably because of poor hearing and visual senses than from a slow-moving vessel (Hazel et al., 2007).

Marine turtles are predominantly oceanic species, except in the nesting season when they come ashore. Five marine turtle species were identified as potentially occurring in the operational area (Table 5-9). The operational area overlaps an inter-nesting habitat critical to the survival of flatback, green and hawksbill turtles, as well as flatback and hawksbill internesting buffer BIAs (Section 5.6.2). The nearest marine turtle nesting site (Thevenard Island) is 20 km from the operational area where project vessel use is proposed. Marine turtles are not expected to be in the operational area in high numbers during the petroleum activity, even during nesting and internesting periods, given the distance from the known nesting beaches. Given the slow speeds at which project vessels operate, collisions with individual marine turtles are considered unlikely.

Species Recovery Plans and Threat Abatement Plans

BHP has considered information contained in relevant recovery plans for marine fauna that identify vessel collision as a threat (Section 10). This includes the objectives and actions within the Conservation Management Plan for the Blue Whale 2015–2025 (Commonwealth of Australia, 2015a), which relate to vessel – whale collisions.

9.3.4 Demonstration of As Low As Reasonably Practicable

The ALARP process for the environmental aspect is summarised in Table 9-12. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 9-12: Interaction with Marine Fauna – As Low As Reasonably Practicable Assessment Summary

Function	Control Measure	Accept/ Reject	Reason	Performance Standard
Administrate	EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including: • Project vessels will not travel faster than six knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale. • Project vessels will not approach closer than 50 m for a dolphin or turtle or 100 m for a whale (with the exception of animals bow riding). • If the cetacean or turtle shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than six knots. • Project vessels will not travel faster than eight knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.	Accept	Reduces interaction risk to cetaceans (modified to include turtles and whale sharks). Controls based on legislative requirements must be accepted. Control is feasible, standard practice with minimal cost.	**PS 9.3.1**
	Environmental awareness induction provided to all marine crew to advise marine fauna interaction requirements.	Accept	Providing training to personnel assists in understanding obligations regarding marine fauna interactions. Control is feasible, standard practice with minimal cost.	**PS 9.3.2**
Separate	Avoid periods of marine fauna sensitivity (such as humpback whale migration).	Reject	The benefit that may accrue from avoiding periods of humpback whale migration is considered to be negligible based on the observation that even with all the oil and gas development (and associated vessel movements) occurring in the Exmouth Basin over the last ten years, the humpback whale population (Stock IV) has grown at an estimated 10% per year to the point where International Union for Conservation of Nature has removed the humpback whales from the threatened category and there have been no recorded cases of whale-vessel collisions. Bejder et al. (2015) found the population abundance of eastern and western Australian humpback whales has recovered to more than around 50% of their pre-whaling abundance and argued that, based on meeting the eligibility criteria for removing a species from any category in the list of threatened species	-

Function	Control Measure	Accept/ Reject	Reason	Performance Standard
			under the EPBC Act, the available scientific evidence does not support the listing of humpback whale populations on the EPBC Act list of threatened species. The cost associated with avoiding periods of peak whale density would be several millions of dollars if it requires placing contracted vessels on standby or the petroleum activity to be put on hold. Given the procedures proposed for preventing vessel-whale collisions have been demonstrated to be effective, it is considered the potential cost of this additional control is grossly disproportionate to the negligible benefit that may accrue.	
Engineer	Passive acoustic monitoring to detect cetaceans in the vicinity of the vessels	Reject	The cost of a passive acoustic monitoring system has been estimated to be unacceptably high and would require several permanent mooring locations in the operational area with real-time monitoring and analysis. Given the project vessels would be stationary for the most part or moving slowly (hence little chance of strike), it is considered that the cost is grossly disproportionate to the benefit that may be gained.	-

ALARP Summary

The risk assessment and evaluation has identified a range of controls (Table 9-12) that when implemented are considered to manage the risks of marine fauna interaction to ALARP.

BHP considers the control measures described above are appropriate to reduce the potential risks of marine fauna interaction. Additional reasonable control measures were identified in Table 9-12 to further reduce impacts but rejected since the associated cost or sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

9.3.5 Demonstration of Acceptability

Given the adopted controls, the marine fauna interaction risk will be reduced to a tolerable level. Further opportunities to reduce the risk have been investigated in Table 9-12.

The adopted controls are considered good oil-field practice/industry best practice. No concerns or objections regarding marine fauna interaction risks have been raised by relevant stakeholders. BHP has considered information contained in recovery plans and threat abatement plans (Section 10). The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). The environmental risks meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the risk to be managed to an acceptable level.

9.3.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria
No injury or mortality to EPBC Act 1999 and *WA Biodiversity Conservation Act 2016* listed fauna during operational activities	**PS 9.3.1** Project vessels comply with EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans to minimise potential for vessel strike and application of these regulations to whale sharks and marine turtles.	Records of breaches of vessel and cetaceans, whale sharks and turtles interaction requirements outlined in EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06).
	PS 9.3.2 Environmental awareness induction provided to project vessel marine crew before activities to advise marine fauna interaction requirements.	Signed environmental awareness induction attendance records demonstrate environmental briefing has been conducted for marine crew and includes marine fauna sightings and recording requirements.

9.4 Introduced Marine Species

9.4.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Hazard	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Introduced marine species	Movement of project vessels and immersible equipment from known high invasive marine species risk areas	Introduction of invasive marine species to areas, leading to impact to native species.	100	0.1	10	Type A Lower Order Risk	Tolerable

9.4.2 Source of Hazard

Project vessel activities have the potential to result in introduction of Invasive Marine Species (IMS) through:

- discharges of vessel ballast water containing foreign species
- translocation of species through biofouling of vessel hull or niches (such as sea chests, bilges or strainers)
- translocation of species on submerged equipment such as ROV.

The operational area is deep offshore in open waters, away from shorelines and critical habitat, therefore they are not conducive to the settlement and establishment of IMS. The most likely transfer of IMS is between project vessels within the operational area.

Should a project vessel be mobilised from international waters, there is the potential for transferring IMS from international waters into the operational area. There is a smaller risk of transferring IMS from vessels mobilised from Australian waters.

Ballast Water

The Commonwealth Department of Agriculture, Water and the Environment (DAWE) is the lead agency with responsibility for managing ballast water. Vessels manage ballast water in accordance with IMO Ballast Water Management (BWM) Convention, IMO Guidelines, the mandatory Australian Ballast Water Management

Requirements (Rev 8) are enforced under the *Biosecurity Act 2015* and associated local measures intended to minimise the risk of transplanting harmful aquatic organisms and pathogens from ships' ballast water and associated sediments, while maintaining ship safety. Contracted project vessels have individual BWM Plans.

Vessels arriving from overseas, intending to discharge trim or ballast water in coastal Australian waters, are required to have exchanged ballast water in accordance with DAWE requirements. The Australian Ballast Water Management Requirements are now aligned with the BWM Convention:

- All vessels must carry a valid Ballast Water Management Plan.
- Vessels with a BWM system should also carry a Type Approval Certificate specific to the type of BWM system.
- All vessels must submit a Ballast Water Report. Vessels intending to discharge ballast are obligated to report.
- International vessels can submit a Ballast Water Report through the Maritime Arrivals Reporting System at least 12 hours before arrival.
- All vessels must maintain a complete and accurate record of all ballast water movements.
- Domestic trading vessels can request a low-risk exemption through a Domestic Risk Assessment. All applications must be submitted through the Maritime Arrivals Reporting System.

From September 2019, all vessels that use ballast water are required to meet the Regulation D2 discharge standard of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Convention) at their next renewal survey. Vessels using ballast water exchange as their primary ballast water management method are required to phase out this management method and meet the Regulation D2 discharge standard. Vessels may meet this standard by installing an IMO Type Approved ballast water management system, or as specified within the Convention.

Biofouling

Biofouling on vessel hulls, external niche areas and immersible equipment pose a potential risk of IMS in Australian waters. Under the National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry and IMO Guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (resolution MEPC.207(62), DAWE and Department of Environment and Energy guidelines and BHP APU IMS Management Procedure, a risk assessment approach is applied to manage biofouling.

The BHP APU IMS Management Procedure (AOHSE-E-0018) outlines:

- Regulatory Framework for managing IMS
- BHP's marine activities at risk of facilitating introduction or translocation of IMS into Western Australia and Commonwealth waters
- BHP and contractors' roles and responsibilities;
- management and mitigation measures to prevent IMS incursions and manage identified biofouling pre-hire and post-mobilisation:
    - All contracted vessels are required to complete the BHP IMS risk assessment process described in this procedure. The IMS risk assessment assigns a final risk category of low, moderate, uncertain or high to vessels based on a range of information listed below. If a risk category of moderate, uncertain or high is scored, a range of management options are available, including inspections, cleaning or treatment of internal seawater systems to bring the risk category to low.
    - All documentation must be provided to BHP during the Marine Management Process before hire.
    - Any vessel contracted for greater than 12 months will be audited annually.
- the BHP IMS Risk Assessment and Approval Procedure form (AOHSE-E-0018-001) for assessing vessel and immersible equipment for IMS risk, is in alignment with NOPSEMA's Information Paper (IP1899) on 'Reducing Marine Pest Biosecurity Risks through Good Practice Biofouling Management' (NOPSEMA,

2020a). The BHP IMS Risk Assessment and Approval Procedure form (AOHSE-E-0018-001) considers the:

- history of the vessel, including destination and time spent in the last port of call
- equipment deployment and cleaning history
- status of anti-fouling coating and marine growth protection system
- independent biofouling inspection results and timing
- ballast water management, including water exchange and origin.

The completed IMS risk assessment must show that IMS risk is low for each project vessel and associated immersible equipment, prior to entering the operational area.

9.4.3 Environmental Impact Assessment

Non-endemic marine species transported into areas where they have not previously been found can displace native species or interfere with ecosystem processes in other ways (such as through predation). IMS may also be economically damaging, including direct damage to assets (fouling of vessel hulls and infrastructure), depletion of commercial marine species, and damage to recreational values of the area (such as tourism and recreational fishing). Furthermore, once introduced to an area, eradication or control of introduced species may be difficult, expensive and disruptive or damaging to other marine life.

The present knowledge base is inadequate to produce a detailed character profile of all marine organisms that may be translocated by shipping beyond their natural range. Ruiz et al. (2000) have analysed the common factors influencing success of translocated marine pests. Most marine pest species appear to have planktotrophic larvae; however, oviparous species are included. Many of them are epibenthic fouling species but some are soft substratum burrowers or planktonic.

The successful establishment of translocated marine pests via either ballast or hull fouling depends primarily on:

- colonisation and establishment of the marine pest on a vector (vessel, equipment or structure) in a donor region (for example, a home port, harbour or coastal project site where a marine pest is established)
- survival of the marine pests on the vector during the voyage from the donor to the recipient region
- colonisation (for example, by reproduction or dislodgement) of the recipient region by the marine pest, followed by successful establishment of a viable new local population.

The deep offshore open waters (around 130 m) of the operational area are not conducive to the settlement and establishment of IMS. The operational area water depths preclude light penetration to the seabed and the operational area is distant from any coastline (>50 km) and critical shoreline habitats. The likelihood that any marine organisms could become established at the field is unlikely.

9.4.4 Demonstration of As Low As Reasonably Practicable

The ALARP process for the environmental aspect is summarised in Table 9-13. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 9-13: Introduced Marine Species – As Low As Reasonably Practicable Assessment Summary

Function	Control Measure	Accept/ Reject	Reason	Associated Performance Standard
Administrate	Project vessels will comply with the BHP APU IMS Management Procedure.	Accept	Controls based on legislative requirements must be accepted. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.4.1**
	Australian Ballast Water Management Requirements (as defined under the *Biosecurity Act 2015*): Project vessels will manage their ballast water using one of the approved ballast water management options, as outlined in the Australian Ballast Water Management Requirements.	Accept	Controls based on legislative requirements under the *Biosecurity Act 2015* must be accepted. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.4.2**
Substitute	Source project vessels based in Australia only.	Reject	Sourcing vessels from Australian waters may result in a slight reduction in the likelihood of introducing IMS to the operational area; however, it does not completely eliminate the risk of IMS introduction. The potential cost of implementing this control could be high, given the potential supply issues associated with only locally-sourcing project vessels.	-
Eliminate	Mandatory dry-dock cleaning of vessels and cleaning of immersible equipment before entry to the operational area to reduce risk of IMS introduction.	Reject	Substantial costs and would affect schedule, resulting in potential delays. Significant cost deemed grossly disproportionate to very low risk, given controls already in place.	-
Engineer	No ballast water exchange.	Reject	Ballast water exchange is critical for maintaining vessel stability.	-

ALARP Summary

The risk assessment and evaluation has identified a range of controls (Table 9-13) that when implemented are considered to manage the potential risks of introduced IMS to ALARP.

BHP considers the control measures described above are appropriate to reduce the risks of introduced IMS. Additional reasonable control measures were identified in Table 9-13 to further reduce impacts but rejected since the associated cost or sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

9.4.5 Demonstration of Acceptability

Given the adopted controls, the introduced IMS risk will be reduced to a tolerable level. Further opportunities to reduce the risk have been investigated in Table 9-13.

The adopted controls are considered good oil-field practice/industry best practice. No concerns or objections regarding introduced IMS risks have been raised by relevant stakeholders. The environmental risks meet the BHP environmental risk acceptability criteria (Section 7.3). The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). BHP has considered information contained in recovery plans and threat abatement plans (Section 10). BHP considers the risk to be managed to an acceptable level.

9.4.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Performance Standard	Measurement Criteria
No introduction of invasive marine species to Australian waters from the petroleum activity	**PS 9.4.1** Project vessels will manage their ballast water using one of the approved ballast water management options, as outlined in the Australian Ballast Water Management Requirements.	Documentation of ballast water management in accordance with the Australian Ballast Water Management Requirements.
	PS 9.4.2 **BHP APU IMS Management Procedure:** An IMS risk assessment will be completed for the project vessels and associated immersible equipment (such as ROV) before mobilisation to operational area.	Completed IMS risk assessment for each project vessel and associated immersible equipment before entering the operational area, showing IMS risk is low

9.5 Minor Spills/Leaks of Chemicals and Hydraulic Fluid

9.5.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Hazard	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Minor spills and leaks of chemicals and hydraulic fluid	Minor spills and leaks of chemicals and hydrocarbons on the vessel deck reaching the marine environment and from subsea equipment (such as ROVs).	Localised and temporary reduction in water quality adjacent to the discharge and minor adverse toxicity effects to surface and water column biota.	10	0.3	3	Type A Lower Order Risk	Tolerable
	Leak or loss HyDex from a downline leak fails or failure		10	0.3	3	Type A Lower Order Risk	Tolerable
	Release of water and dye from decontamination runs #3 and #4		10	0.3	3	Type A Lower Order Risk	Tolerable

9.5.2 Source of Hazard

Minor spills and leaks of chemicals and hydrocarbons

During the petroleum activity, the handling, use and storage of chemicals and hydrocarbons on the project vessels will be required, which may include:

- fuel and refined oil
- hydraulic fluids and oils
- greases and lube oils
- cleaning and cooling agents.

Spills and leaks of chemicals and hydraulic fluid on the decks of the project vessels could occur as a result of spillage during handling, inadequate bunding and storage, inadequate method of securing or tank and pipework failure, leaks from equipment or rupture or failure of hoses. Chemical storage areas are typically set up with effective primary and secondary bunding to contain any deck spills; however, hydraulic hoses may be located outside of bunded or deck areas. Typically, volumes of spills and leaks on vessels are small (less than 20 L).

Leaks or rupture of ROV hydraulic hoses may occur through equipment malfunction or line pinches, which would lead to the loss of small volumes of hydraulic fluids directly to the marine environment. Accidental release of hydraulic fluids volumes from ROV failure are expected to be low (less than 20 L).

Leak or loss HyDex

HyDex is used for hydrocarbon cleaning of the GEP in Run #2 of the mercury removal activities (refer Section 4.7). As shown in Section 4.7.2, HyDex is run from offshore to onshore. This requires HyDex to be pumped from a project vessel via a downline to the PLEM.

The worst case credible release of HyDex is in the event that the downline fails and HyDex pumping continues for a period of 5 minutes before it is noticed, and pumping equipment is shutdown. Given that pressure monitored it is not credible that the release goes unnoticed for a period greater than 5 minutes. A maximum volume of 3.2 m^3 of HyDex may be released to the marine environment based on the HyDex pumping rate for a period of 5 minutes.

Leak or loss MerCure

MerCure is pumped from onshore to offshore and back again (refer to runs #3 and #4 in Section 4.7.2). There are no credible releases of MerCure at the PLEM end of the GEP. The following releases were investigated:

1. Loss of communication between offshore and onshore, resulting in the runs #3 or #4 continuing once they have reached the pig receiver at the PLEM end of the GEP.

Once the pig runs have reached the PLEM end of the GEP then it is communicated to onshore to stop pumping. In the event that communication is lost between the project vessel and the onshore pumping location then pumping is stopped completely. Should pumping continue for a short period and releases contents behind the first pig, this would a water pig with a fluorescein dye (as described below). It is not credible that subsequent pigs be released as pumping would have stopped completely.

2. The failure of the pig receiver

The pig runs are monitored at pig receiver at the PLEM end of the GEP from the offshore project vessel. The pig receiver is observed by the ROV and in the event that the dyed water was observed then it would be communicated to onshore to stop pumping the pig train.

3. A release along the GEP

The GEP is displaced with nitrogen and at 15 bar. GEP corrosion is not considered an integrity concern at present as the pipeline carried dry / treated export quality gas over the life of field operations and external cathodic protection measurements confirm there is approximately 100 years of design life remaining in the cathodic protection system. In addition run #1 in Section 4.7.2 is undertaken to verify that the GEP is piggable.

Release of water and fluorescein dye

As described in above, in the event that there is a failure in communications or failure of the pig receiver then it is possible that the contents of the first pig in runs #3 or #4 are released to the marine environment. The dye within the water is a fluorescein liquid, commonly used within the offshore industry for leak testing.

9.5.3 Environmental Impact Assessment

Given the minor quantities involved:

- less than 20 L hydraulic fluid
- less than 3.2 m^3 of HyDex
- less than 3.2 m^3 of fluorescein dye with water

The accidental discharge of chemicals and hydraulics has the potential to result in a localised reduction in water quality and a minor potential for toxicity impacts to plankton and fish populations (surface and water column biota). Large, more mobile fauna are likely to be transient within the operational area and toxic impacts are unlikely to occur to these species. The potential impacts would most likely be highly localised and restricted to the immediate area in the footprint of the release.

Hydraulic oils behave similarly to marine diesel when spilled to the marine environment. These are medium oils of light to moderate viscosity. They have a relatively rapid spreading rate and will dissipate quickly in ocean conditions. Any impact is temporary and minor, and relate to very local plankton and fish populations (surface and water column biota). Impact will decrease rapidly as the release dilutes and disperses in the marine environment.

Fluorescein dyes are commonly used within the offshore industry for leak detection and are of low toxicity. Any impact is temporary and minor, and relate to very local plankton and fish populations (surface and water column biota). Impact will decrease rapidly as the release dilutes and disperses in the marine environment.

Whilst HyDex is toxic in the marine environment the volume accidently released is relatively minor. Given the minor volume any impact is temporary and minor, and relate to very local plankton and fish populations (surface and water column biota). Impact will decrease rapidly as the release dilutes and disperses in the marine environment.

Species Recovery Plans and Threat Abatement Plans

BHP has considered information contained in relevant recovery plans for marine fauna that identify marine pollution as a threat (Section 10). This includes the objectives and actions with the Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017), which relate to marine pollution.

9.5.4 Demonstration of As Low As Reasonably Practicable

The ALARP process for the environmental aspect is summarised in Table 9-14. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 9-14: Minor Spills and Leaks of Chemicals and Hydraulic Fluid – As Low As Reasonably Practicable Assessment Summary

Function	Controls	Accept/ Reject	Reason	Performance Standard
Administrate	Project vessels have an approved SOPEP (as appropriate to vessel class) in accordance with Marine Order 91 (marine pollution prevention – oil)	Accept	Controls based on legislative requirements must be accepted. The SOPEP contains plans in case of an oil spill to prevent spills reaching the marine environment, as appropriate to vessel class. Environmental benefit outweighs minor costs in implementing and testing the vessel SOPEP, which contains plans to prevent spills reaching the marine environment.	**PS 9.5.1**
	BHP chemical selection process (Section 4.11).	Accept	Aids in the process of chemical management that reduces the impact of chemical discharge to the marine environment. Only environmentally acceptable and ALARP products, as determined by the BHP chemical selection process (Section 4.11), are used.	**PS 9.5.2**
	Critical hoses outside bunded areas (such as ROVs) are inspected and maintained as part of PMS.	Accept	Maintenance and inspection completed as scheduled on PMS reduces the risk of leaks to the marine environment.	**PS 9.5.3**

Function	Controls	Accept/ Reject	Reason	Performance Standard
			Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	
	Pressure/leak testing the HyDex downpipe to manufactures standard: a) at the offshore location b) prior to going offshore	Accept	Pressure/leak testing the HyDex downpipe to manufactures standard ensures the downpipes of sufficient integrity prior to use reducing the chance of failure during operation. Minor cost involved in testing. Control is feasible, standard practice with minimal cost. Benefits outweigh any cost sacrifice.	**PS 9.5.4**
	Communications are established between the offshore project vessel and the onshore location prior to each mercury removal scope pig runs taking place.	Accept	Establishing communications between the offshore project vessel and the onshore location prior to each mercury removal pig runs taking place ensures that once the pig run reaches the pig receiver the offshore project vessel can communicate to onshore to stop pumping. This will ensure that the likelihood of leaks at the PLEM are reduced. Control is feasible, standard practice with minimal cost involved. Benefits outweigh any cost sacrifice.	**PS 9.5.5**
Substitute	Do not use, or use and alternative to HyDex and/or MerCure	Reject	Atteris (Atteris, 2019b) and NGI (NGI, 2021) identified and ranked methods and technologies that could remove or reduce mercury from the GEP in the marine environment. Based on the outcomes, the use of MerCure and HyDex use were selected as the best means for achieving an acceptable level of mercury decontamination in the GEP. Other means of removal or reduction (e.g. use of other decontamination solutions and methods) have been investigated but offer inferior decontamination potential or have been discounted during the CEIA (Section 3). As described in Section 4.7, a MerCure pig has been developed to remove mercury from the GEP. BHP has conducted extensive work to design mercury removal activities for the highest practicable level of mercury removal (Qa3, 2021b, Qa3, 2021b). Trials were performed at increasing contact time intervals to determine the most appropriate pig train length for the *in situ* decontamination of the GEP. The selected mercury removal activity and pigging program (Section 4.7.2) is designed to remove the mercury to an acceptable level (defined in Section 8.7.5).	-

Function	Controls	Accept/ Reject	Reason	Performance Standard
			BHP have selected the most appropriate chemical solution and pigging runs to achieve an acceptable level of mercury removal. Other options were determined impracticable or do not achieve the required outcome.	
Engineer	Below-deck storage of all hydrocarbons and chemicals.	Reject	Reduces the likelihood of contaminated deck drainage water being discharged to the marine environment.	-
	A reduction in the volumes of chemicals and hydrocarbons stored onboard the vessel.	Reject	Reduces the likelihood of a deck spill from entering the marine environment. The consequence is unchanged.	-

ALARP Summary

The risk assessment and evaluation has identified a range of controls (Table 9-14) that when implemented are considered to manage the potential risks of minor spills and leaks of chemicals and hydraulic fluids to ALARP.

BHP considers the control measures described above are appropriate to reduce the risks of minor spills / leaks of chemicals and hydraulic fluids. Additional reasonable control measures were identified in Table 9-14 to further reduce impacts, but rejected since the associated cost or sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

9.5.5 Demonstration of Acceptability

Given the adopted controls, the risk of minor spills and leaks of chemicals and hydraulic fluids will be reduce to a tolerable level. Further opportunities to reduce the risk have been investigated in Table 9-14.

The adopted controls are considered good oil-field practice/industry best practice. No concerns or objections regarding introduced risk of minor spills and leaks of chemicals and hydraulic fluids have been raised by relevant stakeholders. The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). BHP has considered information contained in recovery plans and threat abatement plans (Section 10). The environmental risks meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the risk to be managed to an acceptable level.

9.5.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Performance Outcome	Performance Standard	Measurement Criteria
No unplanned release of hazardous chemicals or minor hydrocarbon volumes to the marine environment	**PS 9.5.1** Project vessels have a SOPEP (as appropriate to vessel class) in compliance with Marine Order 91 (marine pollution prevention – oil)	Approved SOPEP is available onboard project vessels, as appropriate to vessel class.
	PS 9.5.2 Chemicals selected have ALARP assessment completed and are determined acceptable in accordance with the BHP APU Hazardous Materials Acquisition Environmental Supplement Procedure (AO-HSE S-0002) (Section 4.11).	ALARP assessment documentation shows chemicals requiring further assessment are ALARP and acceptable and selected in accordance with the BHP APU Hazardous Materials Acquisition Environmental Supplement Procedure (AO-HSE S-0002) (Section 4.11).
	PS 9.5.3 Critical hoses outside bunded areas (such as ROVs) are identified and regularly inspected, maintained and replaced as part of the PMS.	Records in the PMS demonstrate inspections of critical hoses comply with equipment specifications.

Performance Outcome	Performance Standard	Measurement Criteria
	PS 9.5.4 Pressure/leak testing the HyDex downpipe occurs to ensure downpipe integrity at the following points: a) Prior to going offshore b) Offshore prior to HyDex use	Downpipe records show the pressure/leak testing has occurred at the following points: a) Prior to going offshore b) Offshore prior to HyDex use
	PS 9.5.5 Communications are established between the offshore project vessel and the onshore location prior to each mercury removal pig run taking place.	Records show that communications have been established between the offshore project vessel and the onshore location prior to mercury removal scope pig runs taking place. All communications are stopped on loss of communication

9.6 Loss of Solid Hazardous and Non-Hazardous Wastes (including Dropped Objects)

9.6.1 Summary of Risk Assessment and Evaluation

Aspect	Source of Risk	Potential Impact	Severity Factor	Likelihood Factor	Residual Risk	Decision Context	Acceptability
Loss of solid hazardous and non-hazardous wastes	Loss of waste (hazardous and non-hazardous) generated during vessel activities.	Localised decline in water quality, toxic effects to marine fauna and potential injury to fauna.	10	0.3	3	Type A Low Order Impact	Tolerable
	Loss of GEP section (contingent GEP removal)	Disturbance of seabed habitat and associated communities.	10	0.3	3	Type A Low Order Impact	Tolerable

9.6.2 Source of Hazard

Solid Wastes

Project vessels produce a variety of solid wastes, including domestic and industrial wastes. These include aluminium cans, bottles, paper and cardboard, scrap steel, chemical containers, batteries and medical wastes.

Waste is segregated on-board the project vessels and stored in designated skips and waste containers, in accordance with the on-board waste management plan. Wastes are segregated into the categories of:

- non-hazardous waste (or general waste)
- hazardous waste
- recyclables (further segregation is conducted in line with practices at existing BHP operations in the region).

There is the potential for solid wastes to be lost overboard to the marine environment, particularly during adverse weather events and back loading activities and due to incorrect waste storage. Waste items lost overboard are typically small wind-blown items such as plastic containers and cardboard.

Dropped Objects

There is the potential for objects to be dropped overboard from the project vessels to the marine environment. Small items dropped may include personal protective gear (such as glasses, gloves, hard hats) and small tools (such as spanners). During the contingent removal of the GEP there is the potential for larger dropped objects to occur (such as a section of cut pipeline) as a result of human error or failure of lifting equipment during the recovery. The size of the section of the GEP cut section would be 36 – 48 m in length.

If a section of the GEP is dropped during the recovery activities, it will be located and recovered; therefore, these impacts will be temporary in nature.

9.6.3 Environmental Impact Assessment

The potential impacts of solid wastes accidentally discharged to the marine environment include pollution and contamination of the marine environment. Marine fauna may interact with the lost waste, resulting in entanglement or ingestion, leading to injury and death of individual animals. Migratory and threatened species may transit through the operational area, including cetaceans, seabirds, marine turtles and whale sharks. Loss of solid waste to the marine environment is highly unlikely to have a significant environmental impact to marine fauna, based on the types and frequency of wastes that could be lost and the transient nature of the marine fauna. Impacts are anticipated to be temporary and minor.

In the unlikely event of loss of a cut GEP section to the marine environment, potential impacts would be limited to localised physical impacts on benthic communities over the footprint of the lost subsea infrastructure. The subsea infrastructure would subsequently be recovered. Impacts will also be temporary in nature. Physical impacts from dropped infrastructure are anticipated to be localised and minor, and be associated with sediment burrowing infauna and surface epifauna invertebrates, particularly filter feeders, inhabiting the seabed directly over the infrastructure footprint. Any elevated turbidity would be very localised and temporary and is therefore not expected to have any significant impact to environment receptors, such as filter feeders.

The operational area overlaps the Ancient Coastline at 125 m depth contour and, therefore, seabed disturbance from dropped objects may directly disturb a very small, localised area of the KEF. No lasting effects are anticipated.

Species Recovery Plans and Threat Abatement Plans

BHP has considered information contained in relevant recovery plans advice for marine fauna that identify marine debris as a threat (Section 10). This includes the objectives and actions within the Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017) and Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (Commonwealth of Australia, 2018), which relate to marine debris.

9.6.4 Demonstration of As Low As Reasonably Practicable

The ALARP process for the environmental aspect is summarised in Table 9-15. This process was completed as outlined in Section 7.1.1 and included consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was rejected.

Table 9-15: Loss of Solid Hazardous and Non-Hazardous Wastes (including Dropped Objects) – As Low As Reasonably Practicable Assessment Summary

Hierarchy of Control	Control Measure	Accept/ Reject	Reason	Performance Standard
Administrate	Marine Order 95 – marine pollution prevention – garbage (as appropriate to vessel class) prescribes matters necessary to give effect to Annex V of MARPOL, which prohibits the discharge of all garbage into the sea, except as provided otherwise, and requires vessels have a garbage management plan.	Accept	Controls based on legislative requirements must be accepted. Requires vessels have a garbage management plan. Securely segregating and isolating the hazardous and non-hazardous waste in accordance with Marine Order 95 will reduce the likelihood of wastes being lost to the marine environment, reducing potential impacts to marine fauna.	**PS 9.6.1**
	Lost waste and dropped objects will be recovered, where safe and practicable.	Accept	Requires dropped objects to be recovered (where safe and practicable to do so). There are minor personnel and vessel costs to plan and undertake recovery if safe and practicable to do so. Environmental benefit outweighs cost sacrifice.	**PS 9.6.2**
	Vessel lifting procedures.	Accept	Reduces the likelihood of an unplanned release. Lifting procedures will ensure lifts are performed in a safe manner and reduce risk of dropped subsea infrastructure. There are minor administrative costs in following the procedure. Environmental benefit outweighs cost sacrifice.	**PS 9.6.3**
Eliminate	BHP chemical selection process (Section 4.11).	Accept	Aids in the process of chemical management that reduces the impact of chemical discharge to the marine environment. Only environmentally acceptable products, as determined by the BHP chemical selection process (Section 4.11), are used.	**PS 9.6.4**
	Eliminate use of vessels.	Reject	The use of vessels is required to conduct the petroleum activity. Control is not feasible.	-
	Immediate removal of solid waste from the operational area.	Reject	Reduces the risk release of non-hazardous solids to the marine environment. However, substantial additional cost through fuel cost and personnel time. The cost is considered grossly disproportionate to the benefit that may be gained.	-
Engineering	Removal of GEP through s-lay reeling.	Reject	As described in Section 4.8, the information required to determine if the S-lay method can be used will not available until after the mercury cleaning and decontaminations pigging scope (Section 4.7) has been completed. Hence, the subsea cut and recovery option is the default method. Control is not currently feasible.	-

ALARP Summary

The risk assessment and evaluation has identified a range of controls (Table 9-15) that when implemented are considered to manage the potential risks loss of loss of solid hazardous and non-hazardous wastes (including dropped objects) to ALARP.

BHP considers the control measures described above are appropriate to reduce the risks of loss of solid hazardous and non-hazardous wastes (including dropped objects). Additional reasonable control measures were identified in Table 9-15 to further reduce impacts, but rejected since the associated cost or sacrifice was grossly disproportionate to any benefit. The impacts are therefore considered reduced to ALARP.

9.6.5 Demonstration of Acceptability

Given the adopted controls, the risk of loss of solid hazardous and non-hazardous wastes (including dropped objects) will be reduced to a tolerable level. Further opportunities to reduce the risk of loss of solid hazardous and non-hazardous wastes (including dropped objects) to the marine environment have been investigated in Table 9-15.

The adopted controls are considered good oil-field practice/industry best practice. No concerns or objections regarding the loss of solid hazardous and non-hazardous wastes (including dropped objects) to the marine environment have been raised by relevant stakeholders. The impact is not inconsistent with the principles of ESD (as defined under the EPBC Act). BHP has considered information contained in recovery plans and threat abatement plans (Section 10). The environmental risks meet the BHP environmental risk acceptability criteria (Section 7.3). BHP considers the risk to be managed to an acceptable level.

9.6.6 Environmental Performance Outcome, Performance Standards and Measurement Criteria

Environmental Performance Outcome	Environmental Performance Standard	Measurement Criteria
No unplanned releases of solid hazardous or non-hazardous waste to the marine environment	**PS 9.6.1** Project vessels comply with measures outlined in Marine Order 95 (marine pollution prevention – garbage) as required by vessel class: • Vessel(s) will have a Garbage Management Plan in place which outlines procedures for handling storing, processing and disposing of garbage.	Audit and inspection records show waste is managed in accordance with Marine Order 95.
	PS 9.6.2 Lost waste/dropped objects will be recovered, where safe and practicable.	Fate of dropped objects detailed in incident documents.
	PS 9.6.3 Lifting Operations Standard (PET-HSE00-HX-STD-00001) details processes to reduce risk of dropped objects, including: • competency of persons performing lift • planning and preparation process for performing lifts. • heavy-lift procedures • preventative maintenance on cranes.	Lifting operations have been performed in accordance with Lifting Operations Standard (PET-HSE00-HX-STD-00001).
	PS 9.6.4 Chemicals selected have ALARP assessment completed and are determined acceptable in accordance with the BHP APU Hazardous Materials Acquisition Environmental Supplement Procedure (AO-HSE S-0002) (Section 4.11).	ALARP assessment documentation shows chemicals requiring further assessment are ALARP and acceptable and selected in accordance with the BHP APU Hazardous Materials Acquisition Environmental Supplement Procedure (AO-HSE S-0002) (Section 4.11).

10 Recovery Plan and Threat Abatement Plan Assessment

This section provides an assessment to demonstrate that the petroleum activity are not inconsistent with any relevant recovery plans or threat abatement plans.

Relevant recovery plans and threat abatement plans to the petroleum activity and the receiving environment are:

- Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017)
- Conservation Management Plan for the Blue Whale 2015–2025 (Commonwealth of Australia, 2015a)
- Sawfish and River Shark Multispecies Recovery Plan (Commonwealth of Australia, 2015b)
- Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans 2018 (Commonwealth of Australia, 2018).
- Conservation Management Plan for the Southern Right Whale 2011 to 2021 (2012)
- Whale shark management with particular reference to Ningaloo Marine Park, Wildlife Management Program no. 57 (DPAW, 2013)
- National Recovery Plan for threatened albatrosses and giant petrels 2011 to 2016 (DSEWPC, 2011)
- Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) (Commonwealth of Australia, 2014)
- Recovery Plan for the White Shark (*Carcharodon carcharias*) (Commonwealth of Australia, 2013)

Objectives and relevant actions from the above plans have been identified in Table 10-1. The table includes an assessment on whether the petroleum activity, including resulting impacts and risks identified in Sections 8 and 9 are inconsistent with those objectives and actions.

Table 10-1: Assessment of the Petroleum activity' Consistency with Objectives and Actions in Relevant Recovery Plans and Threat Abatement Plans

Recovery plans and threat abatement plans	Relevant Action Areas/Objectives	Assessment of consistency
Recovery Plan for Marine Turtles in Australia 2017–2027	Action Area A3: Reduce the impacts from marine debris Understand the threat posed to green turtle NWS stock by marine debris. Determine the extent to which marine debris is impacting Western Australian loggerhead turtles.	**Not inconsistent** Section 9.6 considers the impacts of unplanned releases of solid hazardous and non-hazardous wastes and considers the potential risks to marine turtles. Appropriate controls have been considered and adopted to reduce the risk of unplanned releases of solid hazardous and non-hazardous wastes to ALARP and acceptable levels. Section 8.7 considers the impacts of the release of plastics and marine debris. Whilst there is a release of plastics (over hundreds of years, refer Section 8.7.2) from the GEP, the volumes relatively low quantity (refer to Table 8-15) and plastics make up 0.3% of the overall GEP by weight. The release plastics will be predominately buried within the seabed as the GEP degrades. The contribution of microplastics from the GEP breakdown alone is not considered a volume that would result in an impact greater minor to a small number of marine fauna. Impacts will not be at the population level. Whilst the microplastics entering the marine environment from the GEP are unlikely to result in an impact greater than minor, it is recognised that they do contribute to the overall marine microplastics within the ocean, which cause a range of impacts to marine fauna as they are absorbed by plants and animals and accumulate in the food chain. However the volumes likely to be released from the GEP breakdown are considered to be such a low risk that the objective of the Recovery Plan is not compromised. This is taking into account that the majority of released plastics will be buried below the regional scour depth. Whilst there is a release of plastics, the CEIA (Section 3) demonstrates the abandonment *in situ* alternative will result in equal or better environmental outcomes compared to full removal, which is required by NOPSEMA's *Section 572 Maintenance and Removal of Property* policy (NOPSEMA, 2020b). The release of plastics is therefore justified when taking into account the impacts and risks from other alternative decommissioning strategies

Recovery plans and threat abatement plans	Relevant Action Areas/Objectives	Assessment of consistency
	Action Area A4: Minimise chemical and terrestrial discharge Ensure spill risk strategies and response programs adequately include management for marine turtles and their habitats, particularly in reference to ‘slow to recover habitats’, such as nesting habitat, seagrass meadows or coral reefs.	**Not inconsistent** Sections 8.5 and 8.7 address the impacts from routine discharges to marine turtles. Section 9.2 and 9.5 considers the risks from accidental release of chemicals and hydrocarbons to marine turtles. Spill risk strategies and response program include management measures for turtles and their nesting habitats. Appropriate controls have been considered and adopted to reduce the impacts and risks of planned and unplanned releases of chemicals to the marine environment to ALARP and acceptable levels.
	Action Area A8: Minimise light pollution Artificial light within or adjacent to habitat critical to the survival of marine turtles will be managed such that marine turtles are not displaced from these habitats.	**Not inconsistent** Section 8.2 considers the impacts from project vessel lighting on marine turtles. Given the operational area location, project vessel lighting is not anticipated to displace marine turtles from critical habitats. Light emissions may cause localised and temporary behavioural disturbance to transient individual marine turtles. The level of disturbance is not considered to result in displacement of adult turtles from critical habitat. Appropriate controls have been considered and adopted to reduce the impacts of light emissions to ALARP and acceptable levels.
Conservation Management Plan for the Blue Whale 2015–2025	Action Area A.2: Assessing and addressing anthropogenic noise Assessing the effect of anthropogenic noise on blue whale behaviour	**Not inconsistent** Section 8.3 considers the potential impacts to pygmy blue whales. Noise generated by the petroleum activity is anticipated to result in localised, minor and temporary behavioural disturbance to individuals only. The operational area overlaps a pygmy blue whale distribution BIA. Controls have been evaluated (Section 8.3.4) as appropriate to be manage noise such that any blue whale continues to utilise the area without injury. Appropriate controls have been considered and adopted to reduce the impacts of noise emissions to ALARP and acceptable levels.
	Action Area A.3: Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to utilise the area without injury	**Not inconsistent** Section 8.3 considers the potential impacts to pygmy blue whales. Noise generated by the petroleum activity is anticipated to result in localised, minor and temporary behavioural disturbance to individuals only. The operational area overlaps a pygmy blue whale distribution BIA. Controls have been evaluated (Section 8.3.4) as appropriate to be manage noise such that any blue whale continues to utilise the area without injury. Appropriate controls have been considered and adopted to reduce the impacts of noise emissions to ALARP and acceptable levels.

Recovery plans and threat abatement plans	Relevant Action Areas/Objectives	Assessment of consistency
	Action Area A.4: Minimising vessel collisions Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures are implemented.	**Not inconsistent** Section 9.3 considers the potential impacts to pygmy blue whales. Vessel collisions with pygmy blue whales are unlikely to occur, given the very slow vessel speeds within the confined operational area. Appropriate controls including adherence to EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans have been adopted to reduce the risks of marine fauna interactions to ALARP and acceptable levels.
	Action Area B.3: Describing spatial and temporal distribution and defining biologically important habitat Identify migratory pathways between breeding and feeding grounds. Assess timing and residency within BIAs.	**Not inconsistent** Appendix D, Section 2.5 presents details of pygmy blue whales within BIAs. The section includes a review of literature to identify migratory pathways between breeding and feeding grounds.
Sawfish and River Shark Multispecies Recovery Plan	Objective 5: Reduce and, where possible, eliminate adverse impacts of habitat degradation and modification on sawfish and river shark species Identify risks to important sawfish and river shark habitat and measures needed to reduce those risks.	**Not inconsistent** Section 8.6 considers the impact of seabed disturbance on sawfish and river shark species. Given the low level of seabed disturbance from the petroleum activity and the lack of suitable habitat for sawfish and river shark within the operational area, impacts are not anticipated. Section 9.2 considers the impact of a hydrocarbon release on a variety of habitats, including sawfish and river shark habitat within the EMBA. Appropriate controls have been considered and adopted to reduce the risk of unplanned hydrocarbon releases to ALARP and acceptable levels.
	Objective 6: Reduce and, where possible, eliminate any adverse impacts of marine debris on sawfish and river shark species.	**Not inconsistent** Section 9.6 considers the impacts of unplanned releases of solid hazardous and non-hazardous wastes and considers the potential risks to sawfish and river shark species. Appropriate controls have been considered and adopted to reduce the risk of unplanned releases of solid hazardous and non-hazardous wastes to ALARP and acceptable levels.

Recovery plans and threat abatement plans	Relevant Action Areas/Objectives	Assessment of consistency
Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans	Relevant Objectives: • contribute to long-term prevention of the incidence of marine debris • understand the scale of impacts from marine plastics and microplastics on key species, ecological communities and locations • remove existing marine debris • monitor the quantities, origins, types and hazardous contaminants of marine debris, and assess the effectiveness of management arrangements for reducing marine debris.	**Not inconsistent** Section 9.6 considers the impacts of unplanned releases of solid hazardous and non-hazardous wastes and considers the potential risks to marine fauna. Appropriate controls have been considered and adopted to reduce the risk of unplanned releases of solid hazardous and non-hazardous wastes to ALARP and acceptable levels. Section 8.7 considers the impacts of the release of plastics and marine debris. Whilst there is a release of plastics (over hundreds of years, refer Section 8.7.2) from the GEP, the volumes relatively low quantity (refer to Table 8-15) and plastics make up 0.3% of the overall GEP by weight. The release plastics will be predominately buried within the seabed as the GEP degrades. The contribution of microplastics from the GEP breakdown alone is not considered a volume that would result in an impact greater minor to a small number of marine fauna. Impacts will not be at the population level. Whilst the microplastics entering the marine environment from the GEP are unlikely to result in an impact greater than minor, it is recognised that they do contribute to the overall marine microplastics within the ocean, which cause a range of impacts to marine fauna as they are absorbed by plants and animals and accumulate in the food chain. However the volumes likely to be released from the GEP breakdown are considered to be such a low risk that the objective of the Threat Abatement Plan is not compromised. This is taking into account that the majority of released plastics will be buried below the regional scour depth. The National Plastics Plan (DAWE 2021) recognises the issue of microplastics in our oceans and supporting global action at addressing marine plastic debris and the plan includes an action to continue to implement the Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans. Whilst there is a release of plastics the CEIA (Section 3), demonstrates the abandonment *in situ* alternative will result in equal or better environmental outcomes compared to full removal, which is required by NOPSEMA's *Section 572 Maintenance and Removal of Property* policy (NOPSEMA, 2020b). The release of plastics is therefore justified when taking into account the impacts and risks from other alternative decommissioning strategies.

Recovery plans and threat abatement plans	Relevant Action Areas/Objectives	Assessment of consistency
Conservation Management Plan for the Southern Right Whale 2011 to 2021 (2012)	Action Area A.2: Assessing and addressing anthropogenic noise (shipping, industrial and seismic).	**Not inconsistent** Section 8.3 considers the potential impacts to southern right whales. Noise generated by the petroleum activity is anticipated to result in localised, minor and temporary behavioural disturbance to individuals only. Appropriate controls have been considered and adopted to reduce the impacts of noise emissions to ALARP and acceptable levels.
	Action Area A.5: Addressing vessel collisions	**Not inconsistent** Section 9.3 considers the potential impacts to southern right whales. Vessel collisions with southern right whales are unlikely to occur, given the very slow vessel speeds within the confined operational area. Appropriate controls including adherence to EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans have been adopted to reduce the risks of marine fauna interactions to ALARP and acceptable levels.
Whale shark management with particular reference to Ningaloo Marine Park, Wildlife Management Program no. 57	None. However, identifies boat strike as a risk to whale shark	**Not inconsistent** Section 9.3 considers the potential impacts to whale shark. Vessel collisions with whale shark are unlikely to occur, given the very slow vessel speeds within the confined operational area.
National recovery plan for threatened albatrosses and giant petrels 2011 to 2016	Marine-based threats to the survival and breeding success of albatrosses and giant petrels foraging in waters under Australian jurisdiction are quantified and reduced	**Not inconsistent** Section 8.2 considers the impacts from project vessel lighting on seabirds. Any collision between the birds and project vessels as a result of the attraction are highly unlikely due to the lack of aggregation areas for birds over the operational area and slow-moving project vessels.
Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*)	Objective 7: Improve understanding of the threat of pollution and disease to the grey nurse shark	**Not inconsistent** Section 9.2 and 9.5 considers the risks from accidental release of chemicals and hydrocarbons to grey nurse shark. Appropriate controls have been considered and adopted to reduce the risk of unplanned hydrocarbon release to ALARP and acceptable levels.
Recovery Plan for the White Shark (*Carcharodon carcharias*)	Objective 7: Continue to identify and protect habitat critical to the survival of the white shark and minimise the impact of threatening processes within these areas	**Not inconsistent** Section 9.2 and 9.5 considers the risks from accidental release of chemicals and hydrocarbons to grey nurse shark. Appropriate controls have been considered and adopted to reduce the risk of unplanned hydrocarbon release to ALARP and acceptable levels.

11 Hydrocarbon Spill Response

As required by the Environment Regulations, BHP has prepared the *Griffin Decommissioning Oil Pollution Emergency Plan (OPEP) (GV-HSE-ER-0011)* (refer to Appendix E). The OPEP is the primary reference document and key control measure to be implemented in the event of an oil spill during the petroleum activities. It has been developed as a formal means of establishing the processes and procedures to ensure BHP maintains a constant vigilance and readiness to prevent and, where required, respond to, and effectively manage oil spill incidents that may occur. The OPEP has been developed to comply with the Environment Regulations.

This section of the EP provides a description of the proposed oil spill response strategies based on the worst-case spill scenarios. The response strategies presented are based on the outcome of a Strategic Net Environmental Benefit Analysis (NEBA). For each of the proposed response strategies, their benefits and constraints are presented, along with an assessment of the associated risks and impacts that may occur from their implementation.

11.1 Spill Response Levels

To establish oil spill response arrangements that can be scaled up or down depending on the nature of the incident by integrating with other local, regional, national and industry plans and resources, BHP uses a tiered response approach. The criteria for determining the hydrocarbon spill 'levels' for the purpose of the spill response have been adopted from the National Plan for Maritime Environmental Emergencies (AMSA, 2020) and are described in Table 11-1. The 'level-rating' for oil spill response provides a magnitude description of the potential impact and the effort to support oil spill response.

The 'Level' is determined by the relevant Commander, such as the Field Response Team (FRT) Commander (i.e. the Vessel Master) or by the Incident Management Team (IMT) Incident Commander.

Typically, Level 1 spill responses can be resourced using shipboard or port-located spill kits. Vessels are required to maintain a current SOPEP and appropriate spill kits, response capabilities and trained personnel. Likewise, designated ports and harbours are required to have at least Level 1 response capability on site.

For Level 2 spills, BHP maintains a broad set of spill response capabilities. BHP also has contracts and Memoranda of Understanding (MoUs) with national and international third-party spill response providers to ensure response capabilities can be engaged.

Table 11-1: Worst-Case Spill Scenarios for the Petroleum Activities and Incident Classification Used to Inform Spill Response

Level	Level Definition	Griffin GEP Decommissioning Activities Spill Scenarios
1	**An incident will have minor or limited impacts on the environment which can be controlled by the resources normally available onsite without the need to mobilise BHP IMT or other external resources.**	
	An incident: • occurs within a single jurisdiction • with simple IAP required • resourced from within one area • where environment would be isolated and/or natural recovery expected within weeks • wildlife impacts are limited to individual fauna • that has no immediate concern of shoreline impact • with a BHP Risk Matrix Consequence Level 1-2.	MDO spill from bunkering incident (37.5 m³ MDO)
2	**An incident will have substantial impacts to the environment and cannot be controlled by the use of onsite resources alone and required external resources and support to combat the situation.**	
	An incident: • occurs across multiple jurisdictions • with outline of the IAP required • that requires intra-state resources • with significant environmental impacts, recovery may take months, remediation required • with wildlife impacts to groups of fauna or threatened fauna • where shoreline impact is expected • with a BHP Risk Matrix Consequence Level 3+.	MDO spill from vessel collision (1,000 m³ MDO)
3	**An incident will have serious impacts to the environment and occurs across multiple/international jurisdictions and requires mobilisation of state, national or international resources and support to combat the situation.**	
	An incident: • occurs across multiple/international jurisdictions • with detailed IAP required • that requires national or international resources • with significant environmental area impacted, recovery may take months, remediation required • with wildlife impacts to large numbers of fauna • with a BHP Risk Matrix Consequence Level 4+.	N/A

11.2 Source of Risk

This EP has identified the worst-case and credible hydrocarbon spill scenarios as:

- Level 1: 37.5 m³ bunkering incident
- Level 2: fuel tank rupture from a vessel collision, resulting in a surface release of 1,000 m³ MDO (refer to Section 9.2).

11.3 Strategic Net Environment Benefit Analysis of Response Options

In the oil spill response planning process, BHP has adopted a comprehensive strategic NEBA methodology to select and justify the appropriate response strategy combinations for the credible and worst-case hydrocarbon spill scenario. A NEBA was conducted to select the potential oil spill response strategies in the event of a Level 2 hydrocarbon spill (Table 11-2). The focus of the NEBA was to understand the consequences of 'no action' and to select an oil spill response strategy that delivered a net environmental benefit using the OPEP Priorities.

The NEBA methodology used is described as follows:

- LIST the response strategies available.
- IDENTIFY the benefit, environmental impact and operational challenge of each response strategy.
- EVALUATE the viability of each response strategy in a particular credible scenario.
- FILTER the result to identify all the viable strategies for a particular credible scenario.
- FORMULATE options of different strategy combinations.
- COMPARE these options and select the preferred option of strategy combination.

From these results, the priority application ZONE of each strategy was identified in the preferred strategy combination by selecting the:

- primary response strategy, which has been confirmed to be used and should be applied as soon as possible
- secondary response strategy, which will be only applied if needed and practical
- nil response strategy, which is a non-preferred option, will not be used and does not identify a net environmental benefit.

In the event of an oil spill, an Operational NEBA will be performed to select spill response options that have a net environmental benefit. It is likely spill response will involve a combination of response options and will evolve over time as conditions change.

Table 11-2: Strategic Net Environmental Benefit Analysis of Response Option for Hydrocarbon Spills

RS #	Spill Response Strategy	Overview of Environmental Benefits	Associated Environmental Risks/Impacts	Operational Constraints	Apply Response		Primary or Secondary Response	Justification Note
RS1	Source Control – Vessel Control	Limits or prevents further discharge of hydrocarbons to the marine environment by halting the spill (for example, transferring fuel to another tank).	No significant impacts.	Health and safety considerations may delay implementation under certain circumstances (such as vapours).	Level 2 – MDO	Yes	Primary	Control at the vessel will always be attempted as the immediate primary response to halt further spill to marine environment.
RS2	Monitor and Evaluate	Constant monitoring and evaluation by surveillance is a mandatory strategy required for real-time decision-making during a spill event.	Risks/impacts from operations of monitoring vessels and aircraft (for example, emissions such as air, noise and liquid waste, marine fauna interaction, interference with other users).	Weather conditions may put constraints on visual observations (vessel and aerial). Vessel and aerial surveillance constrained to daylight hours. Stringent safety management requirements for aerial and marine operations. Potential coordination of multiple vessels/aircraft within limited area (simultaneous operations).	Level 2 – MDO	Yes	Primary	Surveillance activities ensure constant monitoring and evaluation of the spill.
RS3	Dispersant – Surface Application	Can remove oil from sea surface and dilute into water column, but no significant benefit to high-sensitivity receptors. Due to constraints – only a small proportion of diesel potentially treated (may be nil). Entrained diesel will break down faster and lowers impacts on sea surface fauna.	Discharge of dispersant into environment. Chemical added to environment when it is not likely to impact high or extreme environment receptors. Operation of aircraft and support vessel (efficacy testing).	Not applicable for MDO spills due to rapid dispersion and spreading.	Level 2 – MDO	No	-	Surface dispersant application is not recommended as a beneficial option for MDO, as it has a low additional benefit of increasing the dispersal rate of the spill while introducing more chemicals into the marine environment.
RS4	Marine Recovery	If effective, can physically remove floating surface oil from the water, thereby preventing shoreline impacts. Recovered oil may be reprocessed.	Operation of vessels (such as burn fuel, physical presence, discharges) for placing and moving booms. Equipment- and labour-intensive. Waste disposal of recovered hydrocarbons. Cleaning and disposal of contamination from boom.	Inefficient and impractical on thin hydrocarbons, such as MDO. Requires surface oil thick enough, typically Bonn Agreement Oil Appearance Code 4 (discontinuous true colour) and 5 (continuous true oil colour).	Level 2 – MDO	No	-	Not applicable for MDO spills due to rapid dispersion and spreading, therefore unlikely to encounter films great than 20 to 25 µm, making recovery via skimmers ineffective.
RS5	Shoreline Protection	Can deflect diesel from shoreline receptors for capture and recovery or dilute into water column.	Physical disturbance to intertidal and shoreline habitats from operating vessels and booms (such as anchoring booms and vessels). Defective booms. Operation of vessel (such as burn fuel, physical presence, discharges). Cleaning of contaminated booms and waste disposal of recovered hydrocarbons and water. Waste disposal of recovered hydrocarbons.	Wind, surface currents and tidal ranges are key constraints for operation of shoreline booms	Level 2 – MDO	Yes	Secondary	Modelling shows low probability of contact with shorelines and low volumes of shoreline accumulation. This strategy is considered to be a secondary response strategy where it is safe and practical to implement and where priority receptors are at risk of impact from MDO.
RS6	Mechanical Dispersion	May be applicable for the localised entrainment of surface oil but is not considered to have a significant effect on removing oil from the surface.	May temporarily increase the concentration of entrained and dissolved oil in the vicinity of submerged shallow water receptors (such as corals, seagrass and macroalgae). Operation of vessel (such as burn fuel, physical presence, discharges).	Offshore vessels are designed not to cavitate, so not efficient at breaking up hydrocarbon films. Small particle size required otherwise material resurfaces. Wind speeds above 20 knots provide natural dispersion, making this method redundant. Cannot be performed where there are high concentrations of vapour.	Level 2 – MDO	No	-	Mechanical dispersion uses vessels with propellers that can cavitate. The turbulence created helps break up surface slicks, dispersing hydrocarbons into the column where biodegradation is enhanced due to smaller droplet sizes. This strategy requires vessels on site with engines that cavitate. Wave action provides some effect. Leaving MDO on the surface may be more advantageous, given its propensity to evaporate.

RS #	Spill Response Strategy	Overview of Environmental Benefits	Associated Environmental Risks/Impacts	Operational Constraints	Apply Response		Primary or Secondary Response	Justification Note
RS7	*In situ* Burning	Removes oil from environment.	Operation of a four-vessel spread (two boom sweep, one igniter, one observer). Particulates (smoke) in air with associated health risks. Incomplete combustion may produce toxic chemicals.	Need to build a thick film for ignition (5 to 10 mm). Wind is a key constraint, calm seas and ideal conditions are considered necessary for booming operations to get a thick film thickness and safe ignition. Availability of fire boom.	Level 2 – MDO	No	-	Not applicable as insufficient surface slick thickness predicted. The experience and expertise are not readily available in Australia.
RS8	Shoreline Clean-Up	Can reduce stranded oil on shorelines and reduce remobilisation of oil.	Physical disturbance to shoreline habitats from staging areas and clean-up activities. Contamination via spreading oil beyond shorelines. Labour-intensive. Logistics. Waste management.	Shoreline characteristics (substrate type, beach type, exposure to wave action, biological, social, heritage or economic resources, amount of hydrocarbon present) and access requirements.	Level 2 – MDO	Yes	Secondary	Modelling shows low probability of contact with shorelines and low volumes of shoreline accumulation. This strategy is considered to be a secondary response strategy where it is safe and practical to implement and where priority receptors are at risk of impact from MDO.
RS9	Natural Recovery	No additional impacts associated with response activities.	No additional impacts.	No constraints.	Level 2 – MDO	Yes	Primary	Makes use of the natural degradation and weathering process to break down and remove surface oil and stranded hydrocarbons. Effectively, this response strategy means no direct action other than monitor and evaluate spill trajectory and rate of habitat/community recovery.
RS10	Environmental Monitoring	Primary tool for determining the extent, severity and persistence of environmental impacts from oil spills, and determine how effective the oil spill response is in protecting the environment.	Labour-intensive. Logistics. Operation of vessel (such as burn fuel, physical presence, discharges). Noise from support vessels and helicopters. Vessel collision. Obstacles to other sea users.	Weather conditions may constrain visual observations (vessel and aerial). Stringent safety management requirements for aerial and marine operations. Potential coordination of multiple vessels and aircraft within limited area (simultaneous operations).	Level 2 – MDO	Yes	Primary	Applicable to Level 2 spills to monitor impact and recovery from oil spill events. The type and extent of scientific monitoring will depend on the nature and scale of oil contact to sensitive receptor locations as determined through monitor and evaluate activities.
RS11	Oiled Wildlife Response	Pre-oiling activities including onshore exclusion barriers, hazing and pre-emptive capture used to reduce incidence of animals becoming oiled. Post-oiling activities including collection and rehabilitation to treat oiled fauna and return to similar suitable habitat. Utilisation of local skilled veterinarians for treatment of oiled wildlife.	Labour-intensive. Logistics. Operation of vessel (such as burn fuel, physical presence, discharges). Hazing: stress to individuals, accidentally drive oiled wildlife into oil, separate groups/individuals (such as parent/offspring pairs) or disturb nesting and foraging behaviours. Pre-emptive capture and post-oiled collection: Risk of injury and inappropriate field collection/handling during pre-emptive capture and after oiled collection. Rehabilitation: inadequate/inappropriate animal husbandry, leading to stress, injury or death. Inappropriate relocation points leading to disorientation and stress.	Wind is a key constraint, calm seas and ideal conditions are considered necessary for capture operations. Weather constraints for use of aerial observation and tracking fauna. Navigation of multiple vessels within a small area. Availability of suitable space/location in township to handle rehabilitation and fauna treatment.	Level 2 – MDO	Yes	Primary	Applicable where surface hydrocarbons cause oiling risk to marine fauna. Applicable to Level 2 spills.
RS12	Forward Command Post	Benefits outweigh impacts. Establishes local command. Better communication with local resources and stakeholders.	Labour-intensive. Logistics. Mobilisation of personnel to Exmouth or Onslow – aviation fuel, etc.	Availability of suitable command post (location/building) in Exmouth.	Level 2 – MDO	Yes	Secondary	Constant monitoring and evaluation of spill and response activities by people on-location during a spill event.
RS13	Waste Management	Benefits outweigh impacts. Oiled waste removed from site by trained contractors and dealt with at an approved waste management facility.	Labour-intensive. Logistics.	Low persistence hydrocarbon expected to generate minimal (if any) waste. Logistics constraints in moving waste from site to approved waste facility.	Level 2 – MDO	Yes	Secondary	Applicable where surface hydrocarbons cause oiling risk to shorelines.

11.4 Environmental Impact and Risk Assessment for Spill Response Activities

While spill response activities are intended to reduce the potential environmental consequences of a hydrocarbon spill, they can introduce new impacts and risks. In the event of a hydrocarbon spill, response strategies will be implemented where possible to reduce environmental impacts to ALARP. The response strategies deemed appropriate, based on the predicted nature and scale of the worst-case spill scenarios identified for petroleum activity, have been identified via the strategic NEBA and ALARP demonstration (refer to Section 11.3 and Appendix G).

The OPEP (Appendix E) provides selected response strategies in the event of a spill, being:

- source control – vessel control
- monitor and evaluate
- shoreline protection
- shoreline clean-up
- natural recovery
- environmental monitoring
- oiled wildlife response
- forward command post
- waste management.

The next sub-sections present the suitable response spill strategies identified in Table 11-2, the impacts and risks associated with their implementation, and control measures for reducing impacts and risks to ALARP and acceptable levels. Section 11.5 assesses their effectiveness and the adequacy of resourcing available to support spill response strategies to further justify reducing impacts and risks to ALARP and acceptable levels.

Typical environmental aspects, impacts and risks that may arise from conducting spill response activities are similar to those already described in Sections 8 and 9 for planned activities and unplanned events, particularly for vessel-based operations. The greatest potential for impacts additional to those described for routine activities is from shoreline clean-up and oiled wildlife response operations.

A number of response strategies, namely RS1 Source Control, RS2 Monitor and Evaluate, RS5 Shoreline Protection, RS6 Shoreline Clean-Up, RS10 Environmental Monitoring and RS11 Oiled Wildlife Response, include components of their response activities that are vessel-based, and the impacts and risks associated with their implementation from vessels are assessed previously in this EP and relate to:

- physical presence (Section 8.1)
- vessel discharges and emissions (light, noise, atmospheric, routine and non-routine discharges, waste management in Sections 8.2 to 8.5)
- unplanned discharges (solids, liquids, and hydrocarbon spills in Sections 9.2, 9.5 and 9.6)
- marine fauna interaction (Section 9.3)
- introduction of invasive marine species (Section 9.4).

As such, impacts and risks relating to the above aspects associated with the spill response strategies are not considered further in this assessment.

11.4.1 Spill Response: Source Control – RS1 Vessel Control

The purpose of this section is to describe BHP's strategy relating to Source Control to:

- limit the release of oil discharged to the marine environment and prevent further release of oil by isolating the source of the release
- manage to ALARP and acceptable levels the risks and impacts of the Source Control response strategy to environmental sensitivities.

The strategy includes identifying the risks and impacts associated with Source Control, which includes considering the benefits associated with vessel control. It then demonstrates these impacts and risks can be reduced to ALARP and acceptable levels, enabling source control to be a primary response strategy.

Specifically, this section includes:

- identification of the potential impacts of vessel control, which includes discussion on vessel control effectiveness, demonstrating the application of vessel control can reduce the total volume of oil ashore
- demonstration of oil spill preparedness
- controls in place to mitigate the impacts and risks of vessel control on sensitive environmental receptors
- demonstration that the vessel control strategy proposed by BHP is ALARP and acceptable
- environmental performance outcomes, performance standards and measurement criteria for Source Control.

Summary of Activity – Vessel Control

The project vessels will have a current SOPEP (as appropriate to vessel class) in accordance with the requirements of MARPOL Annex I (Prevention of Pollution by Oil). This plan outlines responsibilities, specific procedures and resources available for an oil or chemical spill. Spills that occur beyond the capability of the vessel will be managed in accordance with BHP's *Griffin Decommissioning OPEP (GV-HSE-ER-0011)*.

Source Control: Vessel Control	
Initiation Criteria	**Notification of Level 1-2 Oil Spill.**
Activation Time	Immediately, noting safety of personnel as the priority
Resources	Vessel Master and crew trained in vessel-specific SOPEP procedures On-board spill equipment, as per vessel-specific SOPEP
Termination Criteria	Release of oil to the marine environment has ceased and the workplace environment is deemed environmentally safe and free of hydrocarbons
Roles and Responsibilities	Vessel Master to implement vessel-specific SOPEP and notify Duty Incident Controller of release Duty Incident Controller to activate IMT. Refer to Section 12.6.4 for further detail on Response Personnel Roles and Responsibilities
Competencies	Vessel Master trained in vessel-specific SOPEP Duty Incident Controller trained in IMT activation procedures. Refer to Section 12.6.14 for further detail on Response Personnel Competencies

Vessel Source Control methods are implemented as the primary response strategy for responding to single point releases from hull leakage and spills in the event of a vessel collision. Vessel Source Control will be activated immediately by persons onboard, under the direction of the Vessel Master, to reduce or control the discharge, and conducted according to the vessel-specific MARPOL-compliant SOPEP for vessels, as required under *International Convention for Protection of the Sea (Prevention of Pollution from Ships) Act 1983*; AMSA Marine Orders – Part 91 and Part 94; and MARPOL Annexes I and III. Vessel Source Control activities will always consider human health and safety.

Vessel Source Control activities will depend on the type of incident but may include:

- closing valves, isolating pipework and shutting down pumps
- using temporary patches or bungs/plugs to seal holes to prevent further releases, until more permanent measures can be taken
- transferring product between tanks on the vessel or between vessels, in the event of a leaking tank or rupture from a vessel collision
- using spill response equipment located around the vessel, including small booms, absorbent pads, spill-absorbent litter, spill recovery containers, permissible cleaning agents and other materials available onboard to clean up spilled material on deck. Remaining oily spill residues on decks or other surfaces may be washed into drains leading to the oil-water separator system to treat the effluent before discharge.

Potential Environmental Impact and Risks

None in addition to those already associated with vessel-based activities.

Source Control Environmental Performance

Table 11-3 provides the environmental performance outcomes, performance standards and measurement criteria for the Source Control response strategy.

In the event of a spill, Operational NEBAs (refer to Section 4 of the OPEP) will be completed daily, to take into account spill trajectories, prevailing weather and planned actions for the day.

Table 11-3: Environmental Performance – Source Control

RS1 Source Control			
Environmental Performance Outcome	**To prevent the impact on the marine environment resulting from hydrocarbon spills by reducing, controlling or halting the discharge of hydrocarbons through implementing source control methods.**		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criteria**
Source Control – Vessel Control	PS RS1.1	Operational NEBA to include evaluation of requirement for implementing Source Control.	Documentation of completed Operational NEBA.
	PS RS1.2	Predictions of spill trajectory to be modelled to support the Operational NEBA.	Documentation of Contract with AMOSC who maintains call-off contract with RPS.
	PS RS1.3	Response strategy activities continued until termination criteria met.	Incident log.
	PS RS1.4	Source Control – Vessel Control to be managed in accordance with vessel-specific (SOPEP/ Shipboard Marine Pollution Emergency Plan for vessels, in line with MARPOL Annex I).	Vessel audit/inspection records.
			Spill reports logged as per vessel procedures. Spill exercise closeout reports.
	PS RS1.5	Onboard response capabilities in the event of an oil spill are tested, maintained and available before mobilising to demonstrate preparedness.	Record of SOPEP drills and spill exercises in vessel log.
			Vessel audit/inspection records.
	PS RS1.6	Scupper plugs or equivalent deck drainage control measures available where hazardous chemicals and hydrocarbons stored and frequently handled.	Vessel audit/inspection records.

11.4.2 Spill Response: RS2 Monitor and Evaluate

Summary of Activity

The Monitor and Evaluate response strategy will be implemented for Level 1-2 spills. Constant monitoring and evaluation by surveillance is a mandatory strategy required for making real-time decisions during a spill. This strategy includes assessing the location, weather and sea state conditions, volume of oil being released, oil weathering state and trajectory of the spill. The spill will be monitored constantly and evaluated by surveillance techniques. The results of surveillance operations are crucial for implementing further strategies for responding to and managing a spill event. If any of the surveillance or modelling indicates priority receptors are at risk of being impacted by spilled hydrocarbons (refer to Table 2-2 of OPEP), then RS10 Environmental Monitoring will be activated.

The interrelationship between the pre-planning, operational monitoring arrangements, response actions and decision-making by the IMT is shown in Figure 11-1. This diagram is an adaption of Figure 6.1 (Response Phase Monitoring) from the CSIRO publication ‘Oil Spill Monitoring Handbook’.

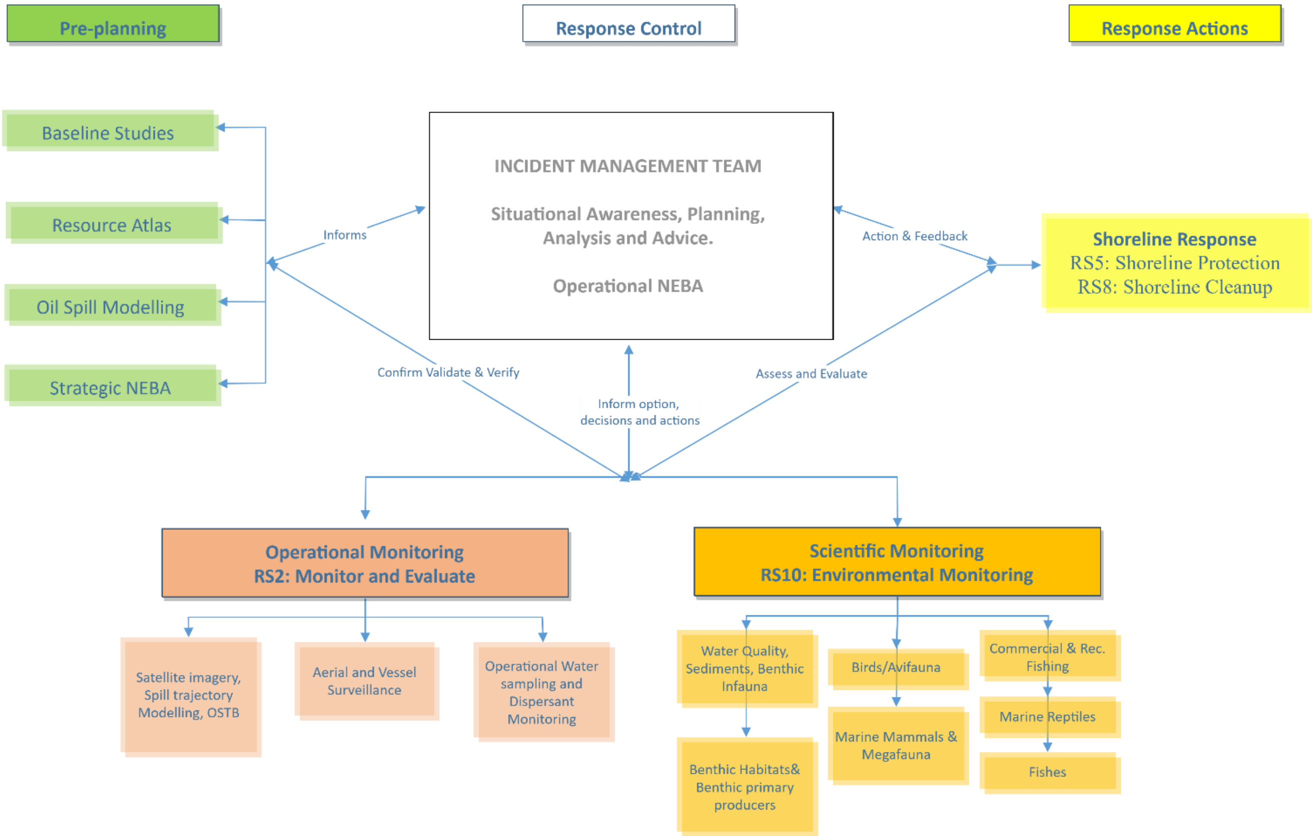


Figure 11-1: Operational and Scientific Monitoring Interrelationship Diagram

The purpose of this section is to describe BHP’s approach relating to the Monitor and Evaluate response strategy to:

- track and monitor the trajectory of the spill so real-time decisions can be made to prevent impacts to extreme and highly sensitive environmental receptors
- manage to ALARP and acceptable levels the risks and impacts of the Monitor and Evaluate response strategy on sensitive environmental receptors.

The strategy includes a description of the impacts and risks associated with Monitor and Evaluate operations during spills, which includes consideration of the benefits associated with the Monitor and Evaluate response strategy. It then demonstrates these impacts and risks can be reduced to ALARP and acceptable levels, enabling Monitor and Evaluate to be a key response strategy in the event of hydrocarbon spills.

Specifically, this section includes:

- assessment of the potential impacts and risks of the Monitor and Evaluate response strategy and the benefits of each response activity
- controls in place to mitigate the impacts and risks of the Monitor and Evaluate response strategy on sensitive environmental receptors
- demonstration that the proposed Monitor and Evaluate response strategy is ALARP and acceptable
- environmental performance outcomes, performance standards and measurement criteria for the Monitor and Evaluate response strategy.

Monitoring and evaluation will require access to aircraft, vessels and personnel. In the event of a spill, the monitoring and evaluation methods that will typically be implemented, depending on the volume of the spill, are:

- aerial surveillance
- vessel surveillance
- oil spill tracking buoys
- spill trajectory modelling
- satellite imagery
- operational water sampling.

Aerial Surveillance – Objective, Scope, Rationale and Methods

Aerial surveillance will be commissioned by the Incident Commander or by a designated officer of the nominated Control Agency. BHP has access to helicopters under a crew transfer contract with helicopter provider CHC. BHP has access to trained aerial surveillance observers in AMOSC and industry mutual aid through its AMOSC Contract. In addition to the aircrew, trained aerial surveillance observers will be included on the flights to confirm the size of the spill and its location. This information will be sent back to the IMT for further processing. A schedule of flights will be developed, to ensure sufficient timely information is available for fate modelling. Aerial observations will only be performed during daylight hours. The aerial surveillance will include digital imagery of the spill, the global positioning system co-ordinates of the spill extremities, an estimate of the spill thickness and the time of the observations. For further detail and the Aerial Surveillance Observation Log refer to APU Operational Response Guideline 1 - Aerial Surveillance. Confirmation, Quantification and Monitoring of Oil Spills (AOHSE-ER-0041).

Aerial Surveillance	
Initiation Criteria	**Notification of Level 2 Oil Spill**
Activation Time	Within two hours of forming the IMT
Resources	Rotary wing aircraft and flight crew: CHC Contract. Aerial surveillance AMOSC staff (nine), AMOSC Core Group (seven) and industry Mutual Aid. Unmanned aerial vehicle and pilots. AMOSC, Mutual Aid, OSRL, local WA hire companies.
Termination Criteria	Aerial surveillance to continue for 24 hours after the spill source is under control and a surface sheen is no longer observable, or as directed by the BHP Incident Commander or relevant Control Agency.
Roles and Responsibilities	Planning Section Chief to monitor movement and update Common Operating Picture. Refer to Section 12.6.4 for further detail on Response Personnel Roles and Responsibilities.
Competencies	Planning Section Chief and Operations Section Chief – experience in managing and leading hydrocarbon spill or similar monitoring. Aerial-based observers – trained in aerial observation of hydrocarbon spills. Refer to Section 12.6.14 for further detail on Response Personnel Competencies

Vessel Surveillance – Objective, Scope, Rationale and Methods

Direct observations from the field support vessels can be used to assess the location and visible extent of any immediate oil spill. Additional vessels will be used to verify modelling predictions and trajectories. Due to the proximity of observers to the water's surface, vessel surveillance is limited in its coverage in comparison to aerial surveillance. It may also be compromised in rough sea state conditions or where fresh hydrocarbons at surface pose a safety risk.

Visual surveillance of visible surface or subsurface oil will either be performed by the field support vessels or other vessels of opportunity located in Exmouth, Onslow and Dampier.

Vessel Surveillance	
Initiation Criteria	**Notification of Level 2 Oil Spill.**
Activation Time	Within two hours of forming the IMT (vessels of opportunity)
Resources	Vessels of opportunity (BHP marine vessel contractor). Vessels of opportunity available on local charter market in Exmouth or Onslow. Field support vessels.
Termination Criteria	Visual observation will continue for 24 hours after the spill source is under control and a surface sheen is no longer observable, or as directed by the BHP Incident Commander or relevant Control Agency.
Roles and Responsibilities	Planning Section Chief to initiate strategy. Vessel Master to execute local observation, with BHP Operations Section Chief coordinating additional vessels in the field.
Competencies	Planning Section Chief and Operations Section Chief – experience in managing and leading hydrocarbon spill or similar monitoring and hold BHP internal crisis and emergency management (CEM) training competencies. Observers trained in vessel-based and aerial-based hydrocarbon spill monitoring techniques.

Oil Spill Tracking Buoys – Objective, Scope, Rationale and Methods

Self-locating datum marker buoys or Oil Spill Tracking Buoys (OSTBs) will monitor the movement of hydrocarbons via satellite.

Oil Spill Tracking Buoys	
Initiation Criteria	**Notification of Level 2 Oil Spill or at the discretion of the Incident Commander for Level 1 spills.**
Activation Time	As soon as practicable.
Resources	OSTBs via AMOSC contract.
Termination Criteria	Tracking buoy deployment to continue for 24 hours after the spill source is under control and a surface sheen is no longer observable, or as directed by the BHP Incident Commander or relevant Control Agency.
Roles and Responsibilities	Planning Section Chief to monitor movement and update Common Operating Picture.
Competencies	Planning Section Chief and Environment Unit Leader with experience managing and leading hydrocarbon spill or similar monitoring and BHP CEM training competencies. Vessel crew trained in activating and deploying OSTBs.

Oil Spill Trajectory Modelling – Objective, Scope, Rationale and Methods

Oil spill trajectory modelling will be conducted to predict the extent of impacts to offshore habitat for any physical disturbance that may impact shoreline, nearshore areas, or areas protected for the purpose of conservation. The IMT will engage RPS via a call-off contract maintained by AMOSC to start modelling the spill and correlate it with real data received from aerial and vessel surveillance, and OSTBs. From these sources, RPS will develop an initial oil spill trajectory model for the next five days, which will allow the IMT to direct resources for the next phase of the response. Alternative oil spill modelling agencies may be selected based on operational requirements.

Oil Spill Trajectory Modelling	
Initiation Criteria	**Notification of Level 2 Oil Spill.**
Activation Time	Within two hours of initial spill notification, oil spill modelling agency to be on standby for trajectory modelling. Within four hours of notification, oil spill modelling agency to provide oil spill trajectory modelling report.
Resources	RPS oil spill tracking modellers and software via AMOSC contract.
Termination Criteria	Spill fate modelling will continue for 24 hours after the source is under control and a surface sheen is no longer observable, or until no longer beneficial to predict spill trajectory and concentrations, or as directed by the BHP Incident Commander in liaison with the relevant Control Agency.
Roles and Responsibilities	Planning Section Chief to initiate the AMOSC Contract. Planning Section to incorporate results into the Common Operating Picture and subsequent Operational NEBA assessments.
Competencies	Planning Section Chief and Environment Unit Leader with experience in managing and leading hydrocarbon spill or similar monitoring and BHP CEM training competencies. RPS response via AMOSC is the recognised industry leader in predictive modelling of hydrocarbon incidents.

Satellite Imagery – Objective, Scope, Rationale and Methods

Satellite imagery will be a supplementary source of information that can improve awareness of the extent, trajectory and even thickness of a slick. Suitable imagery is available via satellite imagery suppliers through existing AMOSC and OSRL contracts. The most appropriate images for purchase will be based on the extent and location of the oil spill. Synthetic aperture radar and visible imagery may both be of value.

Satellite Imagery	
Initiation Criteria	**Notification of Level 2 Oil Spill.**
Activation Time	Within two hours of forming the IMT.
Resources	AMOSC contract with KSAT Satellite Services OR OSRL contract with KSAT Satellite Services.
Termination Criteria	Monitoring to continue until no further benefit is achieved from receiving satellite imagery or as advised by the BHP Incident Commander or relevant Control Agency.
Roles and Responsibilities	Planning Section Chief (BHP IMT) will initiate the contracted support via AMOSC or OSRL.
Competencies	Planning Section Chief and Environment Unit Leader with experience in managing and leading hydrocarbon spill or similar monitoring and BHP CEM training competencies. KSAT personnel are recognised as competent by industry and service contractors.

Oil Spill Preparedness

Oil spill preparedness for the elements of the Monitor and Evaluate response strategy comprise contractual arrangements with Oil Spill Response Agencies (OSRAs), such as AMOSC/OSRL, and/or service agreements with third-party vendors for providing services such as OSTBs and satellite imagery.

Potential Environmental Impacts and Risks

The risks and impacts associated with the vessels involved in the Monitor and Evaluate response strategy from their physical presence, noise and atmospheric emissions, interference with marine fauna, planned and unplanned discharges, and accidental spills have been discussed in the next sections.

The impacts and risks associated with aircraft involved in the RS2 Monitor and Evaluate response strategy relate to acoustic disturbance. During the response activities, aircraft and vessels will generate noise both offshore and in coastal areas near sensitive receptors such as shorebirds, marine mammals, fish and shark species.

Monitor and Evaluate Environmental Performance

Table 11-4 provides the environmental performance outcomes, performance standards and measurement criteria for the Monitor and Evaluate response strategy.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with each response strategy are detailed above.

Table 11-4: Environmental Performance – Monitor and Evaluate

RS2 Monitor and Evaluate			
Environmental Performance Outcome	**Implementation of Monitor and Evaluate activities to provide situational awareness to inform IMT decision-making.**		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criterial**
Monitor and Evaluate	PS RS2.1	Monitor and Evaluate activities to be reviewed and managed in accordance with the IAP.	Daily Incident Action Plans (IAPs).
	PS RS2.2	Spill fate modelling initiated within two hours of incident notification.	Trajectory modelling request form issued within two hours of spill notification.
	PS RS2.3	Operational NEBA to include results of all relevant operational monitoring within RS2 Monitor and Evaluate.	Documentation of completed Operational NEBA.
	PS RS2.4	AMOSC/OSRL contracts, Mutual Aid MoUs and other third-party agreements (such as CHC, marine vendors) for providing equipment and supplies, resources and assisting with spill incidents.	Documentation of AMOSC/ OSRL contracts and Mutual Aid MoUs and other third-party agreements (such as CHC, marine vendors) stored.
	PS RS2.5	Contract with AMOSC who maintains a call-off contract with RPS* to provide spill modelling as required in place during operations. Ensure oil spill modelling capability meets and exceeds industry standards, such that: • within two hours after initial spill notification, oil spill modelling agency to be on standby for trajectory modelling • within four hours of notification, oil spill modelling agency to provide oil spill trajectory modelling report • oil spill modelling agency to perform any additional modelling requirements as per daily IAP. **Alternative oil spill modelling agencies may be selected based on operational requirements.*	Documentation of contract with AMOSC who maintains call-off contract with RPS. **Alternative oil spill modelling agencies may be selected based on operational requirements.*
	PS RS2.6	Contract in place with OSRL to provide satellite imagery within 24 hours of request by BHP IMT.	Documentation of contract with OSRL to provide satellite imagery.
	PS RS2.7	Pre-approved vendors in place during decommissioning activities for activation of environmental monitoring services in the event of an oil spill.	List of pre-approved vendors in place who can be called upon at short notice to provide services if required.

RS2 Monitor and Evaluate			
Environmental Performance Outcome	**Implementation of Monitor and Evaluate activities to provide situational awareness to inform IMT decision-making.**		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criterial**
	PS RS2.8	Maintain capability to monitor spill location and movement via aerial surveillance and observations to enable identification of potential contact with sensitive receptors: • First overflight observations within two hours of request by BHP IMT. • Ensure first aerial observation flights can be completed (in daylight hours) within eight hours after spill. • Enable surveillance information to be used to inform IAPs and response strategy selection.	Records of aerial surveillance logs maintained.
	PS RS2.9	Response strategy activities continued until termination criteria met.	Spill reports and incident response reports detail no hydrocarbons detected by any surveillance technique.
	PS RS2.10	Surveillance data, spill trajectory modelling and satellite imagery data incorporated into IAP preparation process for the response strategies.	Spill reports and incident response reports.

11.4.3 Spill Response: RS5 Shoreline Protection

Summary of Activity

The Shoreline Protection response strategy involves deploying protection and deflection booms (by AMOSC/OSRL) which assist in minimising the amount of oil contacting shorelines. In a hydrocarbon spill event and if the modelling suggests sensitive shorelines and receptors are at risk of contact, protective and deflective booms will be deployed to deflect a slick away from a known sensitivity towards an area where collection can be more effective without impacting high value receptors. Alternatively, slicks can be deflected to shorelines of lower environmental value where the oil can be collected.

This response strategy will involve deploying vessels, equipment and personnel and its success depends on weather and sea state conditions.

Sensitive shorelines that require protection and deflection by a potential oil spill will be identified and prioritised through the IAP and Operational NEBA process. This will be performed in line with advice from environmental advisors and stakeholder groups, such as DoT DBCA.

RS5 Shoreline Protection	
Initiation Criteria	**Notification of Level 2 Oil Spill where shorelines with identified sensitive receptors will potentially be contacted by the spill.**
Activation Time	Within two hours of forming the IMT.
Resources	Shoreline protection equipment and trained personnel available via AMOSC, Mutual Aid and OSRL. Logistics contractor (located in Exmouth) available to BHP via existing contracts. Vessels available to BHP via existing marine contracts. Vessels of opportunity available on local charter market in Exmouth or Onslow.
Termination Criteria	Operational NEBA has determined this strategy is unlikely to result in an overall benefit to the affected shoreline/s, or as directed by the BHP Incident Commander or relevant Control Agency. Agreement is reached with the Jurisdictional Authority relevant to the spill to terminate shoreline protection.
Roles and Responsibilities	Environment Unit Lead to conduct Operational NEBA to confirm strategy will result in net environmental benefit. Planning Section Chief will initiate the contracted support via AMOSC. Logistics Section Chief will initiate required contracted support via Logistics and Marine contractors. Refer to Section 12.6.4 for further detail on Response Personnel Roles and Responsibilities.
Competencies	Planning Section Chief and Operations Section Chief – experience in managing and leading hydrocarbon spill or similar incident. Shoreline Clean-up and Assessment Technique (SCAT) personnel trained in shoreline assessment techniques. Shoreline protection personnel trained in shoreline response techniques. Refer to Section 12.6.14 for further detail on Response Personnel Competencies.

Potential Environmental Impacts and Risks

This response strategy will involve deploying vessels, equipment, and personnel. The installation of booms and associated equipment could result in damage to sensitive habitats and disturbance of fauna (such as trampling of mangroves, emergent reefs, turtle nesting beaches; and damage to emergent reefs by vessels used to deploy nearshore booms and anchoring impacts), entanglement of marine fauna within booms, accidental corralling of fauna into surface oil, accidental deflection of surface oil to sensitive shorelines and environmental receptors, and damage to aboriginal registered sites of cultural significance from shoreline accumulation and deployment of protection and deflection booms.

The environmental sensitivity of shorelines that may be impacted by a potential Level 2 oil spill is a key consideration in determining priorities for shoreline response. The sensitivity of shorelines may vary depending on the time of year, as some shorelines in the region are used as turtle and bird nesting areas. Table 2-2 of the *Griffin Decommissioning OPEP (GV-HSE-ER-0011)* (Appendix E) provides information regarding the seasonality of receptors at priority areas.

Oil Spill Preparedness

BHP can protect priority areas where functional shoreline protection can be implemented before the predicted arrival time of first oil. During the response, SCAT teams and specialists will continue to monitor opportunities to deploy additional shoreline protection strategies above and beyond what has already been identified as suitable for protection. BHP would continuously replenish the shoreline protection stockpile to maximise the potential to use this method. Pre-mobilisation of additional equipment or resources or improving access along the coastline for shoreline protection is not justified for the environmental benefit gained.

Spill modelling indicates only two areas are most likely to be impacted by an oil spill (where shoreline loading is >100 g/m^2 threshold). This includes Exmouth (1% probability) under summer conditions and Muiron Islands (1% probability) under winter conditions.

The need is to install shoreline protection equipment before the presence of hydrocarbon at locations where deployment can be safely and practicably achieved. The earliest shoreline oiling would be expected to appear is Day 5 (Exmouth at >100 g/m^2). The capacity for the shoreline protection will be maintained until the termination criteria for RS5 Shoreline Protection has been achieved.

Response Arrangements – Equipment

There is sufficient equipment in the Exmouth AMOSC stocks of Zoom Boom (500 m), Beach Guardian (500 m) and nearshore skimmers (two) to perform first-strike shoreline protection at priority areas. First strike response resources will be mobilised within 24-48 hours, be in place within 72 hours, and can be scaled up for a higher category, if needed. BHP trained oil spill responders can be deployed from the Perth office and be on site within 24 hours. Arrangements are in place with an Exmouth logistics contractor to collect and transport equipment to Exmouth and Muiron Islands.

Response Arrangements – Personnel

BHP is planning a shoreline protection response matched to the consequence of a worst-case volume ashore. Arrangements are flexible and scalable in time to mobilise. Modelling has indicated the minimum time to contact of oil above the moderate exposure value of >100 g/m² is around five days at Exmouth (Summer) and five and a half days at the Muiron Islands (Winter). BHP can mobilise its Core Group personnel and AMOSC Core Group personnel within 24-48 hours to protect the key environmental sensitivities that may be impacted in this short timeframe.

Shoreline protection operations will continue until the termination criteria for RS5 Shoreline Protection has been achieved.

Logistical Constraints

The following operational constraints limit the contribution to shoreline protection:

<u>Multiple use of logistics contractor to support other operations</u>: The initiation of multiple response strategies in Exmouth has the potential to cause conflicts on the available logistics contractor's movement of equipment required for the first strike shoreline protection. The equipment required to deploy shoreline protection can be delivered to the location by either the logistics contractors or the first strike teams themselves, using utility vehicles and trailers if trucks were deployed for other strategies. It has been assessed that this would not be a conflict to the required deployment timeframe.

<u>Access to areas requiring shoreline protection</u>: There is access to coastline around Exmouth using paved roads, with 4WD access tracks to most beaches. Vehicles for managing the logistics in these areas would be required, such as 4WD buses and trucks. Transit times would be longer. Access to the nearshore islands would be via barge or small vessel.

<u>Locations amenable to shoreline protection</u>: In 2014, BHP, Quadrant Energy (now Santos) and Woodside engaged AMOSC to develop Tactical Response Plans for shoreline protection and clean-up for the key sensitivities at risk from a large hydrocarbon spill. The conclusions identified many areas on the coast were not suited to shoreline protection:

- The exposed coastline at Jurabi, Turquoise Bay and the Muiron islands are not suitable for shoreline protection methods. Shoreline booming would be suitable at times for enhanced collection but was determined to be short-lived between tides.
- During the response, SCAT teams and specialists will continue to monitor opportunities to deploy additional shoreline protection strategies above and beyond what is described in the Tactical Response Plans. BHP would continuously replenish the Exmouth shoreline protection stockpile to maximise the potential to use this method.

In summary, BHP has access to shoreline protection equipment, trained personnel and supporting staff that are sufficient and appropriate for shoreline protection operations. Trained personnel requirements will be filled from the AMOSC Core Group. Due to the minimal shoreline contact predicted from spill modelling, the resources available via AMOSC Core Group and Mutual Aid are expected to provide sufficient capability to implement this response strategy. BHP has pre-identified protection priorities, equipment and resource requirements, access and constraints within Tactical Response Plans that will enable efficient measures to be implemented.

Shoreline Protection Environmental Performance

Table 11-5 provides the environmental performance outcomes, performance standards and measurement criteria for the Shoreline Protection response strategy.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with each response strategy are detailed above.

Table 11-5: Environmental Performance – Shoreline Protection

RS5 Shoreline Protection			
Environmental Performance Outcome	**Implementation of shoreline protection activities to reduce surface hydrocarbons reaching sensitive shoreline receptors.**		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criterial**
Shoreline Protection	PS RS5.1	Shoreline protection operations to be reviewed and managed in accordance with the IAP.	IAPs.
	PS RS5.2	Mobilise vessels and equipment to conduct shoreline protection in areas where surface oil is predicted to make contact with sensitive environmental receptors and where Operational NEBA identified a net environmental benefit of initiating the response strategy.	Spill modelling reports submitted and logged by IMT. Documentation of completed Operational NEBA.
	PS RS5.3	Initiate shoreline protection response strategy – deploy booms within 72 hours of IMT notification.	Incident response reports. Daily field reports submitted to the IMT.
	RS5.4	Use North West Cape Sensitivity Mapping (AOHSE-ER-0036), cultural heritage maps and shoreline Tactical Response Plans to reduce impacts to marine flora and fauna and aboriginal registered sites of cultural significance, from Shoreline Protection response strategy. For areas outside the mapping areas noted above: • Use the BHP geographic information system (GIS) database or DoT OSRA. • Conduct observations/surveys before deploying equipment and personnel to develop a deployment/operations plan, which includes avoiding impacts to wildlife, minimising ground disturbance, protecting sensitive areas, and consulting with DBCA and local stakeholders. Activities not to proceed if: • EPBC Act-listed Threatened/Migratory marine fauna are observed in the immediate area • Aboriginal registered sites of cultural significance are located in the immediate area without consultation with (and authority where required) the WA Department of Planning, Lands and Heritage.	IAPs detail areas for initiation of planned shoreline protection. No EPBC Act-listed Threatened/ Migratory marina fauna sighted and recorded in observation logs. Records of IAPs and field reports include review and management of heritage values.
	PS RS5.5	AMOSC and OSRL contracts and other third-party agreements for providing equipment/ supplies and resources for shoreline protection response strategy in place during operations.	Records of AMOSC and OSRL contracts and other third-party agreements.
	PS RS5.6	IMT to mobilise people and equipment to achieve the IAP performance outcomes.	Incident response reports.
	PS RS5.7	Shoreline protection equipment, including boats, will be selected that are fit for purpose and no anchoring of vessels or booms will occur on emergent reefs or other fragile/sensitive benthic habitats.	Contracts for use of shoreline protection equipment with OSRAs. Incident response reports.
	PS RS5.8		IAPs. Incident response reports.

RS5 Shoreline Protection			
Environmental Performance Outcome	**Implementation of shoreline protection activities to reduce surface hydrocarbons reaching sensitive shoreline receptors.**		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criterial**
		Spill surveillance reports and spill trajectory modelling predictions incorporated into IAP preparation process for response strategies.	Spill modelling reports submitted and logged by IMT.
	PS RS5.9	Trained operators to monitor and evaluate the integrity of boom deployment.	Boom maintenance checks and operational surveillance records.
	PS RS5.10	Implement environmental monitoring to determine the ongoing acceptability of the environmental risk associated with applying shoreline protection methods.	Monitoring records document ongoing review of the environmental risk and acceptability of shoreline protection methods.
	PS RS5.11	If EPBC Act-listed threatened/migratory species, such as humpback whales or whale sharks, are observed in the immediate vicinity of operations as determined from situational awareness reports from the RS2 Monitor and Evaluate response strategy and/or from the vessel platforms, operations will cease until the animal has not been sighted for 30 minutes.	Operational NEBA, situational awareness reports from RS2 Monitor and Evaluate, and IAP document decision framework for activation of shoreline protection.
	PS RS5.12	Shoreline protection will not be implemented if consideration of the weather conditions, and/or temporal (seasonal) windows of ecological sensitivity for environmental values discussed in Section 3, coupled with the outcomes of the daily Operational NEBA, indicate there would be no net environmental benefit for priority areas.	Operational NEBA and IAP document decision framework for use of shoreline protection.
	PS RS5.13	Response strategy activities continued until termination criteria met.	Incident response reports from RS2 Monitor and Evaluate activities and observation logs detail trajectory of surface oil slick is such that it is no longer deemed a potential threat to sensitive environmental shoreline receptors.

11.4.4 Spill Response: RS8 Shoreline Clean-Up

Summary of Activity

The Shoreline Clean-Up response strategy will be implemented for Level 2 spills. Where shoreline protection and deflection are not possible or unsuccessful, shoreline clean-up activities will be implemented. The Shoreline Clean-Up response strategy is typically logistic- and labour-intensive, requiring multiple vessels, equipment, clean-up crews and waste management. However, spill modelling for the petroleum activity indicates if a worst-case spill were to occur, only small volumes of MDO may contact shorelines, requiring only a few clean-up teams.

Shoreline clean-up involves physically removing stranded oil from shorelines via techniques that include:

- natural recovery
- sediment relocation
- mechanical clean-up using heavy machinery
- debris removal via manual bagging
- absorbents
- pumps and vacuums
- low-pressure flushing
- high-pressure flushing.

BHP will use the information gained from implementing the RS2 Monitor and Evaluate response strategy (Section 11.4.2) to predict shorelines that will be impacted and will require priority shoreline clean-up activities. Through information gathered and assessed by the IMT and DoT, the trajectory of the spill towards the specific shoreline will be confirmed and the shoreline clean-up strategy will be implemented. After identifying environmentally-sensitive receptors, it will be of the highest priority that BHP will establish a nearshore and onshore response to manage the impacts that may occur to those sensitive shoreline receptors.

The shoreline clean-up response strategy will consider:

- shoreline characteristics (substratum type, beach type, shoreline exposure, biological, social, heritage and economic values; characteristics of the oil (e.g., degree of weathering); amount of oil present, distribution on the shoreline; shoreline sediment type)
- logistics considerations (availability of access; waste removal; availability of equipment and labour; availability of waste storage areas)
- operational risk assessment of potential shoreline clean-up methods, leading to the development of Operational NEBAs
- damage to Aboriginal registered sites of cultural significance from shoreline clean-up activities.

DoT is the Control Agency for shoreline response in WA. BHP will develop daily IAPs as a first priority; an Operational NEBA will also be performed for shoreline protection and clean-up in consultation with DoT. The specific clean-up techniques will be risk-assessed and refined when developing the IAP to suit the circumstances of the incident response. The sensitivity of shorelines may vary depending on the time of year, such as shorelines and beaches used by birds and turtles for nesting. This will be considered during the Operational NEBA.

Based on the IAP, BHP will establish and deploy SCAT teams for assessing the shoreline and developing recommended clean-up strategies for the IMT planning and operations group. SCAT team members will include personnel trained in oil spill response measures and environmental and coastal sensitivities of the region. Ideally, each SCAT team will include a representative from the appropriate State Agency (DoT/DBCA).

The SCAT teams will systematically survey the shoreline that will be segmented into sections. The SCAT teams will then provide sketches and reports that will include recommendations for the most appropriate clean-up strategy for the shoreline segment. This information will feed back to the IMT, who will then prioritise areas for clean-up and allocate resources.

The SCAT teams will use techniques to determine appropriate termination end points for response in consultation with the appropriate State Agency (DoT/DBCA). The endpoints can be determined through:

- qualitative field observations – to describe the presence or absence of stranded oil and/or the character of such oil
- quantitative field measurement methods – based on visual measurements and observations of the quantity of oil
- analytical measurement methods – typically require collection of representative field samples and subsequent laboratory analysis, or
- interpretive impact assessment methods – based on an evaluation of system impacts (e.g., Operational NEBA).

Through the designated Control Agency, BHP will resource the necessary personnel and logistics associated with maintaining those crews at the impact location, which includes support arrangements to ensure the health, safety and welfare of the shoreline crews. This includes availability of personal protective equipment, sun shelter, first aid supplies, catering, drinking water, ablutions, decontamination facilities, accommodation, transport and communications to support the number of personnel expected to be required at the impact location.

RS8 Shoreline Clean-Up	
Initiation Criteria	**Notification of Level 2 Oil Spill where shorelines with identified sensitive receptors will potentially be contacted by the spill.**
Activation Time	Within two hours of forming the IMT.
Resources	Shoreline clean-up equipment and trained personnel available via AMOSC, Mutual Aid and OSRL. Logistics contractor (located in Exmouth) available to BHP via existing contracts. Vessels available to BHP via existing marine contracts. Vessels of opportunity available on local charter market in Exmouth or Onslow.
Termination Criteria	Operational NEBA has determined this strategy is unlikely to result in an overall benefit to the affected shoreline/s, or as directed by the BHP Incident Commander or relevant Control Agency. Agreement is reached with the Jurisdictional Authority relevant to the spill to terminate shoreline clean-up.
Roles and Responsibilities	Environment Unit Lead to conduct Operational NEBA to confirm strategy will result in net environmental benefit. Planning Section Chief will initiate the contracted support via AMOSC. Logistics Section Chief will initiate required contracted support via Logistics and Marine contractors. Refer to Section 12.6.4 for further detail on Response Personnel Roles and Responsibilities.
Competencies	Planning Section Chief and Operations Section Chief – experience in managing and leading hydrocarbon spill or similar incident. SCAT personnel trained in shoreline assessment techniques. Shoreline clean-up personnel trained in shoreline response techniques. Refer to Section 12.6.14 for further detail on Response Personnel Competencies.

Potential Environmental Impacts and Risks

The physical clean-up activities associated with shoreline response strategy could result in trampling of shoreline habitats by response clean-up crew, heavy machinery and vessel anchoring, damaging shoreline habitats and emergent reef features and Aboriginal registered sites of cultural significance, flushing and pressure washing procedures, damaging habitats and altering beach profiles by removing or relocating sediment. The use of equipment, machinery and clean-up personnel in some coastal environments, such as mangroves and turtle and bird nesting beaches, could potentially cause more damage than the stranded hydrocarbons themselves, thereby reducing the recovery and net environmental benefit of the clean-up strategy. The presence of staging areas and camps for clean-up personnel, although relatively short-term, may disrupt normal behaviour of coastal species such as shorebirds and turtles, and could potentially interfere with nesting and feeding behaviours. Shoreline clean-up activities also present a risk of cross-contamination between oiled and non-oiled areas or further spreading of hydrocarbons.

Net Environmental Benefit Analysis of Shoreline Clean-Up

Environmentally-sensitive shorelines, cultural heritage sites and shoreline receptors that may be impacted by a potential oil spill are a key consideration in determining priorities for shoreline response and clean-up activities. This section outlines the overarching approach to identifying shore-based oil spill response and clean-up priorities in the event of spill incidents. Table 11-6 outlines the sensitivity of coastal features, appropriate protection and clean-up procedures. Table 11-7 identifies proposed protection and clean-up approaches for these sensitive coastal features. The associated environmental risk assessment of the identified protective measures and preferred clean-up methods is provided Table 11-8. The outcomes from Table 11-6 and Table 11-8, along with the Operational NEBA, inform the IAP.

Table 11-6: Coastal Features Classification – Sensitivity, Protection and Clean-Up Methods

Coastal Feature	Sensitivity *	Comments	Protective Measure	Clean-up Method (Table 11-7)		
				Preferred	Possible	Avoid
Sites of Cultural Significance	S1	Potential damage to Aboriginal registered sites of cultural significance from shoreline clean-up activities and shoreline response operations.	2, 3	1, 7	6, 14	5, 8, 9, 10, 11, 12, 13
Mangroves & Tidal Flats	S1	Extremely low energy areas. Oils may penetrate muddy substrate rapidly and deeply and can persist for years. Associated tidal flats are very important for wading birds. These areas should receive top protection and clean-up priority.	2, 3	1, 7	3, 6, 14	5, 8, 9, 10, 11, 12, 13
Intertidal Limestone Reef & Corals	S2	Unless tide is low, most corals will not be directly exposed to floating oil. However, turbulent mixing from waves can result in contact and adhesion of oil to reef areas.	1, 2, 3, 4	1, 3, 7	8	5, 6, 9, 10, 14
Sandy Beaches	S3 S1*	Sand beaches are relatively low in ecological diversity, except during times of turtle and bird nesting. Higher clean-up priority should be given to turtle nesting and amenity beaches. High potential for oil penetration.	1, 3	1, 3, 6, 7, 8, 13	9, 14	5, 10, 11
Sheltered Rock Shores	S3	Landed oil will weather quickly and may accumulate in pools and cracks.	1, 3	7	3, 8, 9	5,10,11
Shingle, Rock and Sand Mixed Beaches	S4	High potential for oil penetration and persistence.	1, 3	7, 9	8, 14	5, 10, 11, 12
Exposed Rock, Shores and Cliffs	S4	Wave reflection may keep oil offshore. Moderate diversity and recolonised quickly. Oil will accumulate in tidal pools and cracks.	1, 3	7	1, 3, 9, 12	5, 10, 11
Marina, Jetties, Piers	S4	Very low likelihood of marina or pier areas being affected. To be cleaned as circumstances dictate.	**1, 3**	1, 3, 6, 9, 10	11, 12	5

Sensitivity Codes:

S1: Extreme Sensitivity: High Protection and clean-up priority.

S2: High Sensitivity: Protection and clean-up priority as resource use and circumstances dictate.

S3: Moderate Sensitivity: Protection and clean-up priority as resource use and circumstances dictate.

S4: Low Sensitivity Low protection and clean-up priority.

*Sandy beaches have an extreme sensitivity during turtle and bird nesting, which occurs at multiple sandy beaches in the region.

Table 11-7: Protection and Clean-Up Options

1. Containment and recovery using booms	8. Manual clean-up of oil, or movement of substratum
2. Divert to less sensitive shore	9. Low pressure seawater flushing
3. Human-made sorbent methods	10. High pressure flushing
4. Earth barriers	11. Hot water steam cleaning
5. Chemical dispersant	12. Low pressure warm seawater wash
6. Skimmers, vacuums	13. Mechanical clean-up of oil, removal or movement of substrate
7. Natural recovery, allow to weather naturally	14. Bioremediation

Table 11-8: Environmental Risks of Shoreline Protective and Preferred Clean-Up Method

Protection/ Clean-Up Options Method Reference (Table 11-7)	Method	Environmental Risks	Likelihood Factor	Severity Factor	Residual Risk	Acceptability
1	Containment and recovery booms	Wildlife entrainment, disturbance, injury and entanglement while deploying and using equipment and personnel. Contamination of ground or surface water resulting from managing waste.	0.1	10	1	Tolerable
2	Diversion to a less sensitive shoreline	Contamination and accumulation of oil on the less-sensitive shore. Wildlife entrainment, disturbance, injury and entanglement while deploying and using equipment.	1	30	30	Tolerable
3 6	Human-made sorbents, skimmers and vacuums	Contamination of ground or surface water resulting from management of waste. Wildlife entrainment, disturbance, injury and entanglement while deploying and using equipment and personnel.	0.1	30	3	Tolerable
4 8	Earth barriers Manual clean-up and movement of substratum	Ground and vegetation disturbance to and compaction of sensitive coastal landforms through using machinery and moving earth, resulting in erosion and potential sedimentation of surface water. Drive oil deeper into substratum. Impacts to invertebrates from disturbance to sediment. Wildlife entrainment, disturbance, injury and entanglement while deploying and using equipment and personnel. Contamination of ground or surface water resulting from managing waste.	1	10	10	Tolerable

Protection/ Clean-Up Options Method Reference (Table 11-7)	Method	Environmental Risks	Likelihood Factor	Severity Factor	Residual Risk	Acceptability
7	Natural recovery, allow to weather naturally	Prolonged and ongoing contamination and visible oil on both the shore and in the marine sediments and water column.	1	10	10	Tolerable
9 10	Low-pressure flushing High-pressure flushing	Contamination of surface water with oily water. Drive oil deeper into substratum. Erosion of substratum. Impacts to invertebrates from disturbance to sediment. Damage or death to sensitive shoreline flora and fauna via action of water and deployment of equipment and personnel.	1	10	10	Tolerable
13	Mechanical clean-up of oil, removal or movement of substrata	Vegetation clearing and damage, soil compaction. Hydrocarbon leaks from equipment. Drive oil deeper into substratum. Impacts to invertebrates from disturbance to sediment. Erosion of substratum. Damage or death of sensitive shoreline flora and fauna via action of water and deployment of equipment and personnel.	1	10	10	Tolerable

Oil Spill Preparedness

If the Operational NEBA indicates shoreline clean-up would result in an overall benefit to the shorelines contacted by hydrocarbons, clean-up operations will aim to remove hydrocarbons from shorelines, to reduce the duration of exposure of sensitive shoreline biota and habitats to accumulated oil.

The priority coastal types for shoreline clean-up include sandy beaches, tidal mudflats and mangroves, and sites of cultural significance. Priority will be given to resourcing the shoreline clean-up response at known environmental sensitivities if a spill occurs during windows of increased ecological sensitivity (Table 2-2 of the *Griffin Decommissioning OPEP (GV-HSE-ER-0011)* (Appendix E)), such as peak migratory periods for shorebirds and turtle nesting season.

The needs for a shoreline clean-up operation require capacity to respond to stranded oil in different phases: pre-cleaning areas of predicted oiling, removal of bulk oil, and polishing for final treatment, as described below:

- Pre-cleaning of beaches aims to mobilise oiled waste by clearing debris from shorelines to well above the high tide mark, wherever safe and practicable to do so.
- Removal of bulk oil aims to recover as much of the hydrocarbon as expeditiously as possible to prevent mobilization and secondary impacts to unaffected areas or those cleaned previously. It also has the environmental benefit of reducing the potential for hydrocarbon contact with wildlife.
- Polishing and final treatment aims at removing residual oil and stains.

The need for polishing and final treatment would continue until the RS8 Shoreline Clean-Up termination criteria have been met, supported by relevant termination criteria from environmental monitoring (e.g., IAP – sediment quality).

Response Arrangements – Equipment

Presented below are the processes in place to ensure the appropriate kinds of equipment to perform the range of shoreline clean-up techniques are identified and available. Shoreline clean-up operations will be preceded by shoreline assessments performed by SCAT teams. The SCAT teams will provide recommendations (and priorities) for the clean-up methods to be implemented. SCAT teams will consist of trained oil spill responders, who will have access to reference guides that can assist in their decision-making (e.g., Shoreline Operations Field Guide (OSRL, 2015) and the Oiled Shoreline Clean-Up Manual, (Cedre, 2013)).

This information will be provided to the BHP IMT (Planning Section). The Planning Section will liaise with the Logistics and Operations Sections on providing the various equipment and personnel to perform the clean-up operation. As shown in Table 11-9, mobilization timeframes are compatible with the timeframes for expected hydrocarbons to contact shorelines (Section 9.3.2). The shoreline clean-up teams will remain onsite until the relevant termination criteria from the environmental monitoring response strategies (e.g., IAP – sediment quality) are achieved.

Table 11-9 indicates the type of equipment that is required to implement the shoreline response strategy. First strike capability is available in Exmouth, which can be made available to BHP in the listed timeframes.

Table 11-9: Equipment Required to Implement Shoreline Clean-Up

Equipment	Location	Availability	Comments
AMOSC shoreline equipment containers (including decontamination kit and wheelbarrows)	Harold Holt Exmouth	Day 1-2	
AMOSC skimmers and nearshore boom	Harold Holt Exmouth	Day 1-2	Priority for booms is shoreline protection (where feasible) then enhanced recovery (clean-up)
AMOSC skimmers and nearshore boom	Fremantle	Day 2-3	
AMOSC shoreline equipment containers (including decontamination kit and wheelbarrows)	Geelong	Day 3-4	
AMOSC skimmers and nearshore boom	Geelong	Day 3-4	
National Plan shoreline equipment/skimmers, etc	National	Day 3-4	
OSRL skimmers and nearshore boom	Singapore	Day 14	
Additional boom, skimmers and other spill response equipment	International	Day 14	Direct purchase from suppliers/vendors
Flushing equipment pumps, hoses, etc	Onslow, Karratha, Port Headland, Perth	Day 2-3	BHP service contracts (Coates Hire)
Vacuum recovery	Karratha, Port Headland, Newman, Perth	Day 2-3	BHP service contracts (Veolia)
Mechanical equipment, bobcats, loaders, graders bulldozer, tractors, etc	Exmouth, Onslow, Karratha, Carnarvon, Perth	Day 2 (local) Day 3-4 (regional)	BHP service contracts (BGC contracting, NTC Contracting, NRW)
Shoreline equipment resupply/additional (rakes, bags, shovels, sorbents, wheelbarrows, personal protective equipment (PPE))	Perth	Day 2-3	BHP supply contracts. (Perth Petroleum Services)
AMOSC waste storage (including temporary storage and waste skips and tanks for transport)	Exmouth, Broome, Fremantle	Day 3	
AMOSC decontamination and staging site equipment	Exmouth, Fremantle, Geelong	Day 3	

AMOSC has shoreline clean-up and decontamination kits that can be used in the first strike capability. The gap in the amount of equipment available to be used to establish additional staging areas and to perform clean-up operations can be closed by supplying through OSRL and existing supplier and logistical arrangements. Consumable equipment (e.g., rakes, shovels, PPE, waste bags) can be readily obtained from hardware/industrial suppliers and delivered to Exmouth to meet the arrival time of additional responders.

Mechanical equipment to support shoreline response includes bobcats, front end loaders, bulldozers and other general civil and earthmoving equipment. This would primarily be used for transporting collected oil from the manual teams and transporting back to the staging/waste recovery area. This equipment can also be used for mechanical recovery and clean-up (where suitable). This will be sourced through arrangements with local and regional earthworks contractors initially, supplemented by larger earthmoving companies (e.g., NTC Contracting, NRW, BGC). Table 11-10 provides the indicative schedule for shoreline clean-up operations.

Table 11-10: Indicative Schedule for Shoreline Clean-Up Operations

Activity	Day																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	On-going	TC
Mobilise BHP/AMOSC Core Group																		
Identify Response Location of highest priority protection based on trajectory																		
Advance party to establish location																		
Mobilise equipment to response locations																		
Remove beach debris above high tide mark from priority areas																		
Commence oil recovery from priority areas																		
SCAT team surveillance																		
Establish additional beach clean-up sectors																		

Key: Mobilisation Field activity IMT response TC = until termination criteria met

Response Arrangements – Personnel

BHP has assessed personnel needs to meet the worst-case volume ashore for the *Griffin Decommissioning OPEP* (GV-*HSE-ER-0011)*. The assessment assumed a manual clean-up volume of 1 m³ of oiled sediment per person a day (Owens Response Group, AMOSC), based on the industry standard to determine various effectiveness of removing the bulk oil. Actual shoreline clean-up rates will depend on factors such as the shoreline type, distribution of the hydrocarbon on the beach, debris, method used for clean-up, environmental conditions (weather) and logistical arrangements.

Due to the predicted low volumes of oil accumulation ashore from the worst-case spill, only two clean-up teams are expected to be required if shoreline clean-up was deemed a suitable strategy from an Operational NEBA. The small number of personnel required to fill these teams would be met by AMOSC Core Group personnel, who would be mobilised within 24 to 48 hours. Shoreline clean-up operations will continue until the termination criteria for RS8 Shoreline Clean-Up has been achieved.

Logistical Constraints

The following operational constraints limit the effectiveness of shoreline clean-up:

<u>Accommodation</u>: Availability of accommodation may be a constraint for the response. As detailed in Section 12.6.7, BHP has analysed the accommodation availability and options to increase availability for responders. While Exmouth (and Onslow) has the potential to house a large influx of people, there are limitations on the amount of accommodation that would be deemed immediately suitable for a shoreline workforce being required to perform manual clean-up and other physical work. BHP would work with the Shires/providers to increase the availability of current accommodation in these locations and the alternative options referred to in Section 12.6.7.

Movement of personnel: Movement of personnel from their accommodation or transit point to the clean-up location can impact the effectiveness of the response. If the clean-up location requires a long commute, the amount of effectiveness from the shoreline crews diminishes as the amount of time spent in the actual operation is reduced.

Weather: Storms may impede actual operations on the day or access to certain locations due to flooding. Shoreline crews will need to work around tidal movements on the beaches. Clean-up activities will be arranged around tidal cycles.

Access to areas requiring shoreline clean-up: There is access to coastline around Exmouth using paved roads with 4WD access tracks to most beaches. Access to the nearshore islands would be via barge or small vessel.

Shoreline Clean-Up Environmental Performance

Table 11-11 provides the environmental performance outcomes, performance standards and measurement criteria for the Shoreline Clean-Up response strategy.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with each response strategy are detailed above.

Table 11-11: Environmental Performance – Shoreline Clean-Up

RS8 Shoreline Clean-Up			
Environmental Performance Outcome	**Implementation of shoreline clean-up activities to remove stranded hydrocarbons in order to reduce impacts to sensitive shoreline receptors and facility habitat recovery**.		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criterial**
Shoreline Clean-Up	PS RS8.1	Shoreline clean-up to be reviewed and managed in accordance with the IAP.	IAPs.
	PS RS8.2	Perform a preliminary IAP and Operational NEBA within 24 hours of an incident, to inform mobilisation of shoreline clean-up response requirements.	IAPs. Operational NEBA.
	PS RS8.3	Implement shoreline clean-up response strategy in accordance with: optional shoreline protection methods of different coastal types (refer to Table 11-6 and Table 11-8) North West Cape Sensitivity Mapping (AOHSE-ER-0036). For areas outside the mapping areas noted above: Use the BHP GIS database and the DoT OSRA. Conduct observations/surveys before deploying equipment and personnel to develop a deployment/operations plan, which includes avoiding impacts to wildlife, minimising ground disturbance, protecting sensitive areas, and consulting with DBCA and local stakeholders.	Shoreline assessment reports. Post-incident monitoring reports. Documentation of surveys before deploying equipment and personnel to avoid impacts to wildlife, minimise ground disturbance, protect sensitive areas, and consult with DBCA and local stakeholders.
	PS RS8.4	All necessary regulatory approvals in place before implementing shoreline clean-up activities.	Correspondence logs.
	PS RS8.5	Reduce impacts to Aboriginal registered sites of cultural significance, from Shoreline Clean-Up response strategy activities, by not performing: if Aboriginal registered sites of cultural significance are located in the immediate area, without consultation with (and authority where required) the WA Department of Planning, Lands and Heritage.	Records of IAPs and field reports include review and management of heritage values.
	PS RS8.6	Mobilise First Strike Team to Exmouth (or Onslow) within 24-48 hours after notification by IMT.	Incident response reports.

RS8 Shoreline Clean-Up			
Environmental Performance Outcome	**Implementation of shoreline clean-up activities to remove stranded hydrocarbons in order to reduce impacts to sensitive shoreline receptors and facility habitat recovery**.		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criterial**
	PS RS8.7	Mobilise vessels and equipment to conduct Shoreline Clean-Up response strategy initiated by IMT after outcomes of first IAP and maintained regularly in IAP objectives.	Logs of IAPs and NEBA assessments.
			Shoreline assessment reports.
			Post-incident monitoring reports.
	PS RS8.8	AMOSC and OSRL contracts and other third-party agreements for providing equipment and supplies and assisting with shoreline clean-up in place during operations.	Records of AMOSC and OSRL contracts and other third-party agreements.
	PS RS8.9	Prevent further surface water contamination by conducting all flushing clean-up activities to a contained area.	Operational plans and reports indicate deployment of booms, skimmers and/or sorbent to the area receiving the flushing wastewater.
	PS RS8.10	Implement environmental monitoring to determine the ongoing acceptability of the environmental risk associated with applying shoreline clean-up methods.	Monitoring records document ongoing review of the environmental risk and acceptability of shoreline clean-up methods.
	PS RS8.11	No machinery to be used in mangroves. No machinery to be used within 20 m of an identified turtle nest.	Records of IAPs and field reports demonstrate no machinery used in mangroves or within 20 m of an identified turtle nest.
	PS RS8.12	Response strategy activities continued until termination criteria met.	Analysis by the SCAT team and approved by the Incident Commander in consultation with stakeholders, has determined continued shoreline clean-up response is not environmentally and socially beneficial to identified sensitive shorelines and shoreline receptors.

11.4.5 Spill Response: RS9 Natural Recovery

Summary of Activity

Natural recovery, as the title suggests, uses the natural degradation and weathering processes to break down and remove surface oil and stranded hydrocarbons. Effectively, this response strategy means no direct action is taken other than to monitor and evaluate the oil spill trajectory, the rate of dispersion of the diesel, and the rate of habitat/community recovery. As such, no additional risks or impacts will occur, other than those described previously.

11.4.6 Spill Response: RS10 Environmental Monitoring

Summary of Activity

Post-spill environmental monitoring will be initiated for Level 2 spills to support the oil spill response strategies and to understand any effects on sensitive receptors. The Oil Spill Monitoring Handbook published by CSIRO (2016) will be used to inform the development and implementation of environmental monitoring programs.

BHP's environmental monitoring is optimised through efficiently implementing robust sampling designs from the onset of a potential incident. BHP environmental monitoring procedures have been developed as a formal means of establishing the processes and procedures to ensure BHP can monitor effects of oil spills on the marine environment that may occur during exploration, production, operational and decommissioning activities. They also act as a valuable tool to access the effectiveness of the response strategies and thereby feed into the ongoing planning of the response strategies.

Specifically, the environmental monitoring procedures describe the work instructions for daily monitoring activities, any specifications of the analytical laboratory, such as sample handling and storage procedures, reporting of results and quality assurance and control procedures. They also inform the effectiveness of response strategies and feed into the ongoing planning of the response strategies.

Table 11-12 summarises the environmental receptors that would be monitored in the event of a spill incident, based on their sensitivity. It also provides the corresponding monitoring procedure that would be provided to the external consultant performing the work, noting the same company may not necessarily be contracted for all monitoring scopes. Appendix I summarises the key features of each of the AOHSE-ER monitoring procedures listed in Table 11-12, including information such as strategy objectives/aims, initiation/termination criteria, activation times, resources, general methods, roles and responsibilities and competencies. Table 1 in Appendix I shows the interface between the RS2 Monitor and Evaluate response strategy and RS10 Environmental Monitoring response strategy, as well as activation triggers for RS10 Environmental Monitoring.

Table 11-12: Summary of Environmental Receptors, Description of Monitoring and Applicable BHP Monitoring Procedure Controlled Document

Receptor	Sensitivity Ranking	Impact Monitoring	Monitoring Procedure
Water Quality	High	Reactive post-spill pre-impact	BHP Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037)*
Shoreline Sediment Quality (*incorporates Rocky Shorelines*)	High	Reactive post-spill pre-impact	BHP Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037)*
Benthic Infauna (incorporates migratory shorebird habitat, sandy beaches, intertidal zone, mixed beaches)	High	Reactive post-spill pre-impact	BHP Incident Action Plan – Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna (AOHSE-ER-0037)*
Avifauna	High	Post-spill	BHP Incident Action Plan –Seabirds and Migratory Shorebirds (AOHSE-ER-0038)*
Marine Mammals (such as whales, dolphins, dugongs) and Megafauna (whale sharks)	High	Post-spill	BHP Incident Action Plan – Marine mammals and Megafauna (AOHSE-ER-0039)*
Benthic Habitats and Benthic Primary Producers (mangroves, corals, macroalgae, sponge communities and seagrass)	High	Post-spill	BHP Incident Action Plan – Benthic Habitats and Benthic Primary Producers (AOHSE-ER-0040)*
Marine Reptiles – Turtles	High	Post-spill	BHP Incident Action Plan – Marine Reptiles (AOHSE-ER-0043)*

Commercial and Recreational Fish Species	High	Post-spill	BHP Incident Action Plan – Commercial and Recreational Fish Species (AOHSE-ER-0048)
Fishes	High	Post-spill	BHP Incident Action Plan – Effects of an Oil Spill on Fishes (AOHSE-ER-0051)
Aboriginal Cultural Heritage	High	Post-spill	BHP Aboriginal Heritage Procedures (reference BHP MEMO HER A1000) activated by BHP Heritage Team

Post-Spill, Pre-Impact Monitoring

BHP has also funded collection of extensive baseline datasets on benthic habitats in the Ningaloo Marine Park using hyperspectral data (bottom reflectance) at 3.5 by 3.5 m pixel resolution (Kobryn et al., 2011). The authors of this study stated that ‘Globally, this data set is one of the most extensive for a coral reef system and covers over 300 km of coastline from approximately 100 km south of Coral Bay, north to the Muiron Islands, around the North West Cape, to just past Exmouth Town, and extending seamlessly from the 20 m depth contour to 2 km inland’. Overall, most of the benthic cover in the Ningaloo Marine Park comprises macroalgal and turfing algae communities (54%), while hard and soft coral cover (>10% per pixel) represents only 7% of the mapped area (762 km²). In terms of spatial distribution, Turquoise Bay had the largest proportion of coral cover and the area between the two Muiron Islands was predominantly covered in coral and algae with not much sand present (Kobryn et al., 2011).

Mapping of coastal habitats found there was a distinct difference in vegetation cover from south to north of the Ningaloo Marine Park, where most live shrubs and trees occurred in the northern section of the study area (6,556 km²). Live shrubs and trees along the coast comprise 0.29% to 6.5% of the study area. Shrubs and trees were mostly confined to drainage channels, with two small areas of mangroves identified at Mangrove Bay (Kobryn et al., 2011). In summary, the hyperspectral habitat mapping project demonstrates it is possible to map coral reef and adjacent coastal habitats over large areas such as the Ningaloo Marine Park using remote sensing techniques, and provides evidence of BHP’s commitment to understanding the environment in which it operates.

Numerical modelling indicates the amount of time available to perform any meaningful post-spill pre-impact assessment, based on the worst-case scenario, is around two to four days before shoreline contact of oil at the low exposure value of >10 g/m². On this basis, the procedure for post-spill pre-impact monitoring would follow the Type I guidelines outlined in AMSA (2003); e.g., prioritising data that can be collected quickly and inexpensively in the field and analysed later (such as oil, sediment and water samples). Specifically, post-spill pre-impact monitoring done under these time constraints would prioritise:

- Water Quality – surface and water column samples (e.g., subsea which incorporates dispersed oil) to prioritise chemical parameters, including total petroleum hydrocarbons and BTEX.

Post-spill pre-impact sampling will be designed using scientific principles such as multiple control locations to allow comparisons with any impacted locations, as well as sampling before and after the incident with replicated samples and at replicated sites to allow for robust statistical analyses and the assessment of any environmental impacts (as described by Underwood, 1997). The sampling intensity (e.g., number of replicates/sites) will depend on the nature of the oil spill and the sensitivity of the issue being assessed.

Scalability and Flexibility of Sampling Designs for Environmental Monitoring

The overarching aim of the environmental monitoring procedures will be to collect monitoring data that allows comparisons of post-impact data with baseline data to determine oil spill response efficiency, as well as the extent and effectiveness of remediation of impacted areas. The sampling designs for the monitoring programs will provide adequate cover for situations where baseline data is outdated due to recent changes in sensitive receptors or not relevant to the event that has occurred. Pre-impact monitoring will be designed with post-impact monitoring in mind to provide data that is directly relevant and comparable to the data gathered during post-impact monitoring.

Sampling Designs for Environmental Monitoring in the Absence of Baseline Data

A robust baseline dataset is required for an impact and recovery assessment in the event of an oil spill. Monitoring programs will be designed to ensure meaningful data is collected that is sufficiently powerful to detect ecologically-relevant changes. Where appropriate baseline data is available, sampling designs will always try to collect or use baseline data using a before-after-control-impact (BACI) design.

For those receptors where there is an absence of or limited suitable baseline data, environmental monitoring will be designed such that impacts can be quantified using rigorous scientific and statistical design elements so impacts and recovery can be measured, and to ensure long-term monitoring continues until termination criteria are met.

*In situ*ations where limited or no baseline data is available, post-impact monitoring data will be collected using 'beyond-BACI' principles, resulting in data that is amenable to statistical techniques such as asymmetrical analyses of variance following procedures described by Underwood (1994) and Glasby (1997). This type of analysis involves comparing the disturbed location to the average of multiple unaffected control or reference locations and is a proven and reliable technique for determining environmental impacts. BHP would ensure modern statistical approaches were used in assessments of the effects of an oil spill on sensitive environmental receptors where historical baseline datasets were intended to be compared with post-impact data.

*In situ*ations where a BACI design is not practicable or not appropriate, other sampling designs may be adopted, including:

- impact versus control
- gradient of impacts
- control charts
- lines of evidence.

Effective oil spill response management will be contingent on knowledge of the distribution of sensitive receptors, coupled with access to an oil spill forecast model and situational awareness (e.g., RS2 Monitor and Evaluate) to inform sampling effort, equipment deployment and field logistics in the post-spill pre-impact period. The sampling designs and field procedures specified in the environmental monitoring procedures follow scientific principles such as multiple control locations to allow for comparisons with any impacted locations, as well as sampling before and after the incident with replicated samples and at replicated sites, to allow for robust statistical analyses and the assessment of any environmental impacts (as described by Underwood, 1997).

Given these environmental monitoring procedures have been written for a disturbance that has an extremely low probability of occurrence and is unplanned, specific locations or sampling sites have not been specified in the guidelines. Rather, these would be informed by oil spill trajectory modelling and RS2 Monitor and Evaluate. Thus, by their nature, these sampling designs, and the resources required for implementing them, are flexible and would be scaled either upwards or downwards depending on the nature and scale of the oil spill. For example, sensitive locations, those with limited or no suitable baseline data, and those with a high probability and low minimum time to contact of oil, will be prioritised compared to similar locations with a lower probability and longer time to contact of oil, where time may permit the collection of reactive (post-spill but pre-contact) baseline data.

Aboriginal Cultural Heritage

Monitoring of the potential impacts to Aboriginal heritage sites due to Level 2 hydrocarbon spills or spill response activities shall by coordinated by the BHP Heritage team. This team sits within the BHP Minerals Australia business and has extensive experience and processes in managing Aboriginal Heritage sites for BHP. This team will work with Aboriginal groups and relevant authorities (WA DoT, WA Department of Planning, Lands and Heritage) to identify, protect, and monitor Aboriginal heritage sites to meet the requirements of the WA *Aboriginal Heritage Act (1972)*. The BHP Heritage team will form a sub-team within the BHP IMT Planning team. Information from this team will be provided to the IMT Environment Unit Leader to be integrated into the daily IAP and NEBA assessments.

BHP has procedures for managing Aboriginal heritage sites that cover:

- the process for engaging with Aboriginal groups
- access to recorded heritage sites
- barriers to protect heritage sites
- the process for discovering new heritage sites
- management of information associated with Aboriginal heritage sites which include protocols that restrict access to this information
- the approvals process for land disturbance in relation to Aboriginal heritage sites
- reporting on incidents of unapproved access or disturbance of Aboriginal heritage sites.

BHP seeks to consult with the relevant Aboriginal groups and will apply for approval from the relevant authority if sites are vulnerable to disturbances from spill response activities. These approvals manage and enforce conditions associated with oil spill response activities and ensure compliance to Aboriginal heritage commitments and regulatory requirements. These procedures provide the mechanism for BHP heritage specialists to provide technical and professional advice regarding cultural heritage management of sites, including monitoring and protection requirements, to ensure compliance with legislation and relevant heritage protocols and agreements.

RS10 Environmental Monitoring	
Initiation Criteria	**Refer to individual monitoring programs outlined in Table 11-12.**
Activation Time	Within two hours of forming the IMT.
Resources	Pre-approved vendors for environmental monitoring services. Logistics contractor (located in Exmouth) available to BHP via existing contracts. Vessels available to BHP via existing marine contracts. Vessels of opportunity available on local charter market in Exmouth or Onslow
Termination Criteria	Refer to individual monitoring programs outlined in Table 11-12.
Roles and Responsibilities	Planning Section Chief will initiate the contracted support via Monitoring Service Providers. Logistics Section Chief will initiate required contracted support via Logistics and Marine contractors. Planning Section Chief in liaison with Environment Unit Lead signs off on the finalised monitoring design. Refer to Section 12.6.4 for further detail on Response Personnel Roles and Responsibilities.
Competencies	Planning Section Chief and Operations Section Chief – experience in managing and leading hydrocarbon spill or similar incident. Refer to Section 12.6.15 for BHP’s minimum competency requirements of personnel undertaking environmental monitoring

Potential Environmental Impacts and Risks

Environmental monitoring will be labour-intensive and involve deploying vessels, equipment and personnel. Environmental monitoring activities may also result in impacts to cultural heritage sites and shoreline habitats and fauna, such as damage to intertidal, shoreline and emergent features from trampling by monitoring personnel and grounding/anchoring of monitoring vessels, and disturbance to fauna causing distress and/or changes in behaviour.

Oil Spill Preparedness

The resource capacity and ongoing scalability in the preparedness for environmental monitoring is outlined in Appendix I.

BHP maintains a list of pre-approved vendors who can be called upon at short notice to provide environmental monitoring services in the event of an oil spill.

The BHP Contractor Assurance Program is managed through 1SAP (Maintenance Plan No. 30828237). The scope of the assurance program is to ensure completion of the annual OPEP contractor capability assessment to meet the requirement to maintain oil spill preparedness. Maintenance Plan Task 1.3 includes contacting environmental monitoring vendors to obtain information about personnel, location, qualifications, and skill set.

In addition, Maintenance Plan No. 30884994 includes a quarterly verbal check with each vendor about availability to mobilise in the event of an oil spill to meet the requirements for RS10 Environmental Monitoring response strategy.

Environmental Monitoring Environmental Performance

Table 11-13 provides the environmental performance outcomes, performance standards and measurement criteria for the Environmental Monitoring response strategy.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with each response strategy are detailed above.

Table 11-13 Environmental Performance – Environmental Monitoring

RS10 Environmental Monitoring			
Environmental Performance Outcome	**Implement environment monitoring programs, where RS2 indicates environmental receptors at risk of contact (including cultural heritage), to support and inform spill response planning, assess the effects of spills and monitor post-spill recovery of sensitive environmental receptors contacted by a spill.**		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criteria**
Environmental Monitoring	PS RS10.1	Environmental Monitoring response strategy activities to be reviewed and managed in accordance with the IAP.	IAPs.
	PS RS10.2	Mobilisation of vessels, equipment, and personnel to conduct environmental monitoring in areas where hydrocarbons are predicted to make contact with sensitive environmental receptors and where Operational NEBA identified a net environmental benefit of initiating the response strategy.	Spill modelling reports submitted and logged by IMT. Documentation of completed Operational NEBA.
	PS RS10.3	Initiate mobilisation of environmental monitoring personnel (and equipment/vessels) to site within 48-72 hours of notification by Incident Commander.	Contracts/agreements in place for <u>all</u> pre- and post-spill environmental monitoring activities.
	PS RS10.4	Spill surveillance reports and spill trajectory modelling predictions incorporated into IAP preparation process for response strategies.	IAPs. Incident response reports. Spill modelling reports submitted and logged by IMT.
	PS RS10.5	Implementation of environmental monitoring will follow pre-designated plans for establishing work areas, as described in North West Cape Sensitivity Mapping (AOHSE-ER-0036), to protect environmental sensitivities. For areas outside the mapping areas noted above: • Use the BHP GIS database and/or the DoT OSRA. • Conduct observations/surveys before deploying equipment and personnel to develop a deployment/operations plan, which includes avoidance of impacts to wildlife, minimisation of ground disturbance, protection of sensitive areas, and consultation with DBCA and local stakeholders.	Records of IAPs and field reports include review and management of environmental sensitivities.
	PS RS10.6	Vessels used to implement environmental monitoring will be fit-for-purpose and no anchoring of vessels will occur on emergent reefs or other fragile/sensitive benthic habitats.	Contracts for use of small vessels with OSRAs. Daily field reports show no anchoring on sensitive habitats.

RS10 Environmental Monitoring			
Environmental Performance Outcome	**Implement environment monitoring programs, where RS2 indicates environmental receptors at risk of contact (including cultural heritage), to support and inform spill response planning, assess the effects of spills and monitor post-spill recovery of sensitive environmental receptors contacted by a spill.**		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criteria**
	PS RS10.7	Pre-approved vendors in place during decommissioning activities for activation of environmental monitoring services in the event of an oil spill.	List of pre-approved vendors in place who can be called upon at short notice to provide services if required.
	PS RS10.8	Sampling operations for marine water, sediment quality and benthic infauna to follow procedures outlined in AOHSE-ER-0037 to determine any environmental impacts and inform effectiveness of response strategies. Laboratory analyses will follow: • US EPA Method 8260 (volatile organic hydrocarbons) • US EPA Method 8015 (total petroleum hydrocarbons).	Chain of custody, laboratory results and analytical technique documented. Records of independent peer review of the taxonomy of benthic invertebrates. Environmental monitoring reports containing assessments of environmental impacts.
	PS RS10.9	Sampling operations for marine mammals and megafauna, avifauna, shallow water benthic habitats, marine reptiles, commercial/recreational fish species and mobile and site-attached fishes associated with coral reefs, seagrasses, macroalgal beds, deep-water sponge gardens and mangroves will follow procedures outlined in AOHSE-ER-0038, AOHSE-ER-0039, AOHSE-ER-0040, AOHSE-ER-0043, AOHSE-ER-0048 and AOHSE-ER-0051 to determine any environmental impacts and inform effectiveness of response strategies.	Environmental monitoring reports containing assessments of environmental impacts.
	PS RS10.10	Environmental monitoring includes assessment of impacts from oil pollution and response activities on Aboriginal heritage sites: • Activate BHP Heritage Team less than eight hours after notification from the BHP IMT. • Consult relevant authorities in regard to cultural heritage sites (e.g., Aboriginal groups, WA DoT, WA Department of Planning, Lands and Heritage). • Adhere to relevant cultural heritage legislative requirements and consent from Aboriginal groups.	Evidence of activation of BHP Heritage Team in incident log. Record of IAPs and field reports include review and management of heritage values. Records of consultation with relevant authorities (Aboriginal groups, WA DoT, WA Department of Planning, Lands and Heritage). Records demonstrate no breaches of relevant heritage legislations. Records include copies of relevant permits, approvals, consents.
	PS RS10.11	Environmental monitoring activities continue until termination criteria met (refer to individual monitoring programs outlined in Table 11-12).	Report analysis determines Environmental Monitoring Programs have achieved their endpoint criteria and approved by the Incident Commander in consultation with stakeholders.

RS10 Environmental Monitoring			
Environmental Performance Outcome	**Implement environment monitoring programs, where RS2 indicates environmental receptors at risk of contact (including cultural heritage), to support and inform spill response planning, assess the effects of spills and monitor post-spill recovery of sensitive environmental receptors contacted by a spill.**		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criteria**
	PS RS10.12	Monitoring of pre-approved vendors availability to mobilise, and capability and capacity are appropriate for execution of Environmental Monitoring response strategy.	Annual and quarterly check of capability and availability (as per BHP 1SAP Maintenance Plan numbers 30828237 and 30884994).

11.4.7 Spill Response: RS11 Oiled Wildlife Response

Note: the WA DoT is the Control Agency and DBCA is the Jurisdictional Authority and lead organisation (under DoT) for oiled wildlife response (OWR) within WA State waters. BHP and AMSA are the Control Agencies for oiled wildlife response within Commonwealth waters from facility and vessel spills respectively.

Summary of Activity

OWR includes wildlife reconnaissance/surveillance, wildlife hazing, pre-emptive capture and the capture, cleaning, treatment, and rehabilitation of animals that have been oiled. It also includes the collection, necropsy, and disposal of deceased wildlife impacted by oil.

Reconnaissance/surveillance for oiled wildlife is a critical first-strike response and should be maintained throughout the oiled wildlife response. Adequate wildlife reconnaissance/surveillance is required to determine the amount of wildlife impacted and their locations, to inform and direct the oiled wildlife response.

RS11 Oiled Wildlife Response	
Initiation Criteria	**Operational monitoring shows wildlife are contacted or are predicted to be contacted by a spill.**
Activation Time	Within two hours of forming the IMT.
Resources	Oiled wildlife response equipment and trained personnel available via AMOSC, Mutual Aid and OSRL. Logistics contractor (located in Exmouth) available to BHP via existing contracts. Vessels available to BHP via existing marine contracts. Vessels of opportunity available on local charter market in Exmouth or Onslow.
Termination Criteria	Oiling of wildlife has not been observed over a 48-hour period. Oiled wildlife has been successfully rehabilitated. Agreement is reached with Jurisdictional Authorities and stakeholders to terminate the incident response.
Roles and Responsibilities	Environment Unit Lead to conduct Operational NEBA to confirm strategy will result in net environmental benefit. Environment Unit Lead to advise DoT/DBCA of the potential need for oiled wildlife response. Planning Section Chief will initiate support via AMOSC. Logistics Section Chief will initiate required contracted support via Logistics and Marine contractors. Refer to Section 12.6.4 for further detail on Response Personnel Roles and Responsibilities.
Competencies	Planning Section Chief and Operations Section Chief – experience in managing and leading hydrocarbon spill or similar incident. Oiled wildlife personnel trained in oiled wildlife response techniques. Refer to Section 12.6.14 for further detail on Response Personnel Competencies.

Potential Environmental Impacts and Risks

OWR will require support vessels, aircraft, trained personnel and a suitable oiled wildlife facility for cleaning and aftercare treatment of oiled wildlife.

Potential risks and impacts from implementing the OWR include:

- Non-oiled fauna may be accidentally driven into surface oil slicks or impacted shorelines during hazing and pre-emptive capture activities, resulting in increased numbers of oiled wildlife.
- During hazing and pre-emptive capture activities, oiled fauna may be accidentally driven into surface oil slicks or impacted shorelines rather than away from oil.
- Inappropriate equipment and capture techniques may result in distress, fatigue, injury, death, or the separation of faunal groups (adult/juvenile pairs).
- Inadequate or inappropriate cleaning and husbandry techniques and conditions may result in distress, disease, injury, or death.
- Captured wildlife may be released to inappropriate relocation areas.
- responding safely and efficiently to oiled wildlife
- protecting the health and welfare of wildlife threatened or impacted by oil
- coordinating field reconnaissance of at-risk or impacted wildlife
- preventing or minimising exposure of wildlife to oil where possible
- recovering oiled wildlife safely and effectively
- prioritising the treatment of species of conservation value when resources are limited
- establishing an effective system for the treatment and rehabilitation of oiled wildlife
- releasing wildlife back into the wild as healthy, contributing members of a population
- identifying and removing dead oiled wildlife from the coastal environment.

Specific wildlife permits are required from the DBCA for activities involving protecting and treating wildlife during an Oiled Wildlife Response, including:

- hazing: deterring wildlife from entering oiled sites
- pre-emptive capture: capturing and holding (or translocating) wildlife
- recovering oiled wildlife from the environment
- treating and rehabilitating oil impacted wildlife
- releasing rehabilitated wildlife
- humanely euthanising oiled animals as necessary (under veterinary direction)
- retrieving dead oiled wildlife from the marine and coastal environment.

Oil Spill Preparedness

The WA Oiled Wildlife Response Plan (WAOWRP), developed by DBCA and AMOSC, is the key plan for oiled wildlife response. This plan defines the minimum standards for OWR in WA and is a sub-plan to the State Hazard Plan: Maritime Environmental Emergencies. The Pilbara Region Oiled Wildlife Response Plan sits under the WAOWRP and provides operational guidance to respond to injured and oiled wildlife in the Pilbara.

The worst-case spill scenario for the petroleum activity shows minimal shoreline contact, and large aggregations of wildlife are not expected or known to occur within the moderate exposure thresholds zone of a potential spill release. Consequently, large numbers of oiled wildlife are not anticipated in the event of a spill.

For OWR preparedness, BHP is planning to respond to a low level (Level 2) OWR for the petroleum activity, as defined in the WAOWRP. However, BHP will continue to increase resources beyond this level if the spill demands more facilities and personnel to treat oiled wildlife.

The environmental benefit of the Oiled Wildlife Response strategy is the humane treatment of oiled wildlife through mitigation of impacts from oil. The priority areas for wildlife protection include Ningaloo Marine Park World Heritage listed area, the Muiron Islands, turtle nesting locations and migratory shorebird habitats. Should a spill occur during turtle nesting season and/or the migratory shorebird season (September to April), priority will be given to resourcing OWR at these areas. BHP recognises wildlife abundance varies with differing shoreline types; consequently, SCAT teams will cover the shorelines across the whole impact area and not just those in the high-priority areas.

OWR level	Duration of OWR	Birds general	Birds OWR complex #	Turtles - hatchlings / juveniles / adults	Dolphins / Whales	Pinnipeds	Mammals terristrial	Reptiles	Dugongs
Level 1	<3 days	1-2 birds per day or < 5 total	No complex birds	None	None	None	None	None	None
Level 2	4-14 days	1-5 birds per day or <20 total	No complex birds	< 20 hatchlings no Juveniles or adults	None	None	None	None	None
Level 3	4-14 days	5-10 birds per day or < 50 total	1-5 birds per day or <10 total	< 5 juv/adults, < 50 hatchlings	None	< 5 seals	< 5	< 5 - no crocodiles	None
Level 4	>14 days	5-10 birds per day or < 200 total	5-10 birds p/day	< 20 juv/adults < 500 hatchlings	< 5 or known habitats affected	5-50 seals	5-50 mammals	5-50 reptiles	Dugong habitat affected only
Level 5	>14 days	10-100 birds per day or > 200 total	10-50 birds per day	>20 juv/adults, > 500 hatchlings	>5 dolphins	> 50 seals	> 50 mammals	>50 reptiles	Dugongs oiled
Level 6	>14 days	>100 birds for day	10-50 birds per day	>20 juv/adults, > 500 hatchlings	>5 dolphins	> 50 seals	> 50 mammals	>50 reptiles	Dugongs oiled
# Threatened species, protected by treaty, or specialist feeders									

Source: WAOWRP V1.1 (2014)

Figure 11-2: Oiled Wildlife Response Planning Level

Response Arrangements

In State waters, BHP is required to provide the first strike OWR actions until DBCA takes over, whereby, BHP then becomes the support organisation.

The first strike response actions would initially consist of reconnaissance measures to assess the extent of wildlife impacted (wildlife response level) and formulation of the OWR Plan (in consultation with DBCA) for inclusion in the IAP, and until DBA can take over. The initial OWR Plan may include the following strategies:

- On-going wildlife targeted reconnaissance and monitoring
- Preventative actions such as hazing (scaring wildlife away from the oil) in consultation with DBCA, SMEs and with permit approval
- Wildlife rescue- capture of oiled wildlife
- Field processing- establishment of field site(s), tagging and initiation of individual wildlife paper-trail, triage, first aid, transport to a primary care facility
- Collection, appropriate storage, and transport of wildlife carcasses
- Health and safety

BHP has access to aircraft that could be used for wildlife reconnaissance within hours of a spill. This would be followed by further access to vessels and personnel that could be mobilised within 48 hours.

BHP has the capability to set up oiled wildlife field facilities within 3-4 days of a spill through access to AMSOC equipment, and equipment purchased at the time of a spill. A survey for possible sites to establish an oiled wildlife facility on the Exmouth Peninsula has identified the disused Horizon Energy Station as a potential location.

BHP will not only provide the initial first strike OWR but will act as a support organisation for the ongoing OWR once DBCA takes over, mainly through access to the response capability outlined in Table 11-14 and further resourcing as dictated by DBCA at the time of a spill.

The indicative personnel required for a Level 2 OWR response is 26 personnel (WAOWRP). BHP could support a Level 2 OWR mainly through support staff, such as, non-technical wildlife support roles (management, logistics, planning, human resourcing, transporters, cleaners, trades persons, security etc.). These roles could be filled by BHP personnel and labour hire agencies that can provide workers that undergo an induction and basic training. For those roles requiring technical expertise, BHP will need to activate arrangements with AMOSC and OSRL (Table 11-14), as well as make contractor arrangements for accessing skilled wildlife personnel at the time of a spill.

Table 11-14: Oiled Wildlife Response Capability

Resources	Location	Mobilisation Timeframe
Reconnaissance		
Rotary wing aircraft and flight crew: CHC Contract.	Karratha	Within 2 hours of forming the IMT
Drone and pilots	Local WA hire companies	1-2 days
Vessels of opportunity (BHP marine vessel contractor). Vessels of opportunity available on local charter market	Exmouth and Onslow	Pending availability and location. Expected within 12 hours
Aerial surveillance crew AMOSC staff AMOSC Core Group personnel available Additional trained industry mutual aid personnel available	Perth and Australia wide	< 24-48 hours
Hazing		
3 x AMOSC Wildlife fauna hazing and exclusion kit 1 x AMOSC Breco buoy	2 x Fremantle, 1 x Geelong Fremantle	48 hours
Rescue and field processing		
4 x AMOSC OWR Box Kits (basic medical supplies, cleaning/rehab, PPE)	1 x Fremantle, 1 x Exmouth, 1 x Broome, 1 x Geelong	48 hours
50 % of OSRL Search and rescue kits (including field first aid) (approximately 2 available)	1 x Singapore, 1 x Bahrain, 1 x Fort Lauderdale, 2 x Southampton	Location dependent
OWR facility		
OWR container/ mobile washing facility 2 x AMOSC 4 x AMSA	AMOSC- 1 x Fremantle, 1 x Geelong AMSA- 1 x Dampier, 1 x Darwin, 1 x Devonport, 1 x Townsville	Location dependent
AMOSC call off contract with DWYERTech NZ – a facilities management group	New Zealand	Availability within 24 hours of call-off
Personnel		
BHP labour hire arrangements	WA	< 48 hours
1 x AMOSC Oiled Wildlife Advisor	WA	< 48 hours
AMOSC OWR Industry Team	WA, Australia wide	< 48 hours

Resources	Location	Mobilisation Timeframe
AMOSC MOU with Phillip Island National Perk (best endeavours availability)	Victoria, Australia	Best-endeavour availability
Access to 24/7 technical advice (remote or on-site) from Sea Alarm Foundation	Belgium	Upon notification able to provide remote advice and option to a Sea Alarm Technical Advisor on-site during an incident

Oiled Wildlife Response Environmental Performance

Table 11-15 provides the environmental performance outcomes, performance standards and measurement criteria for the Oiled Wildlife Response strategy.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with the response strategy are detailed above.

Table 11-15: Environmental Performance – Oiled Wildlife Response

RS11 Source Control – Oiled Wildlife Response			
Environmental Performance Outcome	**Implement oiled wildlife response in accordance with the Western Australian Oiled Wildlife Response Plan and Pilbara Region Oiled Wildlife Response Plan to protect or reduce impacts to marine fauna during a spill event by removal and relocation or treatment and release.**		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criteria**
Oiled Wildlife Response	PS RS11.1	Mange Oiled Wildlife Response operations in accordance with the IAP.	IAPs.
	PS RS11.2	Mobilise vessels to conduct Oiled Wildlife Response in areas where surface oil is predicted to travel and make contact with sensitive environmental receptors and where the Operational NEBA identified a net environmental benefit of initiating the response strategy.	Spill modelling reports submitted and logged by IMT. Documentation of completed Operational NEBA.
	PS RS11.3	Lead response personnel are trained and experienced for the activities to which they are assigned.	Training records.
	PS RS11.4	Maintain access to Oiled Wildlife Response Equipment and Personnel through AMOSC and OSRL	Records of AMOSC and OSRL contracts
	PS RS11.5	Oiled Wildlife Response managed in accordance with the WAOWRP	Oiled wildlife logs demonstrate the WAOWRP and PROWRP processes and procedures have been followed.
	PS RS11.7	Response strategy activities continued until termination criteria met.	Incident response reports from RS2 Monitor and Evaluate activities and observation logs detail surface oil slick has been broken up to extent that continuation of the operations is no longer considered to be effective and/or surface oil slick is no longer deemed a potential threat to sensitive environmental receptors.

RS11 Source Control – Oiled Wildlife Response			
Environmental Performance Outcome	**Implement oiled wildlife response in accordance with the Western Australian Oiled Wildlife Response Plan and Pilbara Region Oiled Wildlife Response Plan to protect or reduce impacts to marine fauna during a spill event by removal and relocation or treatment and release.**		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criteria**
	PS RS11.8	Oiled wildlife operations will avoid cultural heritage sensitivities. Consultation with (and authority where necessary) the WA Department of Planning, Lands and Heritage will be required for entry to these sensitivities.	Records of IAPs and field reports include review and management of heritage values.
	PS RS11.9	Oiled wildlife response capability to be maintained for the duration of the response and rehabilitation.	Records of animals relocated, treated, released and deceased.

11.4.8 Spill Response: RS12 Forward Command Post

Summary of Activity

Constant monitoring and evaluation by people on-location is a mandatory strategy required for real-time decision-making during a spill event. The objective of this response strategy is to assist the IMT in planning the oil spill response activities in the spill zone by assisting in developing incident action plans, overseeing field operations, managing rosters and providing situational briefings/debriefings. Personnel within the forward command post will also maintain liaison with local emergency service organisations, industry and other government departments active in the spill zone. The forward command post will be established at Harold E Holt Naval Communications Base or the Exmouth State Emergency Services offices, or another appropriate building.

Potential Environmental Impacts and Risks

There are no relevant environmental risks and impacts associated with mobilising BHP employees and third-party contractors to Exmouth to establish a forward command post outside of standard BHP HSE requirements.

Forward Command Post Environmental Performance

Table 11-16 provides the environmental performance outcomes, performance standards and measurement criteria for the Forward Command Post response strategy.

Table 11-16: Environmental Performance – Forward Command Post

RS12 Forward Command Post			
Environmental Performance Outcome	Forward command post will be maintained to prevent environmental impact to sensitive environmental receptors.		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criterial**
Forward Command Post	PS RS12.1	Mobilise BHP personnel, third-party contractors to Exmouth or Onslow within 24 hours of notification by the BHP Incident Commander.	IMT communication logs demonstrate mobilisation to site within 24 hours of notification by the BHP Incident Commander.
	PS RS12.2	Maintain capability to monitor spill location and coordinate response activities on the ground via location of key personnel at the forward command post for the duration of the oil spill response.	IMT logs demonstrate that forward command post has been maintained for the duration of the oil spill response.

11.4.9 Spill Response: RS13 Waste Management

Summary of Activity

In the event shoreline contact was made and as part of Shoreline Clean-Up, BHP will use Veolia (North West Waste Alliance) who can collect, transport, treat and dispose of oil wastes generated by a hydrocarbon release.

RS13 Waste Management	
Initiation Criteria	**Response activities that will be generating waste have been initiated.**
Activation Time	Within two hours of forming the IMT.
Resources	Waste Service Provider and Logistics contractor available to BHP via existing contracts.
Termination Criteria	All waste generated from the oil spill response has been stored, transported and disposed as per the regulatory requirements. Agreement is reached with Jurisdictional Authority to terminate the response.
Roles and Responsibilities	Planning Section Chief will initiate the contracted support via Monitoring Service Providers. Logistics Section Chief will initiate required contracted support via Waste Service Provider and Logistics contractors. Refer to Section 12.6.4 for further detail on Response Personnel Roles and Responsibilities.
Competencies	Planning Section Chief and Operations Section Chief – experience in managing and leading hydrocarbon spill or similar incident. Refer to Section 12.6.14 for further detail on Response Personnel Competencies.

Potential Environmental Impacts and Risks

During an oil spill clean-up, the disposal of waste material must not pose any threat to the health and safety of people or the environment and must be performed in accordance with relevant State legislation. The type and amount of waste generated will depend on the spill itself and its location. It is important to note the volumes of oily waste recovered from shorelines may be significantly greater than the volume of oil spilled. Typical waste volumes generated will be influenced by a bulking factor:

- For shoreline clean-up there is a 1:10 increase of waste volume generation due to collection of sand and detritus from the high-water mark and surrounding environment.

Table 11-17 identifies the types of waste likely to be generated from a spill from the operations. Based on spill modelling for petroleum activity, BHP do not anticipate that large volumes of waste will be generated.

Table 11-17: Response Strategies and Their Effect on Waste Generation

Response Strategy	Effect on Waste Stream	Type of Waste Generated
Shoreline Protection	The type of spilled oil will often have a profound effect on the amount of oily waste generated. Waste segregation and minimisation techniques are critical to ensure an efficient operation. These should be established at the initial recovery site and maintained right through to the final disposal site otherwise waste volumes will spiral out of control. Waste sites should be managed in such a way as to prevent secondary pollution.	• Oiled personal protective equipment and workforce • Oiled sorbent materials • Oiled equipment/vessels
Shoreline Clean-Up		• Oiled equipment/vessels • Oiled personal protective equipment and workforce • Recovered oil • Oiled vegetation • Oily water • Oiled sorbent materials • Oiled beach material, sand • Oiled flotsam and jetsam • Animal carcasses • Oiled transport
OWR		• Oiled water • Oiled personal protective equipment and consumables • Animal carcasses • Medical supplies

For any spill likely to produce significant amounts of waste, a Waste Management Plan will be developed to ensure:

- oily waste is properly handled and stored
- oil and oily debris are adequately segregated, treated and stored at the point of collection
- oil and oily debris are rapidly collected and taken to designated sites for storage, treatment or disposal
- treatment or disposal practices ensure the waste poses no future threat to the environment.

In addition, the Waste Management Plan will identify how waste volumes will be minimised (Table 11-18).

Table 11-18: Waste Management Hierarchy

Reduction	Efficient response strategies selected for oil spill clean-up to ensure the minimum material is used and/or contaminated during the process.
Reuse	This is the reuse of an item for its original purpose, e.g., clean-up equipment should be cleaned and reused in place of disposable items. An example might be cleaning personal protective equipment so it can be reused.
Recovery	This is the production of marketable product for waste, such as taking waste oil to a refinery for conversion into other useable products. This will be directly affected by the quality of the recovered product, e.g., highly contaminated material is less likely to be suitable for recycling.
Refuse	Refuse is the final and least desirable option. If none of the above methods can be performed for whatever reasons, the waste must be disposed of effectively through some means. This may be the case for highly-mixed wastes of oils, plastics, organic debris, water, sediments, and others that cannot be separated.

The basis for such a Waste Management Plan will include a demonstration of:

- Temporary on-site waste storage – Care will be taken in selecting a location for a temporary waste handling base to allow for waste separation. Local authorities and waste management contractors will be consulted regarding the selection of suitable disposal routes, local regulations and may provide local facilities.
- Segregation of waste – Wherever possible, wastes will be segregated in accordance with the preferred segregation. It may be required to separate oil from associated water, sediment, and debris, in order to minimise volumes. It is preferable this is not attempted on the spill site.
- Onsite handling – Attention will be given to preventing leaching or spillage of oil from vehicles or containers. Onsite handling equipment is available via Macedon Gas Plant, Dampier Port Authority, DoT, AMOSC or AMSA.
- Offsite transport and storage – Only State-licensed waste contractors will be used. Care will be taken that all vessels, vehicles or containers used for transporting oily wastes are effectively sealed and leak-proof.
- Waste treatment and disposal options – The disposal method most appropriate in an incident will depend on several factors, including the nature and consistency of the waste, the availability of suitable sites and facilities, the costs involved and regulatory restrictions.
- Waste separation – Waste separation is usually performed offsite at a designated waste processing area.
- Disposal – Waste must be disposed of in accordance with WA regulations.
- Establishment of a field decontamination facility – The size and complexity of field decontamination facilities required will depend on the character of the oil and the scale and nature of the clean-up being implemented.

Monitoring and Reporting of Waste

The Onshore Materials Logistics Coordinator will be responsible for maintaining a Waste Management Register for all waste generated from the Shoreline Clean-Up response strategy. The designated Waste Contractor will monitor, measure and record all waste streams that are disposed of onshore.

Measurement required by Waste Contractor Conditions include without limitation:

- types of waste collected (such as liquid oily waste)
- quantities of types of wastes collected (such as tonnes, litre)
- destination of waste collated (named authorised disposal facility)
- method of waste disposal (such as landfill, recycling)
- quantity of recyclable waste by type.

The Logistics Team will ensure adequate waste disposal records are being maintained by the Waste Contractor, and that the Waste Reference Number for all waste is communicated to the Onshore Materials Logistics Coordinator for updating the Waste Management Register once waste is disposed.

Waste management reporting will comply with the reporting requirements of:

- Environmental Protection (Controlled Waste) Regulations 2004
- BHP Our Requirements HSEC Reporting
- National Pollutant Inventory annual reporting of emissions and discharges relating to resource consumption, such as waste effluent.

In addition to reporting all waste generated from a spill event, it will also be tracked upon mobilising the Waste Contractor using the Controlled Waste Tracking System (CWTS). This is an online user system provided by DBCA to enable electronic tracking of controlled waste loads across the state. Upon request, DBCA generates user profiles that enable access to components of the CWTS specific to waste generators, carriers and/or waste disposal sites (treatment plants) and enable them to complete their statutory obligations online.

Oil Spill Preparedness

Veolia (North West Waste Alliance) has provided an Emergency Response Capability Statement that outlines its capabilities and capacity to deal with an oil spill scenario from BHP activities. BHP has arrangements in place with Veolia for providing waste management services during a spill incident.

Veolia has and continues to perform various emergency response tasks involving a wide range of hazardous materials. Hydrocarbon spills comprise most of the emergency response tasks, and Veolia has a wealth of experience in this area. In addition to a range of waste bin collection vehicles and trailer and tanker transport, Veolia operates a fleet of vacuum-loading heavy vehicles, with capacities ranging from 3,000 to 25,000 L.

Based on the road travel time from Karratha to Exmouth of around seven hours, it is reasonable to state Veolia will be able to provide BHP with transport and waste storage facilities within 24 hours of mobilising.

Veolia has a combined North West team of more than 150 team members state-wide, national fleet of more than 2,000 specialised vehicles and workforce of more than 3,500. The Veolia mobilisation and shutdown team can deliver crews of up to 100 operators anywhere in the country within 72 hours of callout and 24/7 access to a global technical team. Veolia also performs treatment and disposal services for oil wastes.

Waste Management Environmental Performance

Table 11-19 provides the environmental performance outcomes, performance standards and measurement criteria for the Waste Management response strategy.

The initiation criteria, course of action, resources, supporting documentation and termination criteria associated with each response strategy are detailed above.

Table 11-19: Environmental Performance – Waste Management

RS13 Waste Management			
Environmental Performance Outcome	**Prevent impacts to sensitive shorelines, shoreline receptors and sites of cultural heritage through the implementation of waste management that complies with waste treatment, transport, and disposal regulations and in accordance with waste management hierarchy.**		
Response Strategy	**Control Measure ID**	**Performance Standard**	**Measurement Criteria**

Waste Management	PS RS13.1	Contracts and other third-party agreements for providing equipment/supplies and assisting with waste management in place for duration of activity.	Records of contracts and other third-party agreements in place during activity.
	PS RS13.2	Perform a preliminary IAP and Operational NEBA within 24 hours of an incident, to inform mobilisation of waste management response requirements.	IAPs. Operational NEBA.
	PS RS13.3	Waste management to be reviewed and managed in accordance with the IAP.	IAPs.
	PS RS13.4	All necessary regulatory approvals in place before implementing waste management activities.	Correspondence logs.
	PS RS13.5	Mobilise equipment and personnel to conduct Waste Management response within 24 hours of notification by IMT following outcomes of first IAP and maintained regularly in IAP outcomes.	Waste records/manifests.
	PS RS13.6	Manage waste retrieval in accordance with the Waste Management Plan.	Waste Management Plan.
	PS RS13.7	Implement environmental monitoring to determine the ongoing acceptability of the environmental risk associated with waste management methods.	Monitoring records document ongoing review of the environmental risk and acceptability of waste management methods.
	PS RS13.8	Waste management operations will avoid cultural heritage sensitivities. Consult with (and authority where necessary) the WA Department of Planning, Lands and Heritage for entry to these sensitivities.	Records of IAPs and field reports include review and management of heritage values.
	PS RS13.9	Response strategy activities continued until termination criteria met.	Analysis by the SCAT team and approved by the Incident Commander in consultation with stakeholders, has determined continued waste management is not environmentally and socially beneficial to identified sensitive shorelines and shoreline receptors.

11.5 Hydrocarbon Spill Response As Low As Reasonably Practicable Assessment

11.5.1 Demonstration of As Low As Reasonably Practicable

In considering the approach to demonstrate ALARP for an emergency event, the focus is upon examining ways in which it is possible to mitigate the consequences of the event, particularly what is reasonable to have in place in terms of preparedness for a spill. In the case of demonstrating ALARP for oil spill response, it is necessary to define the objective for which the ALARP option will be evaluated.

This section provides detailed ALARP assessment of the adequacy of resourcing available to support the suitable response spill strategies listed in Table 11-2. In developing the performance standards that apply to each response strategy, BHP has considered the level of performance that is reasonable to achieve for each control measure and the ‘effectiveness’ of the control measure.

The effectiveness of the control measure is assessed by considering:

- availability: the status of availability to BHP
- functionality: a measure of functional performance
- reliability: the probability that the control will function correctly
- survivability: the potential of the control measure to survive an incident
- independence/compatibility: the degree of reliance on other systems and/or controls to perform its function.

This follows the definitions in NOPSEMA's Control Measures and Performance Standards Guidance Note (NOPSEMA, 2020a), with rankings provided in Table 11-20.

Table 11-20: Evaluation Criteria for Ranking Effectiveness

Evaluation Criteria	Effectiveness Ranking	
	Low	**High**
Availability	BHP does not have equipment/resources on standby, or contracts, arrangements or MoUs in place for providing equipment and resources. BHP has internal processes and procedures in place to expedite timely provision of equipment/resources.	BHP has equipment/resources on standby, and/or contracts, arrangements, or MoUs in place for providing equipment and resources.
Functionality	Implementation of the control measure does not greatly reduce the risk/impact.	Implementation of the control measure has material difference in reducing the risk/impact.
Reliability	The control measure is not reliable (for example, has not been tried and tested in Australian waters) and/or low assurance can be given to its success rate and effectiveness.	The control measure is reliable (for example, has been tried and tested in Australian waters) and/or high assurance can be given to its success rate and effectiveness.
Survivability	Control measure has a low operating timeframe and will need to be replaced regularly throughout its operational period in order to maintain its effectiveness.	Control measure has a high operating timeframe and will not need to be replaced regularly throughout its operational period in order to maintain its effectiveness.
Independence/ Compatibility	Control measure relies on other control measures being in place and/or the control measure is not compatible with other control measures in place.	Control measure does not depend on other control measures being in place and/or control measure can be implemented in unison with other control measures.

Each control was then evaluated by considering the environmental benefit gained from implementation compared with its practicability (e.g., control effectiveness, cost, response capacity and implementation time) to determine if the control was either:

- accepted and implemented, or
- rejected.

This traffic light system is used in the ALARP demonstration tables where the 'do nothing' option is rejected, along with a Scalable Option that generally involves mobilising spill response resources and equipment to Exmouth or Dampier. Accepted controls in all the ALARP demonstration tables indicate those that would be implemented as part of the response. Appendix G provides BHP's ALARP assessment for resourcing for spill response strategies.

ALARP Summary

The Operational NEBA is the primary tool used during spill response to select strategies that have the least net impact to environmental strategies and an overall net environmental benefit. The NEBA response strategy evaluation process is a decision support tool that is used as a spill occurs to help interpret spill response activities, particularly where both positive and negative impacts have the potential to arise, in which case the sensitivity with the higher priority becomes the preferred response option. For spill response under the control of BHP, the IMT applies the Operational NEBA process to identify the response options that are preferred for the situation oil type and behaviour, environmental conditions, direction of plume and protection priority of sensitive receptors.

This will ensure, at the strategy level, the response operations reduce additional environmental impacts to ALARP. Spill response activities will be conducted in offshore and coastal waters using vessels and aircraft. The greatest potential for additional impacts from implementing spill response is considered to be to wildlife in offshore waters from oiled wildlife response activities, and to shoreline habitats and fauna receptors within shallow waters or on shorelines from shoreline clean-up activities.

Given the types of activities considered appropriate to responding to a worst-case spill and the scale of the activity, standard control measures adopted by BHP for spill response to reduce the level of additional impacts are considered to reduce these impacts to ALARP. This includes working with the relevant Control Agency for spill response and applying the process and standards, such as for oiled wildlife response as included within the WA Oiled Wildlife Response Plan.

A detailed ALARP evaluation was performed by BHP to determine what additional control measures could be implemented to reduce the level of impacts and risks. No additional controls, beyond those identified during the detailed ALARP assessment can reasonably be implemented to further reduce the risk of impacts. The impacts and risks of the spill response activities are therefore considered to be reduced to ALARP.

11.5.2 Demonstration of Acceptability

BHP considers a range of factors when determining that a level of impact and risk to the environment is broadly acceptable, as summarised in Table 11-21.

Table 11-21: Demonstration of Acceptability for Spill Response Strategies

Acceptability Criteria	Acceptability Criteria	Demonstration
Codes and Standards	Is the impact or risk being managed in accordance with relevant Australian or international legislation, Ministerial Conditions or standards?	Impacts and risks associated with spill response activities are well understood through available information. Control measures implemented will minimise the potential impacts from spill response activities to protected areas and their values, and to species identified in Recovery Plans and Conservation Advice.
Ecologically Sustainable Development (ESD)	Is the proposed impact consistent with the principles of ESD?	BHP performs petroleum activities in a manner consistent with its Charter values and Code of Business Conduct. In determining the level of acceptability of spill response activities, and guided by the Charter value of sustainability, BHP has identified, assessed and controlled risks to minimise environmental impacts. BHP considers this approach is consistent with the principles of ESD.
Internal Context		
BHP Charter and HSE Management System compliance	Is the proposed impact or risk consistent with the requirements of BHP Our Requirements, Petroleum Standard and HSE Management Systems?	Spill response will comply with BHP Charter values and management systems.
Professional judgement	Is the impact or risk being managed in accordance with industry best practice?	Controls identified in this plan are consistent with industry best practice and guidelines. Accepted controls that will be implemented are tabulated in Section 11.4 and Appendix G.
ALARP	Are there any further reasonable and practicable controls that can be implemented to further reduce the impact or risk?	All reasonable and practicable controls have been assessed (refer to tables in Section 11.4 and Appendix G). BHP considers control measures and performance standards for spill response activities reduce the impacts and risks to ALARP.
External Context		

Environmental best practice	Are controls in place to manage the impacts and risk to the environment that are commensurate with the nature and scale of any environmental sensitivities of the receiving environment?	Controls are in place to manage the impacts and risks associated with implementing response activities in the event of a spill. BHP will apply a range of controls to minimise the potential environmental impacts and risks to protected areas and their values, and to protected species and their habitat. The environmental performance outcomes, performance standards and measurement criteria that determine whether the outcomes and standards have been achieved are commensurate with the environmental significance of the receiving environment.
Stakeholder views	Do stakeholders have concerns/issues, and, if so, have controls been implemented to manage their concerns/issues?	Stakeholders have been consulted about the petroleum activity (Section 6) and no stakeholder concerns have been raised regarding this aspect. In the event of a spill, BHP will liaise with relevant regulatory bodies (such as DoT, DNP, DBCA, AMSA) to ensure ongoing consultation regarding spill response information.

Acceptability Summary

BHP will ensure all preventative controls are in place to reduce the risk of a hydrocarbon spill occurring during petroleum activity and the likelihood of the loss of hydrocarbons is extremely low when considering industry statistics and the preventative controls in place. BHP has performed extensive planning and assessment when selecting the spill response options presented, based on:

- the nature and scale of the worst-case hydrocarbon pollution events
- the accessibility, availability and location of appropriate spill response equipment
- the predicted timings of contact of hydrocarbons and loadings of hydrocarbons to sensitive environmental receptors, and the capability and scalability of spill response resources.

BHP has a sound knowledge of the relevant environmental values and sensitivities at risk from hydrocarbon spill events and indirectly from spill response activities, particularly the shallow water and coastal benthic habitats of Ningaloo Reef and Muiron Islands, from work partly funded by BHP.

BHP has assessed the spatial and temporal impacts and risks and environmental benefit gained from implementing spill response activities, which would be considered daily as part of the Operational NEBA. Where BHP is the Control Agency, the decision to implement spill response activities will be made by the BHP Incident Commander, taking into account the outcomes of the daily Operational NEBA, which will incorporate daily situational awareness reports from RS2 Monitor and Evaluate, as well through liaison with DoT.

The proposed control measures for preventing and minimising the risks and impacts associated with implementing spill response activities are comprehensive and consistent with all relevant codes and standards and good oilfield practices. No concerns have been raised by stakeholders regarding response activities. BHP regularly consults with relevant stakeholders about its operations and activities, providing them with sufficient and reasonable opportunities to raise any new concerns or issues for the duration of this petroleum activity. BHP considers control measures presented for spill response activities reduce impacts and risks to an acceptable level.

12 Implementation Strategy

In accordance with Regulation 14 of the Environment Regulations, the EP must contain an implementation strategy for the petroleum activity and monitoring, recording and reporting arrangements. The implementation strategy presented in this section provides specific practices and procedures to ensure:

- all the environmental impacts and risks of the petroleum activity will be continually identified and reduced to a level that is ALARP
- control measures identified in the EP are effective in reducing the environmental impacts and risks of the activity to ALARP and acceptable levels
- environmental performance outcomes and environmental performance standards are met
- arrangements are in place to respond to and monitor impacts of oil pollution emergencies
- arrangements for ongoing consultation with relevant authorities, persons and organisations are in place and maintained through the activities.

12.1 Systems, Practices and Procedures

12.1.1 BHP Petroleum Health, Safety and Environment Management System

The BHP Petroleum HSE Management System defines the boundaries within which all activities are conducted. It provides a structured framework to set common requirements, boundaries, expectations, governance and assurance for all activities. It also supports accountabilities and responsibilities as defined in the organisational structure. The overarching objective of the BHP Petroleum HSE Management System is to aspire to zero harm to people, communities and the environment, and achieve leading industry practice. The structure of the BHP HSE Management System is hierarchical (Figure 12-1).

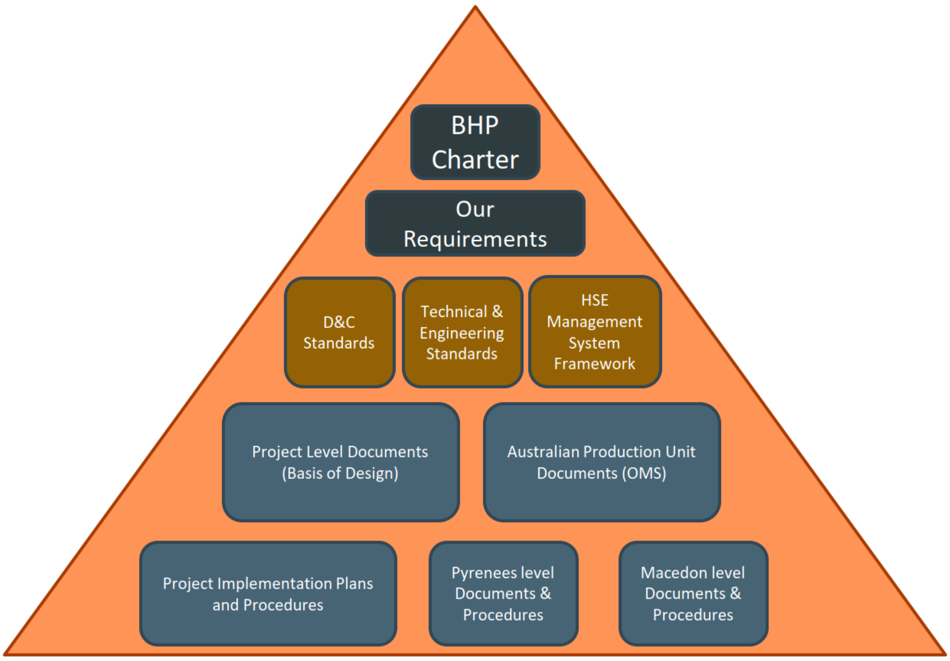


Figure 12-1: BHP HSE Management System

The documents in Figure 12-1 address specific areas (for example, corporate performance reporting, risk management, incident investigation) where it is important activities are conducted consistently across the organisation.

The top level of the triangle shown in Figure 12-1 is the BHP Charter; a copy of the Charter is provided in Appendix A. The Charter details BHP's values and directs the approach to all activities in BHP. It includes value statements about sustainability, integrity, respect, performance, simplicity and accountability. It also provides a means of aligning BHP's values with strategic direction and measures of success. The Charter is supported by BHP's Code of Business Conduct and Working with Integrity. The Charter is signed by the BHP Chief Executive Officer.

The BHP Our Requirements detail and define business planning, risk management and assurance expectations of key process areas. They also serve as audit protocol against which all groups in BHP are assessed. Categories of Our Requirements include HSEC, Human Resources, Legal, Corporate Affairs, Supply and Information Management.

- Direction for environmental performance in BHP is established by the Environment and Climate Change – Our Requirements. The BHP Charter provides a public statement and commitment to zero harm through planning and execution. The petroleum activity will be performed in accordance with the objectives of this Charter, which includes compliance or exceedance with regulatory requirements, setting of objectives and targets and continual improvement. The Charter will be available to all personnel involved in the petroleum activity through the intranet, and hard copies where appropriate.
- The HSE Management System establishes the foundation for continual improvement through applying consistent requirements across all aspects of the petroleum activity, including:
    - identifying statutory obligations and commitments to maintain a licence to operate
    - implementing petroleum risk management processes, including this EP
    - establishing and maintaining the competencies for personnel and providing training to promote expected behaviours
    - managing all contractors and suppliers of petroleum goods and services
    - completing reviews and reporting outcomes of these reviews.

The BHP Petroleum HSE Standard details the mandatory HSE performance requirements as described in the HSE-related Our Requirements and are met through the HSE Management System. They address specific performance requirements that define functional and governance expectations. The controls apply to the entire lifecycle of petroleum activity, processes and products. Contractors are required to comply with the controls, and partners and suppliers are encouraged to adopt the intent and nature of the performance requirements. The controls are regularly monitored through scheduled audit and verification activities and cover the broad areas of:

- hazards and risk management
- crisis and emergency management
- security
- health and hygiene
- aviation
- marine operations
- fatal risks
- environment
- data reporting.

12.2 Environment Plan Organisation, Roles and Responsibilities

A defined chain of command with the roles and responsibilities for key BHP and contractor personnel in relation to EP implementation, management and review are described in Table 12-1. It is the responsibility of all BHP employees and contractors to ensure the BHP Petroleum HSE-related Our Requirements and the BHP Charter (Appendix A) are applied in their areas of responsibility.

Table 12-1: Key Personnel and Environmental Responsibilities

Title	Environmental Responsibilities
Office-based Roles	
BHP Operations Manager	• Ensure compliance with the BHP Charter and Management Standards • Ensure sufficient resources are provided to implement the commitments made in this EP • Provide vessel contractors with the EP and make them aware of the requirements for their activities • Ensure HSE incidents are reported to regulatory authorities as required • Assist the IMT in developing a response strategy in the event of a spill incident
BHP Director of Projects Australia	• Have Technical Authority and manage team of projects and decommissioning professionals • Ensure sufficient resources are provided to implement the commitments made in this EP
BHP Decommissioning Engineering Manager (or equivalent)	• Supervise decommissioning operations, including management of change • Be accountable for developing the decommissioning engineering and associated programs • Ensure compliance with company policies, standards and statutory requirements
BHP Regional HSE Lead	• Ensure compliance with BHP's Charter and Management Standards, this EP and regulatory responsibilities • Ensure incident prepared and response arrangement meet BHP and regulatory requirements • Ensure environmental incidents or breaches of EPOs, EPSs or MCs are reported in line with BHP's incident reporting requirements
BHP HSE Specialist	• Liaise with the Operations Manager, Projects Team and Vessel Master to ensure compliance to legislation, procedures, standards and commitments • Perform environmental education and ensure HSE inductions completed • Ensure compliance with this EP, regulatory and HSE responsibilities • Participate in the hydrocarbon spill response drills • Complete environmental audits to ensure compliance with this EP • Report environmental recordable incidents to NOPSEMA
Contractor Manager	• Prepare, maintain and implement Contractor HSE Management Plans and Procedures • Ensure compliance with this EP, regulatory and HSE responsibilities relevant to their scope of work • Maintain clear lines of communication with the BHP Operations Manager
Field-based roles	
Vessel Contractor Representative	• Be responsible for managing and supervising decommissioning engineering activities in the field site • Ensure field activities are conducted according to the approved programme requirements • Monitor and audit the field activities to ensure compliance with this EP and the regulatory and HSE responsibilities • Manage change during field activities • Disseminate project-specific environmental compliance requirements as required • Ensure environmental incidents or breaches of EPOs, EPSs or MCs are reported and recorded in line with BHP's incident reporting requirements • Comply with this EP, and all regulatory and project obligations applicable to their assigned role

Title	Environmental Responsibilities
Vessel Master	• Manage activities and safety on-board vessel for the duration at sea, and operate under BHP Marine Controls, relevant Commonwealth Acts and Regulations • Ensure vessel operations are undertaken as per this EP and any approval conditions • Conduct SOPEP drills as per vessel's schedule • Report environmental incidents or breaches of EPOs, EPSs or MCs on vessel, in line with BHP's incident reporting requirements • Report recordable incidents • Comply with this EP, and all regulatory and project obligations applicable to their assigned role
All crew	• Work in accordance with accepted HSE obligations and practices • Comply with this EP, and all regulatory and project obligations applicable to their assigned role • Report any hazardous condition, near miss, unsafe act, accident or environmental incident immediately to their supervisor • Report sightings of marine fauna and marine pollution • Attend HSE meetings and training and drills when required • Understand their obligation to 'stop-the-job' due to HSE concerns

12.3 Training and Competency

12.3.1 Competence, Environmental Awareness and Training

BHP's HSE Management System establishes the foundation for continual improvement through applying consistent requirements across all aspects of petroleum activity, including establishing and maintaining the competencies for personnel, and providing training to promote expected behaviours.

For BHP contractors, environmental risks in contracts are managed in accordance with the requirements outlined in the BHP Petroleum HSE Management Standard. As part of the contractor management process, the project vessel contractor's Environmental Management System is assessed to ensure it is aligned with the BHP Charter and BHP Petroleum HSE Management Standard, and meets all commitments made in this EP. If, and wherever, the Contractor's Management System is found to be deficient, it will need to be modified before mobilisation to site.

All personnel on the project vessels are required to be competent and suitably trained to perform their assigned positions. This may be in the form of 'On the Job' or external training. Contractors are responsible for identifying training needs and keeping records of training. Environmental awareness inductions (Section 12.3.3) are required to be performed by all offshore personnel as part of their induction to performing petroleum activity. Vessel contractors and their personnel are made aware of their roles and responsibilities in relation to the requirements of the EP.

12.3.2 Operational Control

The petroleum activity is identified, planned and carried out in accordance with relevant legislation, EP commitments and internal environment standards and procedures. Verification processes are in place to ensure these controls and requirements are being implemented to reduce significant risks to acceptable levels. Some of the key operational controls include:

- task specific toolbox talks, Job Safety Analysis (or equivalent), and associated procedures / checklists;
- contractors' vessel-specific procedures;
- scheduled Preventative Maintenance Systems, tracked through dedicated software packages; and
- environmental inspections by the HSE Specialist.

12.3.3 Specific Environmental Awareness

Inductions are provided to all relevant personnel before mobilising to or on arriving at the activity location. This induction covers the HSE requirements and environmental information specific to the location of the petroleum activity. The induction will include environmental information about:

- general description of the activity location, including any environmentally sensitive areas
- BHP HSE Management System – BHP Charter (Appendix A)
- adherence to standards and procedures, and the use of Job Safety Analysis and Permit to Work hazard identification and management process
- incident reporting process
- spill management including prevention, response and clean-up, location of spill kits and reporting requirements
- waste management requirements and process (segregation of landfill, recycle and hazardous wastes) and location of bins
- reporting of vessel-to-vessel interactions
- reporting procedure for sightings of cetaceans and whale sharks, including the location of marine fauna sighting datasheets.

All personnel who undertake the induction are required to sign an attendance sheet, which is retained by the project vessel contractors.

The project vessels will hold regular HSE meetings which cover all crews. During these meetings, environmental incidents will be reviewed, and awareness material presented. All personnel are required to attend the HSE meetings and attendance sheets are retained by the project vessel contractor. Daily meetings held onboard the project vessels also serve to reinforce environmental awareness during the petroleum activity.

A copy of this EP is provided to the project vessel contractor before performing the petroleum activity.

12.3.4 Incident Management Team

The BHP APU IMT is made up of personnel designated on a roster basis, with each individual available for one week on a 24-hour basis throughout the year, based in Perth. There is a weekly handover and briefing of the operations each week. The BHP APU IMT consists of defined roles which enables BHP to respond to a variety of incidents. The BHP APU IMT is located in the BHP Perth offices and is fully equipped to manage incidents.

IMT members undergo prerequisite Incident Management System training (ICS 100 and ICS 200) before fulfilling their position on the IMT. The training follows industry best practice and incorporates BHP Crisis and Emergency Management (CEM) procedures and processes.

To supplement the initial training, each IMT member participates in desktop exercises and additional minor and major exercises. The training ‘desktop’ exercises are also arranged during the weekly handover sessions, to test a range of IMT responses including oil spill response.

Full details of training requirements for IMT members are detailed in Section 12.6.5.

12.3.5 Contractor Management

For BHP contractors, HSE risks in contracts are managed in accordance with the requirements outlined in the BHP Petroleum HSE Management Standard. As part of the contractor management process, BHP implements pre- and post-contract award processes and activities aimed at ensuring contracts consistently and effectively cover the management of HSE in line with BHP’s Petroleum HSE-related Our Requirements, the BHP Charter and the BHP Petroleum HSE Standard.

While BHP HSE Management System applies to the manner in which BHP execute its responsibilities under this EP, operational control of the project vessels remains the responsibility of the vessel contractor and shall be managed in accordance with BHP Contractor Management Systems.

12.3.6 Marine Operations and Assurance

Systems and procedures are in place to ensure all marine operations for the activities are conducted in accordance with environmental regulatory requirements and BHP marine controls, which cover management of marine operations and contracting of vessels.

The Marine Management Process comprising a Vessel Assurance Questionnaire require audits be completed before hiring a vessel and marine operations suppliers to be audited and verified before engagement. This includes a search of the Offshore Vessel Inspection Database for all relevant records and certification, and additional audits as identified in the risk assessment process for:

- marine management process
- dynamically positioned vessel review
- containment audit to ensure contained transport, storage and discharge of petroleum based and chemical products
- lifting and rigging audit
- emergency response audit.

12.4 Monitoring, Auditing and Management of Non-Conformance and Review

12.4.1 Monitoring Environmental Performance

Environmental performance must be consistent with the BHP Petroleum HSE Standard and commitments made in this EP. The ongoing environmental performance of contractors is the responsibility of key personnel described in Table 12-1. Key data that will be monitored and recorded during the petroleum activity are summarised in Table 12-2.

An as-left ROV survey along the GEP will be undertaken and will be provided to NOPSEMA to meet the requirements of NOPSEMA General Direction (832), which requires:

‘Provide, to the satisfaction of NOPSEMA, for the conservation and protection of the natural resources in the title areas within 12 months after property referred to in direction 1 is removed’

and

‘Make good, to the satisfaction of NOPSEMA, any damage to the seabed or subsoil in the title areas caused by any person engaged or concerned in the operations authorised by the titles within 12 months after property referred to in direction 1 is removed’

Table 12-2: Monitoring and Record-Keeping Summary

Parameter	Monitoring	Record Keeping	Frequency
Marine fauna interactions	Cetacean sightings and interactions (secondary to primary work activities and responsibilities)	Fauna Sighting Datasheet Incident Report Form Monthly Incident Report, Environmental Performance Report	**As required** **As required** **Monthly**
Introduced marine species	Management of biofouling	Marine management process to be completed before hire of project vessels	**Prior to on-hire**
		Record and review of IMS risk assessment by the Environmental Specialist for newly contracted project vessels and immersible equipment entering the operational area	**Prior to on-hire**
		Project vessels’ Biofouling Management Plan and recordkeeping	**Prior to on-hire**
		In-water or dry-dock inspection records for biofouling risk of project vessels sourced from international waters	**Within seven days of mobilisation from foreign port**

Parameter	Monitoring	Record Keeping	Frequency
		Locally sourced vessels that can demonstrate they have only operated within the North West Bioregion for a period of less than three years since they were last assessed as low risk as the result of an in-water or out-of-water IMS inspection (by an approved biofouling inspector) Includes vessels that have exited the Northwest Bioregion for periods of less than seven consecutive days, yet remained within the state (Western Australia) or offshore (>12 nm)	**Prior to on-hire**
		Records of latest in-water or out-of-water inspection demonstrate that the inspection is performed by an approved biofouling inspector	**Prior to on-hire**
	Management of ballast	Approved BWM Plan Approved BWM Certificate Ballast water records	**Prior to entering Australian waters**
Atmospheric emissions	Details of diesel consumption, cold venting and monitoring and reporting of greenhouse gas, ozone-depleting substances, fluoride, nitrogen dioxide, sulphur dioxide and energy use	Daily Reports Envirosys Records ODS Record Book	**Daily during activity**
Waste	Sewage and grey water volumes	Vessel log	**End of activity**
		Maintenance records for sewage and grey water equipment	**End of activity**
	Hazardous and non-hazardous solid waste volumes	Garbage Record Book	**End of activity**
		Maintenance records demonstrating functioning macerator onboard Vessel	**End of activity**
	Oily water – bilges and machinery spaces volumes	Oil Record Book	**End of activity**
	Fuels and oils volumes	Containment and inspections, maintenance records, PMS records, checklists	**End of activity**
	Hazardous chemicals volumes	Hazardous chemical locker inspection	**End of activity**
	Loss or discharge to sea of harmful materials	Record log of report to AMSA RCC	**As required**
	Recovered GEP [1] (contingent GEP removal)	Waste Records Refer Section 12.4.2 for waste manifest data	**As required during activity**
Marine user interactions	Interactions with shipping and commercial fishing vessels movements	Vessel log Incidents also recorded in the BHP 1SAP system	**As required**
Seabed disturbance	Post-removal ROV survey	ROV post-removal images and records	**End of activity**
Training	Details of crew inductions and drills	Induction Record Sheets and drill reports	**As completed**

Note 1: The total amount of waste disposed and waste streams will be included in the environmental performance report submitted by BHP to NOPSEMA (Section 11.5.1)

12.4.2 Long-term Monitoring of the GEP

The *Offshore Petroleum Decommissioning Guideline* (Commonwealth of Australia, 2018), *Section 572 Maintenance and Removal of Property* (NOPSEMA 2020b) and draft *Section 270 NOPSEMA Advice - Consent to Surrender Title* (NOPSEMA 2021) describe the requirement for titleholders to address arrangements for long-term monitoring of equipment abandoned *in situ*. These arrangements are addressed in this section.

BHP’s approach to monitoring is intended to:

- Confirm the condition of the GEP at the time of abandonment
- Credibly predict the future condition of the GEP as it degrades

- Determine if additional risk management is required if the assumptions made in the impact assessment are found to be incorrect.

Confirming the Condition at the Time of Abandonment

BHP has routinely undertaken inspections of the GEP during the operational and cessation of production phases. These surveys have shown that the GEP is stable on the seabed in Commonwealth waters, with no evidence of notable lateral displacement of the GEP.

As outlined in Section 4.9, BHP will undertake an as-left survey to confirm the position of the GEP. Information from this survey will inform consultation with relevant persons, such as confirming the position of the GEP to the AHO for inclusion on hydrographic charts.

Predicting the Future Condition of the GEP

This is consistent with the results of a pipeline stability and corrosion assessments commissioned by BHP, which determined:

- Once abandoned and flooded with seawater, the GEL will degrade between 200 and 1,200 years, depending on corrosion rates and loading
- The section of the GEP in Commonwealth waters is stable in a 100-year return period metocean event (assumed to be an intense cyclone), with a maximum displacement of 1.7 m. This assumes that the GEP is unburied. The GEP in Commonwealth waters is largely partially embedded in the seabed and is predicted to become progressively more buried over time, which will further inhibit lateral movement of the GEP. Hence, the assumption that the GEP is unburied is conservative.

Based on the outcomes of surveys during the operational and cessation of production phases, the corrosion assessment and the stability assessment, BHP is confident that the GEP in Commonwealth waters is stable and will not move beyond the 100 m wide pipeline corridor during the entire degradation process. No long-term monitoring to confirm the position of the GEP is warranted.

Materials from the construction of the GEP will be released to the environment as they degrade. As outlined in Section 4.5, steel and concrete constitute most of the material. The plastic components comprise a relatively small portion of the GEP material. The GEP will not be abandoned *in situ* unless the concentration of mercury is shown to be acceptable. These materials do not pose credible risk of toxic effects in the marine environment and their impacts on the environment are reliably predicted in Section 8.7. As such, monitoring for potential toxicants in sediments or biota (e.g., fishes) is not warranted.

Determining if Additional Mitigation is Required

The existing environment in which the GEP will be abandoned is closed to trawl fishing. The only fishery in the region that uses trawled gear in the water depths along the GEP in Commonwealth waters is the Pilbara Trawl Fishery. This fishery targets demersal fish using trawl nets that are dragged along the seabed, resulting in disturbance to the seabed. Benthic trawls are known to interact with subsea pipelines, with free spans posing a risk of snagging otter boards on trawls (Rouse et al., 2020).

The current management arrangements for the Pilbara trawl fishery came into effect in the 1990's recognise the environmental impact of trawl fishing and limit trawling to several management areas north of Dampier and Port Hedland, the nearest of which is over 180 km from the GEP. Anecdotal evidence from the Western Australian Department of Fisheries suggests that the current management boundaries are very unlikely to be extended to permit the Pilbara trawl fishery to operate over the GEP.

Other fishing methods targeting demersal scalefish, such as lines and traps, have very little potential to interact with the GEP once abandoned *in situ*. Fishers using these methods may reasonably be expected to target the GEP to benefit from the fish assemblage associated with the GEP.

BHP will monitor for potential interactions with fishers by continuing to monitor the management arrangements for fisheries using trawled gear in the region. If these arrangements change such that there is an increased risk of interactions with the GEP, BHP will consult further to inform fishers that the GEP should be avoided. Note that the location of the abandoned *in situ* GEP will be marked on nautical charts by the AHO.

12.4.3 Recovered GEP Waste Monitoring

All recovered GEP waste transported from offshore will be properly manifested. Waste manifests will include the following information:

- Manifest identification number;
- Quantity (m^3/Kg)
- Waste description
- Waste container(s) number and description
- Date of shipment
- Final Destination Description (e.g.: recycling, landfill, etc.)
- Transporter data and waste acceptance declaration
- Receiver data and waste acceptance declaration
- DG class and UN number (for environmentally hazardous waste / NORMS)
- Special handling instructions
- Any other information required by the waste contractor.

12.4.4 Record Keeping

Compliance records will be maintained. Record keeping will be in accordance with Regulation 14(7) of the Environment Regulations that addresses maintaining records of emissions and discharges (Table 12-2).

12.4.5 Auditing, Assurance, Management of Non-Conformance, and Continuous Improvement

The environmental performance of BHP activities will be reviewed in a number of ways to:

- ensure all significant environmental aspects of the activity are covered in the EP
- ensure management measures to achieve environmental performance outcomes are being implemented, reviewed and amended where necessary
- ensure all environmental commitments have been met
- ensure impacts and risks will be continuously identified and reduced to ALARP
- identify potential non-conformances and opportunities for continuous improvement.

BHP reviews and audits its contractors at various stages, including before contract award, before the activities and during activities, in accordance with BHP HSE Management System performance. The environmental performance of contractors to BHP involved in activities will be reviewed through activities including:

- inspections of Contractor Management systems and procedures
- pre-activity audits
- review of reporting documentation
- monitoring of progress
- auditing and assurance program
- regular review of incident, audit, inspection, observation, safety meeting and daily operations reports
- action item tracking and closeout
- end of campaign reviews.

The environmental performance of BHP activities will be reviewed through the following:

- The EP will be distributed to the project vessel contractor before performing the petroleum activity and compliance against EPOs, EPSs and MCs monitored regularly by BHP.
- All environmental management commitments from the EP will be documented and a description of compliance with each commitment will be maintained.

Environment compliance monitoring allows continuous improvement initiatives to be developed and inform the development of future EPs.

12.4.6 Management of Change

Permanent or temporary changes to organisation, equipment, plant, standards or procedures have a potential health, safety, integrity or environmental impact are assessed and subject to formal review and approval as outlined in the BHP HSE Management Standards. This standard requires the change to be justified and authorised, risk assessed to understand the potential impacts of the change, a plan to be in place that clearly specifies the timescale for the change and any control measures to be implemented, and the situation to be reassessed if there is an unexpected change in circumstances. The level of management approval for each change is commensurate with the risk.

Management of changes relevant to this EP, such as timing of the activity or changes to the scope of the activity described in Section 3 of this EP, will be made in accordance with Management of Change procedures outlined in the BHP HSE Management Standards (refer to Section 12.1.1).

The Management of Change process also allows for assessing new information that may become available after acceptance of the EP, such as new management plans for AMPs, new recovery plans or conservation advice for species, and changes to the EPBC Protected Matters Search results.

The Management of Change will be assessed and subject to formal review to determine if a revision of the accepted EP in force for the cessation activities must be submitted to NOPSEMA pursuant to Regulation 17 of the Environment Regulations.

12.5 Reporting

To meet the environmental performance outcomes and standards outlined in the EP, BHP reports at a number of levels as described in the next subsections.

12.5.1 Routine Reporting (External)

Routine regulatory reporting requirements for the petroleum activity are summarised in Table 12-3. The requirements include that BHP develop and submit an annual Environmental Performance Report to NOPSEMA, with the first report submitted within 12 months of the commencement of activities covered by this EP (as per the requirements of Regulation 14(2) (b) of the Environment Regulations).

Table 12-3: Routine External Reporting Requirements

Report / Notification	Recipient	Frequency	Communication	Comment
Before the Activity				
AHO pre-start notification	AHO	No less than four weeks notification before the commencement of activities, where practicable.	Written	As requested by AMSA and AHO during consultation.
NOPSEMA pre-start notification.	NOPSEMA	At least ten days before the activity commences	Written	Complete NOPSEMA's Regulation 29 Start or End of Activity Notification form prior to petroleum activity
WAFIC pre-start notification – Relevant Commercial Fishers (via WAFIC)	WAFIC	Prior to activity commencement	Written	-
AMSA JRCC Notification	AMSA	24 to 48 hrs prior to activity commencement	Written	As requested by AMSA during consultation.
DMIRS notification	DMIRS	Prior to equipment recovery	Written	**Notify DMIRS of the start date recovery executions, (petroleum.environment@dmirs.wa.gov.au).** As requested by DMIRS during consultation.
DoD notification	DoD	Minimum of five weeks notification prior to the commencement of activities.	Written	As requested by DoD during consultation.
During the Activity				
Recordable incident as required by Regulation 26B NOPSEMA must be notified of a breach of an EPO or EPS, in the environment plan that applies to the activity that is not a reportable incident.	NOPSEMA	Complete NOPSEMA's Recordable Environmental Incident Monthly Report form.	Written	Written report - The report must be submitted as soon as practicable after the end of the calendar month, and in any case, not later than 15 days after the end of the calendar month.
Reportable Incident, as required by) Regulation 16(c), 26 & 26A NOPSEMA must be notified of any reportable incidents. For the purposes of Regulation 16(c), a reportable incident is defined as: *An incident relating to the activity that has caused, or has the potential to cause,*	NOPSEMA	As soon as practicable, and in any case not later than two hours after the first occurrence of a reportable incident, or if the incident was not detected at the time of the first occurrence, at the time of becoming aware of the reportable incident	Oral	The oral notification must contain: • all material facts and circumstances concerning the reportable incident known or by reasonable search or enquiry could be found out • any action taken to avoid or mitigate any adverse environmental impacts of the reportable incident • the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident.
	NOPSEMA NOPTA	As soon as practicable after the oral notification.	Written	A written record of the oral notification must be submitted. The written record is not required to include anything that was not included in the oral notification.

Report / Notification	Recipient	Frequency	Communication	Comment
moderate to significant environmental damage.	NOPSEMA NOPTA	Must be submitted as soon as practicable, and in any case not later than three days after the first occurrence of the reportable incident unless NOPSEMA specifies otherwise. Same report to be submitted to within seven days after giving the written report to NOPSEMA.	Written	A written report must contain: • all material facts and circumstances concerning the reportable incident known or by reasonable search or enquiry could be found out • any action taken to avoid or mitigate any adverse environmental impacts of the reportable incident • the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident • the action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future. Consider reporting using NOPSEMA's Report of an Accident, Dangerous Occurrence or Environmental Incident form.
Environmental Performance as required by Regulation 26C NOPSEMA must be notified of the environmental performance at the intervals provided for in the EP.	NOPSEMA	A detailed environmental performance report will be submitted within three months of submission of Regulation 29(2).	Written	Written report must contain sufficient information to determine whether or not environmental performance outcomes and standards in the EP have been met.
AMSA notification of activity change	AMSA	As soon as practicable.	Written	Any changes to the intended operations.
AMSA notification of any oil pollution incidents in Commonwealth waters	AMSA	Within two hours.	Oral and Written	In accordance with the Navigation Act 2012, any oil pollution incidents in Commonwealth waters will be reported by the Vessel Master to AMSA within 2 hours via the national emergency notification contacts and a written report within 24 hours of the request by AMSA. The national 24-hour emergency notification contact details are: Freecall: 1800 641 792 Fax: (02) 6230 6868 Email: mdo@amsa.gov.au
Department of Transport Reporting All actual or impending MOP incidents that are in, or may impact, State waters resulting from an offshore petroleum activity.	Oil Spill Response Coordination (OSRC) Unit within the DoT	Within two hours.	Oral	Notification of actual or impending spillage, release or escape of oil or an oily mixture that is capable of causing loss of life, injury to a person or damage to the health of a person, property or the environment
		POLREP following verbal notification. SITREP within 24 hours of request	Written	All oil pollution incidents in WA State waters will be reported by the Vessel Master to the Oil Spill Response Coordination (OSRC) Unit within the DoT as soon as practicable (within 2 hours of spill occurring) via the 24 hour reporting number (08) 9480 9924. The Duty Officer will then advise whether the following forms are required to be submitted: • Marine Pollution Form (POLREP) http://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-PollutionReport.pdf and/ or • Marine Pollution Situation Report (SITREP) http://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-SituationReport.pdf

Report / Notification	Recipient	Frequency	Communication	Comment
Director of National Parks (DNP) Reporting Notification of the event of oil pollution within a marine park or where an oil spill response action must be taken within a marine park; or if any changes to intended operations (requested through consultation	Director of National Parks	So far as reasonably practicable prior to response action being written.	Oral and written	The DNP should be made aware of oil/gas pollution incidences which occur within a marine park or are likely to impact on a marine park as soon as possible. Notification should be provided to the 24 hour Marine Compliance Duty Officer on 0419 293 465. The notification should include: • titleholder details • time and location of the incident (including name of marine park likely to be affected) • proposed response arrangements as per the OPEP (such as dispersant, containment) • confirmation of providing access to relevant monitoring and evaluation reports when available • contact details for the response coordinator. • Note that the DNP may request daily or weekly Situation Reports, depending on the scale and severity of the pollution incident.
DPIRD Reporting If marine pests or disease are suspected this must be reported to DPIRD.	Director of National Parks	As soon as practicable.	Written	Notify if details regarding the activity change and result in an overlap with or new impact to a marine park
	DPIRD	Within 24 hours.	Oral	Notification of any suspected marine pests or diseases including any organism listed in the Western Australian Prevention List for Introduced Marine Pests and any other non-endemic organism that demonstrates invasive characteristics.
DAWE Reporting Any harm or mortality to EPBC Act listed threatened marine fauna.	DAWE	Within seven days to EPBC.permits@environment.gov.au	Written	Notification of any harm or mortality to an EPBC listed species of marine fauna whether attributable to the activity or not.
DAWE Reporting Marine Fauna Sighting Data	DAWE	As soon as practicable, in any case no later than three months of the end of the activity.	Written	Marine fauna sighting data recorded in the marine fauna sighting database.
Department of Biodiversity, Conservation and Attractions (DBCA) Reporting Any harm or mortality to fauna listed as threatened under the WA Biodiversity Conservation Act 2016.	DBCA	A fauna report will be submitted to DBCA within seven days to fauna@dbca.wa.gov.au.	Written	Notification of any harm or mortality to fauna listed as a threatened species under the WA Biodiversity Conservation Act 2016 as a result of BHP activities.
Australian Marine Mammal Centre Reporting Any ship strike incident with cetaceans will also be reported to the National Ship Strike database.	DAWE	As soon as practicable.	Written	Ship strike report provided to the Australian Marine Mammal Centre: https://data.marinemammals.gov.au/report/shipstrike

Report / Notification	Recipient	Frequency	Communication	Comment
Department of Biodiversity, Conservation and Attractions Reporting Impacts to marine mammals or turtles in reserves.	DBCA	Within 48 hours.	Written	Notification of any incidence of entanglement, boat collisions and stranding of marine mammals in the reserves and any incident of turtle mortality and incidents of entanglement in the reserves as detailed in the Management Plan for the Montebello/Barrow Islands Marine Conservation Reserves.
After the Activity				
NOPSEMA Annual Environment Plan Performance Report	NOPSEMA	Should an activity be continuous for 12 months, then a summary environmental performance report will be submitted before the end of this period.	Written	As required by Regulation 14 (2) and 26C the report will assess compliance with the EPOs and EPSs outlined in this EP. The reporting period is 1 January to 31 December each year.
NOPSEMA Decommissioning progress report In accordance with NOPSEMA General Direction (832)	NOPSEMA	Annual, no later than 31 December each year	Written	Submit to NOPSEMA on an annual basis, until all directions have been met, a progress report detailing planning towards and progress with undertaking the actions required by Direction 1, 2, 3 and 4. The report submitted under Direction 5(a) must be to the satisfaction of NOPSEMA and submitted to NOPSEMA no later than 31 December each year. Publish the report on the registered holders' website within 14 days of obtaining NOPSEMA satisfaction under Direction 5(b)
DMIRS Notification	DMIRS	End date of activities	Written	Notify DMIRS of the end date of the subsea equipment recovery, (petroleum.environment@dmirs.wa.gov.au).
To meet Direction 3 in Schedule 1 of NOPSEMA General Direction (832): Provide, to the satisfaction of NOPSEMA, for the conservation and protection of the natural resources in the title areas within 12 months after property referred to in Direction 1 is removed	NOPSEMA	Within 12 months after property referred to in Direction 1 is removed	Written	Findings of sediment sampling and post-removal ROV footage from as-left survey will be provided to NOPSEMA

Report / Notification	Recipient	Frequency	Communication	Comment
To meet Direction 3 in Schedule 1 of NOPSEMA General Direction (832): Make good, to the satisfaction of NOPSEMA, any damage to the seabed or subsoil in the title areas caused by any person engaged or concerned in the operations authorised by the titles within 12 months after property referred to in Direction 1 is removed	NOPSEMA	Within 12 months after property referred to in Direction 1 is removed	Written	Findings of sediment sampling and post-removal ROV footage from as-left survey will be provided to NOPSEMA
National Pollutant Inventory (NPI) Report	DAWE	Annual, by 30 September each year.	Written	Summary of the emissions to land, air and water including those from the facility. Reporting period 1 July to 30 June each year.
National Greenhouse and Energy Reporting (NGERS)	Clean Energy Regulator	Annual, by 31 October each year.	Written	Summary of energy use and greenhouse gas emissions including those from the facility. Reporting period is 1 July to 30 June each year.
NOPSEMA Environmental Performance Report	NOPSEMA	Annual, with the first report submitted within 12 months of the commencement of the petroleum activity covered by this EP	Written	In accordance with the Regulation 26C, confirmation of compliance with the Performance Outcomes, Performance Standards and Measurement Criteria of this EP. Reporting period 1 July to 30 June. Report must include sufficient information to enable NOPSEMA to determine whether or not the environmental performance outcomes and performance standards in the EP have been met.
NOPSEMA End-of-activity EP Performance Report	NOPSEMA	Within three months of EP completion	Written	The EP will end when BHP notify NOPSEMA that petroleum activity has ended, and all of the obligations under the EP have been completed, and NOPSEMA has accepted the notification, in accordance with Regulation 25A of the Environment Regulations.

12.5.2 Incident Reporting (Internal)

BHP employees and contractors are required to report all environmental incidents and non-conformance with commitments made in the EP. It is the responsibility of the BHP Regional HSE Lead to ensure reporting of environmental incidents meets both regulatory reporting requirements and BHP Petroleum HSE Standard.

1SAP is used for recording and reporting these incidents. Detailed investigations are completed for all actual and high-potential environmental incidents. The classification, reporting, investigation, and actioning of all incidents, including environmental, are performed in accordance with the BHP Petroleum Event and Investigation Management Protocol. Incident (potential or actual) corrective actions are monitored using 1SAP.

12.5.3 Incident Reporting (External) – Reportable and Recordable

Reportable Incidents

A reportable environmental incident is defined in Regulation 4 of the Environment Regulations as:

> *"…**reportable incident**, for an activity, means an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage"*.

Reportable incidents for the petroleum activity include those that have been identified through the risk assessment process as having a severity (consequence) level of ≥3 (refer to Figure 7-3):

- Surface release of MDO from a project vessel as a result of an external impact (vessel collision) which ruptures an MDO tank.
- Movement of project vessels and immersible equipment from known high invasive marine species risk areas.

In accordance with Regulations 26, 26A and 26AA, BHP will report all reportable incidents orally to NOPSEMA, as soon as practicable, and in any case not later than two hours after the first occurrence of the reportable incident; or if the reportable incident was not detected at the time of the first occurrence, the time of becoming aware of the reportable incident.

Oral notifications of a reportable incident to NOPSEMA will be via telephone: 1300 674 472.

The oral notification must contain:

- all material facts and circumstances concerning the reportable incident known or could be obtained by reasonable search or enquiry
- any action taken to avoid or mitigate any adverse environment impacts of the reportable incident
- the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident.

A written record of the reportable incident will be provided to NOPSEMA, as soon as practicable after making the oral notification, but within three days after the first occurrence of the reportable incident unless NOPSEMA specifies otherwise. The written report should use a format consistent with NOPSEMA's Report of an Accident, Dangerous Occurrence or Environmental Incident (Form FM0929).

Within seven days of giving a written report of a reportable incident to NOPSEMA, a copy of the same written report must be provided to the National Petroleum Titles Administrator (NOPTA), and Department of Mines, Industry Regulation and Safety (DMIRS).

Written notification must be provided of any environmental incident that could potentially impact on any land or water in State jurisdiction via: petroleum.environment@dmirs.wa.gov.au.

Recordable Incidents

A recordable environmental incident is defined in Regulation 4 of the Environment Regulations as:

> *"…**recordable incident**, for an activity, means a breach of an environmental performance outcome or environmental performance standard, in the environment plan that applies to the activity, that is not a reportable incident".*

In terms of the activities within the scope of this EP, a recordable incident is a breach of the environmental performance outcome or environmental performance standards listed in this EP.

In the event of a recordable in recordable incident, BHP will report the occurrence to NOPSEMA as soon as is practicable after the end of the calendar month in which it occurs; and in any case, not later than 15 days after the end of the calendar month. If no recordable incidents have occurred, a ‘nil incident’ report will be submitted to NOPSEMA. Written reporting to NOPSEMA of recordable incidents and ‘nil incidents’ can be via completion of NOPSEMA’s Form FM0928– Recordable Environmental Incident Monthly Report. The report will contain:

- a record of all the recordable incidents that occurred during the calendar month;
- all material facts and circumstances concerning the recordable incidents that are known or can, by reasonable search or enquiry, be found out;
- any action taken to avoid or mitigate any adverse environmental impacts of the recordable incidents;
- the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the recordable incident; and
- the action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future.

12.6 Emergency Preparedness and Response

12.6.1 Overview

Under Regulation 14(8), the implementation strategy must contain an oil pollution emergency plan (OPEP) and provide for the updating of the OPEP. In accordance with Regulation 14, the sections below detail the implementation strategy for hydrocarbon spill emergency conditions during decommissioning activities. The section outlines the response framework in the event of a hydrocarbon spill and the emergency response arrangements for a Level 1 and 2 oil spill event based on the strategic NEBA assessment. Specific BHP practices and procedures are presented to ensure that the environmental impacts and risks of spill response activities will be continuously identified and reduced to ALARP, along with environmental performance outcomes, performance standards and management criteria for spill response activities.

As part of the implementation strategy, BHP has developed an activity-specific OPEP (Appendix E). The implementation strategy includes BHP processes and procedures for how training, competencies and on-going environmental awareness will be maintained for the duration of the activity, for all personnel and contractors involved in spill response activities (resourced by BHP).

12.6.2 Oil Spill Response Arrangements

Incident Jurisdictions

In the event of an oil spill, Control Agencies are assigned to respond to the various levels of spills is outlined Table 12-4. The ‘Statutory Agency’ and ‘Control Agency’ are defined as follows:

Jurisdictional Authority*: the State or Commonwealth Agency assigned by legislation, administrative arrangements or within the relevant contingency plan, to control response activities to a maritime environmental emergency in their area of jurisdiction.*

Control Agency*: is the agency with operational responsibility in accordance with the relevant contingency plan to take action to respond to an oil and/or chemical spill in the marine environment.*

Table 12-4: Statutory and lead control agencies for oil spill pollution incidents

Area	Spill Source	Jurisdictional Authority	Lead Control Agency	
			Level 1	Level 2
Commonwealth Waters	Offshore Petroleum Activity	NOPSEMA	BHP	BHP
	Vessels	AMSA	AMSA	AMSA
State Waters	Offshore Petroleum Activity	DoT	BHP	DoT
	Vessels	DoT	DoT	DoT
Port Waters	Vessels	Port Authority	Port Authority / DoT	Port Authority / DoT

Commonwealth waters

BHP holds the Control Agency role for its facility-related spills within Commonwealth waters. As defined by Schedule 3, Part 1, Clause 4 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006, 'facility' spills include those from fixed platforms, Floating Production Storage and Offloading (FPSO)/Floating Storage and Offloading (FSO) systems, Mobile Offshore Drilling Units (MODU) and subsea infrastructure. It also includes vessels undertaking decommissioning activities in BHP's operational area.

For instances where BHP, as the Control Agency, requests assistance of AMSA, BHP will request an AMSA liaison officer be mobilised to the IMT as soon as possible. In the interim period until AMSA have assembled their IMT, BHP (Incident Commander) will liaise closely with the AMSA liaison officer and or the AMSA Incident Controller to inform them of first strike/initial actions being taken.

Western Australia

For WA State waters, the DoT Chief Executive Officer is prescribed as the Hazard Management Agency (HMA) for marine oil pollution as per the WA Emergency Management Act 2005 and Emergency Management Regulations 2006. The DoT as the HMA has developed the State Hazard Plan: Maritime Environmental Emergencies (DoT, 2021).

If a Level 2 spill has potential to enter WA waters, BHP would contact the DoT Maritime Environmental Emergency Response (MEER) unit, as per the reporting requirements in Appendix A - First Strike Plan of the OPEP (Appendix E). Upon notification, the DoT would assume the role of Control Agency and would activate its Maritime Environmental Emergency Coordination Centre (MEECC), DoT Incident Management Team (IMT) and appoint the State Maritime Environmental Coordinator (SMEEC).

BHP will be required to work in coordination with DoT during such instances, as outlined within the DoT's Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (July 2020) (available online: https://www.transport.wa.gov.au/imarine/oil-spill-contingency-plans.asp).

For Level 2 spills that cross from Commonwealth waters to WA waters, both DoT and BHP will be Control Agencies and would work in partnership to coordinate the response effort. For a cross-jurisdictional response, there will be a Lead IMT (DoT or BHP) for each spill response activity, with DoT's control resting primarily on State waters activities.

Appendix 2 of the Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (July 2020) provides guidance on the allocation of a Lead IMT to response activities for a cross jurisdictional spill.

To facilitate effective coordination between the two Controlling Agencies and their respective IMT's during a cross-jurisdictional response, a Joint Strategic Coordination Committee (JSCC) will be established (Figure 12-2). The JSCC will be jointly chaired by the State Marine Pollution Coordinator (SMEEC) and BHP's nominated senior representative and will comprise of individuals deemed necessary by the chairs to ensure an effective coordinated response across both jurisdictions. Additional detail on the JSCC's key functions are outlined in the Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (July 2020).

At the request of the SMEEC, BHP will be required to provide all necessary resources, including personnel and equipment, to assist the DoT's IMT in performing duties as the Control Agency for State waters response. This includes providing an initial 11 personnel to work within the DoT Incident Control Centre in Fremantle, no later than 8 am following the day of the request. It also includes providing personnel to serve in DoT's Forward Operating Base (FOB) no later than 24 hours following formal request by the SMEEC. DoT will in turn, provide BHP with Liaison Officer/s from DoT's command structure to sit within BHP's IMT. Figure 12-3 shows the organisational structure of DoT personnel embedded in the BHP IMT and the structure of BHP personnel in the DoT (State) IMT. Provision of personnel to support the WA DoT IMT and FOB may be through a combination of BHP, AMOSC and/or AMOSC Core Group personnel. As a minimum, the Deputy Planning Officer and Deputy Logistics Officer supporting the WA DoT IMT will be filled by BHP IMT personnel with familiarity with relevant BHP systems and processes.

BHP will locate its IMT in the existing IMT Control Room in Perth.

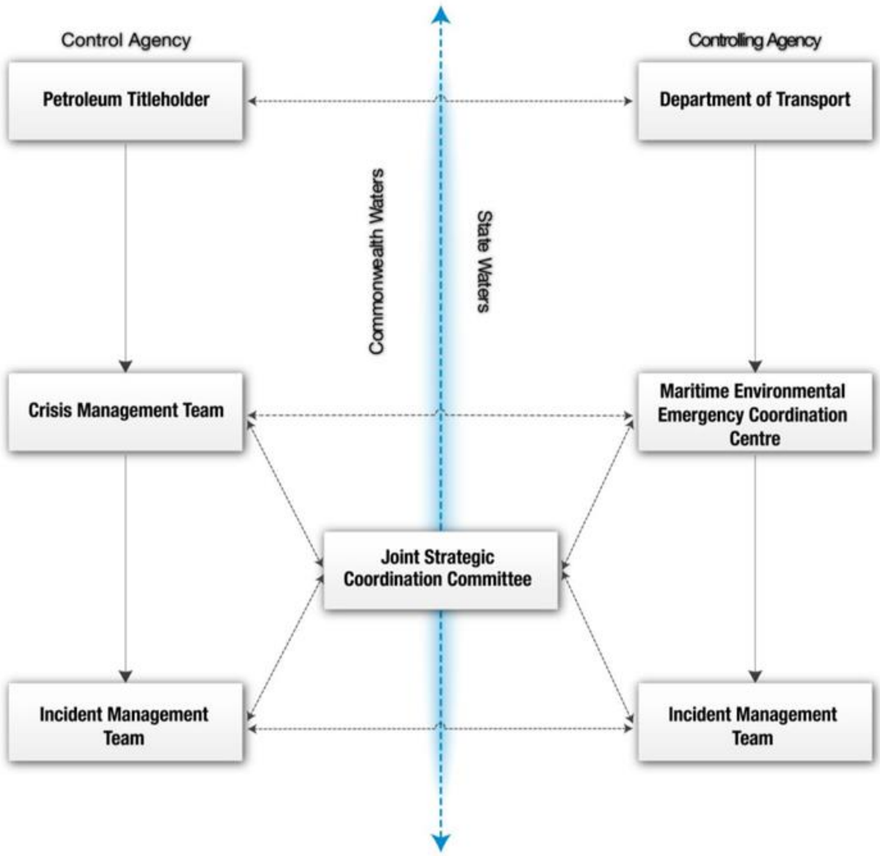


Figure 12-2: Controlling Agency coordination arrangements – Cross jurisdictional (WA DoT, 2020)

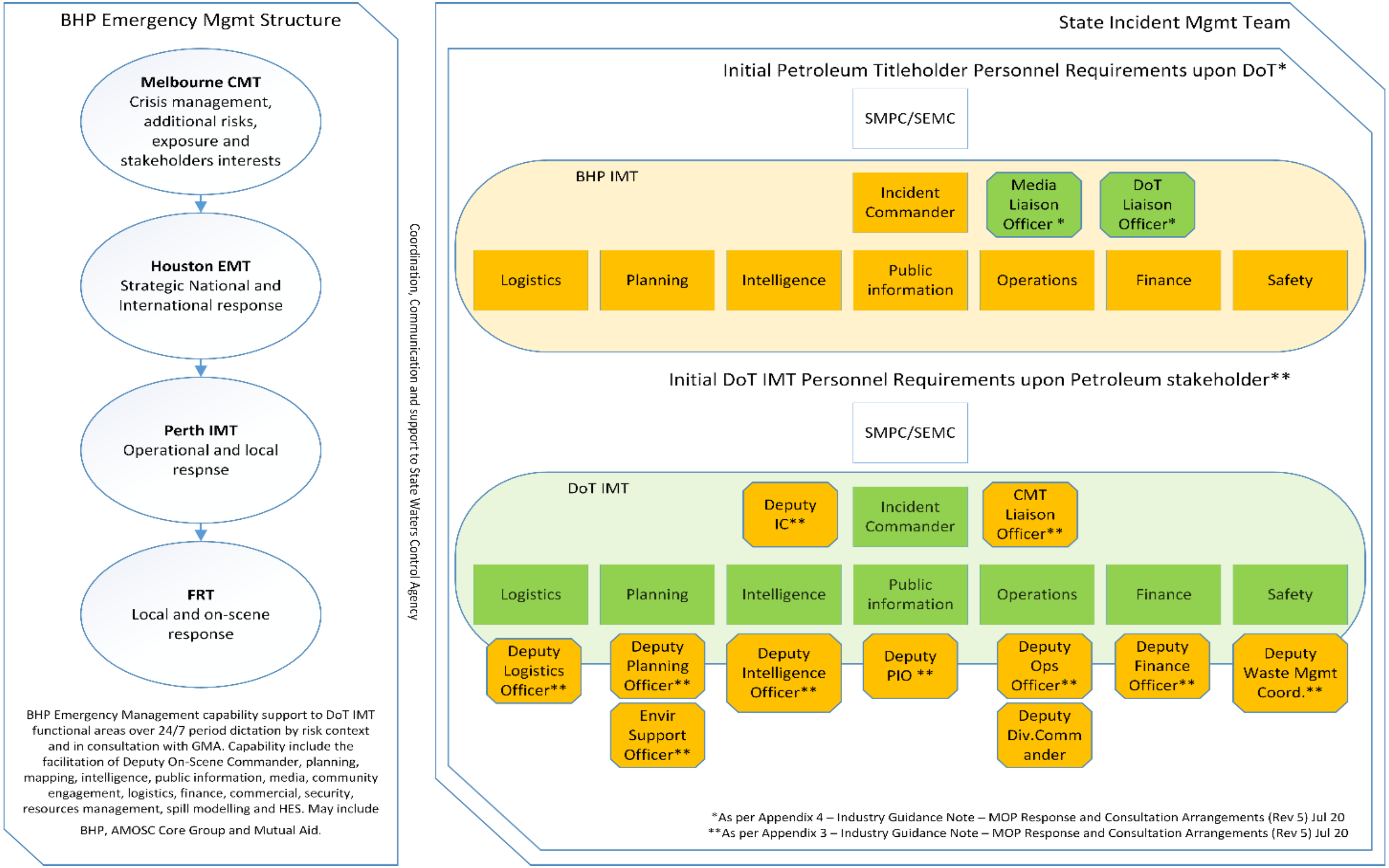


Figure 12-3: Emergency management support to State waters Control Agency – as per WA DoT IGN requirements

12.6.3 External Plans

The petroleum activity OPEP (Appendix E) has been developed to meet all relevant requirements of the Environment Regulations and the following external documents have been used or referred to in the development of the OPEP and the implementation strategy for hydrocarbon spill emergency conditions that may occur during decommissioning activities:

- NatPlan – National Plan for Maritime Environmental Emergencies (NatPlan)
    - Sets out the national arrangements, policies and principles for the management of marine oil pollution. It defines obligations the States and various industry sectors in respect of marine oil pollution prevention, preparation, response and recovery.
- AMOSPlan – Australian Industry Cooperative Spill Response Arrangements
    - Managed by AMOSC, it details the cooperative arrangements for response to oil spills by Australian oil and associated industries.
- HazPlan – Western Australia State Hazard Plan for Maritime Environmental Emergencies (SHP-MEE)
    - Formally endorsed by the State Emergency Management Committee (SEMC) on 4 October 2019, the MEE details the management arrangements for preparation and response to marine oil pollution incidents in State waters.
- DoT Oil Spill Contingency Plan
    - Details the procedures and arrangements for the management of marine oil pollution emergencies that are the responsibility of the DoT.
    - DoT Offshore Petroleum Industry Guidance Note (IGN) – Marine Oil Pollution (MOP) Response and Consultation Arrangements (available online: https://www.transport.wa.gov.au/imarine/oil-spill-contingency-plans.asp);
- Industry Joint Venture Plans: Various Plans developing general and assisted Oil Spill Response Capabilities
- Western Australian Oiled Wildlife Response Plan (WAOWRP)
    - Provides guidance and sets out the management arrangements for implementing oiled wildlife response in State waters. Each region has an Oiled Wildlife Response Plan that gives further details on sensitivities and available resources. The Pilbara Region Oiled Wildlife Response Plan is the relevant regional plan for oiled wildlife associated with Griffin decommissioning activities.
- AMSA Australian Government Coordination Arrangements for Maritime Environmental Emergencies
    - Provides a framework for the coordination of Australian Governmental departments and agencies in response to a maritime environmental emergency

The OPEP interfaces with National, State and BHP plans as shown in Figure 12-4.

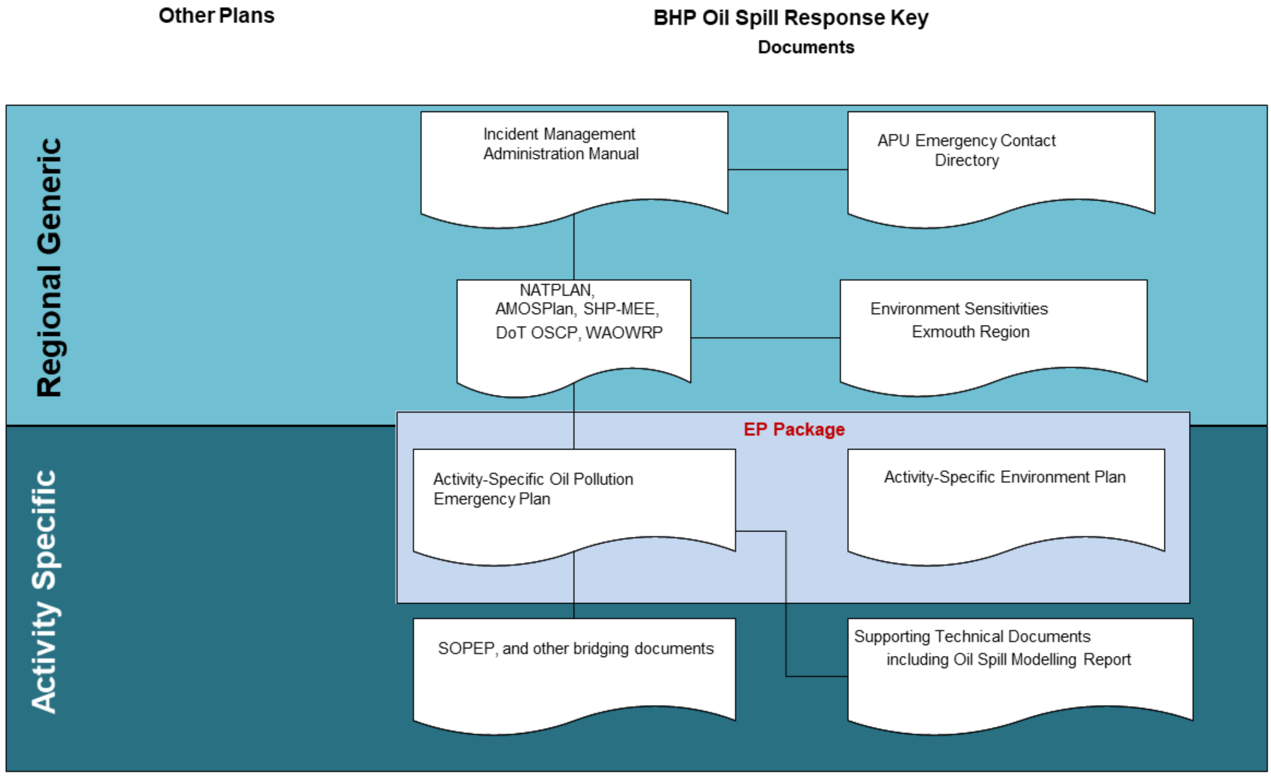


Figure 12-4: National and State plans and integrations with BHP documents

BHP and Contractor Plans

Internal BHP requirements include the need to Develop Emergency Response plans that are scaled according to the Petroleum activity, associated hazards, material risks and applicable regulatory requirements.

To support this requirement, the following documents have been developed and implemented:

- APU Incident Management Plan (AOHSE-ER-0001);
- APU Incident Management Administration Manual (AOHSE-ER-0001-001);
  - Incident Management Handbook – (ICS Model);
- APU Emergency Contact Directory (AOHSE-0002-005);
  - APU IMT Contact Directory (EMQnet);
- Environmental Sensitivities Exmouth Region (AOHSE-ER-0021-008);
- North West Cape Sensitivity Mapping (AOHSE-ER-0036);
- The Griffin Field Decommissioning OPEP (GV-HSE-ER-0011) (Appendix E);
- SOPEPs and bridging documents; and
- Tactical Response Plans (TRPs) for identified receptors.

12.6.4 BHP Incident Response

BHP Response Organisation Structure

The BHP Crisis and Emergency Management (CEM) philosophy is based on three levels of response teams (refer to Table 12-5) which allow for a flexible response with the appropriate level of leadership and support, according to the nature of the specific incident.

Table 12-5: BHP response structure

BHP Response Structure	
Team	**Role**
Field Response Team [FRT]	The FRT is responsible for physically controlling incidents in the field, where possible, and communicating known facts to the IMT. The FRT will depend on the vessel involved in the incident.
Incident Management Team [IMT]	The IMT's role is to provide technical and logistical support to the FRT. It is based in Perth, Australia.
Emergency Management Team [EMT]	The role of the EMT is to provide strategic leadership and support. It is based in Houston, USA.
Teams are progressively activated depending on the severity of an incident.	

The following sections describe the teams listed in Table 12-5 based on the worst-case spill scenarios for the Griffin petroleum activity.

Field Response Team

The FRT will depend on the vessel involved in the incident. The Vessel Master will be in command and will relay immediate emergency response information in the field to BHP IMT.

The role of the FRT is to provide local and on-scene response by implementing priority objectives and attempts to control or contain the source and make appropriate emergency notifications. The FRT reports to the IMT.

Roles and responsibilities of the BHP mobilised FRT are illustrated in Table 12-6.

Table 12-6: FRT roles and responsibilities

Team	Role
Emergency Commander / On-Scene Commander	The Emergency Commander / On-Scene Commander has overall responsibility for management of an incident and is responsible for determining the status of the emergency. This will be the Vessel Master.
Emergency Communications Coordinator	The role of the Emergency Communications Coordinator is to provide a link between all operating responders and to assist them in controlling the incident.
Emergency Coordinator	The Emergency Coordinator provides technical support during the emergency response and communicates with the Emergency Commander / On-Scene Commander.

APU Incident Management Team

Organisational Chart [Level 1/2 Spill Response]

The IMT is responsible for the initial spill response for all spills. The on-duty IMT will handle a Level 1 response. The BHP APU Incident Management Plan (AO-HSE-ER-0001) outlines the roles and responsibilities of personnel in all response scenarios. Those responsible for an oil spill response are shown in Figure 12-5 with allocated responsibilities detailed in Table 12-7.

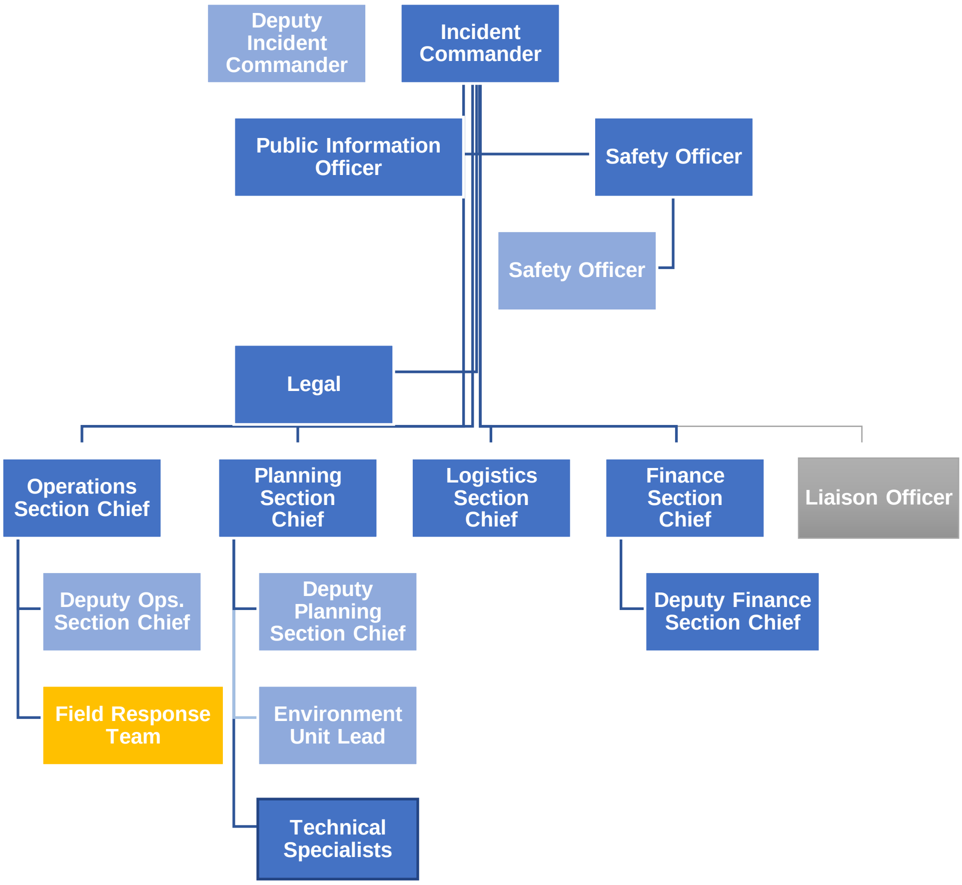


Figure 12-5: APU IMT organisational chart

Table 12-7: IMT roles and responsibilities

Role	Responsibilities
Incident Commander	The Incident Commander directs incident activities, including development and implementation of strategic objectives and liaises with the EMT Leader.
Safety Officer	Safety is responsible for monitoring and assessing hazardous and unsafe actions, in addition to developing measures for assurance of personnel safety, and assessment of any further hazards to the environment.
Public Information Officer	External Affairs is responsible for developing and releasing information about APU incidents to the news media, incident personnel, as well as other appropriate agencies and organisations.
Legal	Provision of legal advice to the Incident Commander relating to response activities, applicable regulatory requirements and any potential liabilities or investigative issues.
Operations	Operations are responsible for all operations directly applicable to the response operations, as guided by the IAP. The Operations Section Chief will act as the Point of Contact between the FRT and the Incident Commander.
Planning	Under the direction of the Planning Section Chief, the Planning Section is responsible for collecting, evaluating, and disseminating the tactical information related to the incident, and for preparing and documenting IAPs.
Environment Unit	The Environment Unit Leader within the Planning Section of the IMT is responsible for the activation and execution of Response Strategy 10 (RS10 Environmental Monitoring). The conduct of the scientific monitoring within this response strategy will be undertaken by contracted providers under the guidance and coordination of the Environment Unit Leader. The Environment Unit Leader position is filled by BHP personnel with a minimum competency of ‘BHP Environment Specialist’ or equivalent. Technical expertise/ qualifications for BHP Environment Specialist is a tertiary degree in environmental science subject and a BHP Environment Unit Leader induction. BHP Environmental Specialists regularly undertake the design and interpretation of environment data as part of their routine responsibilities.

Role	Responsibilities
Logistics	Logistics are responsible for directing all of the services and support needs of an incident, including obtaining and maintaining essential personnel, facilities, equipment and supplies.
Finance	The Finance Section is responsible for managing all financial aspects of an incident. Not all incidents will require a Finance Section. Only when the involved agencies have a specific need for finance services will the Section be activated.
Liaison Officer	Reports to the Incident Commander and acts as a point of contact for external agencies including state and federal government agencies.

The APU IMT is made up of personnel designated on a roster basis, with each individual available for one week on a 24-hour basis throughout the year, based in Perth. There is a weekly handover and briefing of the operations each week. The APU IMT consists of a number of defined roles, which enables BHP to respond to a variety of incidents. The APU IMT is located in the BHP Perth offices and is fully equipped to manage incidents.

IMT members undergo pre-requisite Incident Management System training (ICS 100 and ICS 200) before fulfilling their position on the IMT. The training follows industry best practice and incorporates BHP CEM procedures and processes.

To supplement the initial training, each IMT member participates in desktop exercises and additional minor and major exercises. The training “desktop” exercises are also arranged during the weekly handover sessions, to test a range of IMT responses including oil spill response.

The Regional HSE Lead is responsible for the overall management of the IMT including:

- Training and competency; and
- Ensuring the IMT is adequately resourced.

The IMT consists of key personnel with a broad range of disciplines (e.g., drilling, operations, engineering, maintenance, HSE, supply, external affairs, human resources, finance), together with other support service personnel as necessary.

The IMT has key corporate and external communications responsibilities for:

- Providing tactical and strategic direction, technical expertise and support during an emergency.
- Informing and liaising with relevant emergency services and regulatory authorities as appropriate.
- Managing external communications with media, relatives, contractors, customers, etc.
- Managing Human Resources and Personnel Response (formerly Relative Response) activities; and
- Documenting all aspects of the emergency response activities and communications.

In the event that response to an oil spill incident requires a prolonged spill response, the IMT Commander may activate Australian Marine Oil Spill Centre (AMOSC) (including its core group members) and Oil Spill Response Limited (OSRL) to augment the IMT’s capacity, and request that a Deputy be assigned to the following positions:

- IMT Commander;
- Safety Officer;
- Operations Section Chief;
- Planning Section Chief;
- Logistics Section Chief; and
- Finance Section Chief.

AMOSC or OSRL deputies assigned to the APU IMT will be responsible for providing BHP guidance on the Incident Command Structure (ICS) process and oil spill response strategies. Guidance and support will be available via phone/video conference.

OSRL are an Oil Spill Response Agency (OSRA) based in Singapore and Southampton. BHP has contracted OSRL to provide support during an oil spill response.

Potential Resources Needs

Potential resource requirements for all Levels of response (per 12-hour operational period) are detailed in Table 12-8. BHP's response arrangements can be scaled up or down dependent on the nature and 'level' of the incident.

Table 12-8: Potential resource needs

Function / Position	Level 1	Level 2
Incident Commander	1 per incident; Incident Commander may have Deputies as needed.	
Command Staff: **Safety Officer, Public information Officer, Liaison Officer**	1 per incident: Command Staff may have assistants as needed.	
Operations		
Operations Section Chief	1 per operational period	
Deputy Operations Section Chief	N/A	2
Recovery & Protection Branch Director [dependent on EMBA and suitable response strategies]	N/A	3-4
Air Operations Branch Director	N/A	2
Wildlife Branch Director [dependent on EMBA]	N/A	1
Staging Area Director	N/A	1 per Staging Area
Planning		
Planning Section Chief	N/A	1 per operational period
Deputy Planning Section Chief	N/A	2
Resource Unit Leader	N/A	1
Situation Unit Leader	N/A	1
Technical Specialist	N/A	As needed
Environmental Unit Leader	N/A	1
Documentation Unit Leader	N/A	1
Logistics		
Logistics Section Chief	N/A	1 per operational period
Deputy Logistics Section Chief	N/A	1
Service Branch Director	N/A	As needed
Support Branch Director	N/A	As needed
Finance/Admin		
Finance/Admin Section Chief	1 per operational period	
Deputy Finance/Admin Section Chief	N/A	1
Time Unit Leader	N/A	1
Procurement Unit Leader	N/A	1
Please note: In a large-scale response each function listed above may require a number of people or teams.		

Immediate Response Support

BHP has the capability to implement a response with appropriately trained and competent staff, as follows:

- Incident Commander
- Operations Section Chief
- Planning Section Chief
- Logistics Section Chief
- Deputy Operations Section Chief (Aviation and Marine)
- Safety Officer

- IT Support
- Public Information Officer

Each rostered position is to be within 1 hour of the office and fit for work at all times.

Additional Personnel

Additional personnel, not on the APU IMT would be resourced due to their specific discipline to provide support to the IMT.

- As all events would be managed by the online EMQnet system, additional resources could be sourced remotely i.e., BHP Operations in Trinidad and Tobago, Gulf of Mexico and Houston.
- AMOSC Core group are able to provide Technical support as well as personnel. Around 95 personnel are available under the joint agreement.

Western Australian DoT

As described in Section 12.6.2, BHP are required to provide support personnel to the DoT IMT in the event that DoT is required to establish an IMT. The roles and key duties of these positions are outlined in Table 12-9.

Table 12-9: BHP roles in the DoT Incident Management Team

BHP roles within DoT IMT (State MEECC)	Key duties
CMT Liaison Officer	• Provide a direct liaison between the BHP CMT and the State MEECC. • Facilitate effective communications and coordination between the BHP EMT Leader and the SMPC. • Offer advice to SMPC on matters pertaining to BHP crisis management policies and procedures
Deputy Incident Controller	• Provide a direct liaison between the DoT IMT and the BHP IMT. • Facilitate effective communications and coordination between the BHP Incident Commander and the DoT Incident Controller. • Offer advice to the DoT Incident Controller on matters pertaining to the BHP incident response policies and procedures. • Offer advice to the Safety Coordinator on matters pertaining to BHP safety policies and procedures particularly as they relate to BHP employees or contractors operating under the control of the DoT IMT.
Deputy Intelligence Officer	• As part of the DoT Intelligence Team, assist the Intelligence Officer in the performance of their duties in relation to situation and awareness. • Facilitate the provision of relevant modelling and predications from the BHP IMT. • Assist in the interpretation of modelling and predictions originating from the BHP IMT. • Facilitate the provision of relevant situation and awareness information originating from the DoT IMT to the BHP IMT. • Facilitate the provision of relevant mapping from the BHP IMT. • Assist in the interpretation of mapping originating from the BHP IMT. • Facilitate the provision of relevant mapping originating from the BHP IMT.
Deputy Planning Officer	• As part of the DoT Planning Team, assist the Planning Officer in the performance of their duties in relation to the interpretation of existing response plans and the development of incident action plans and related sub-plans. • Facilitate the provision of relevant IAP and sub-plans from the BHP IMT. • Assist in the interpretation of the BHP OPEP. • Assist in the interpretation of the BHP IAP and sub-plans from the BHP IMT. • Facilitate the provision of relevant IAP and sub-plans originating from the DoT IMT to the BHP IMT. • Assist in the interpretation of BHP' existing resource plans. • Facilitate the provision of relevant components of the resource sub-plan originating from the DoT IMT to the BHP IMT. • (Note this individual must have intimate knowledge of the relevant BHP OPEP and planning processes).

BHP roles within DoT IMT (State MEECC)	Key duties
Environment Support Officer	• As part of the Intelligence Team, assist the Environment Coordinator in the performance of their duties in relation to the provision of environmental support into the planning process • Assist in the interpretation of the BHP OPEP and relevant Tactical Response Plan (TRPs). • Facilitate in requesting, obtaining and interpreting environmental monitoring data originating from the BHP IMT. • Facilitate the provision of relevant environmental information and advice originating from the DoT IMT to the BHP IMT.
Deputy Public Information Officer[1]	• As part of the Public Information Team, provide a direct liaison between the BHP Media team and DoT IMT Media team. • Facilitate effective communications and coordination between BHP and DoT media teams. • Assist in the release of joint media statements and conduct of joint media briefings. • Assist in the release of joint information and warnings through the DoT Information & Warnings team. • Offer advice to the DoT Media Coordinator on matters pertaining to BHP media policies and procedures. • Facilitate effective communications and coordination between BHP and DoT Community Liaison teams. • Assist in the conduct of joint community briefings and events. • Offer advice to the DoT Community Liaison Coordinator on matters pertaining to BHP community liaison policies and procedures. • Facilitate the effective transfer of relevant information obtained from the Contact Centre to the BHP IMT.
Deputy Logistics Officer	• As part of the Logistics Team, assist the Logistics Officer in the performance of their duties in relation to the provision of supplies to sustain the response effort. • Facilitate the acquisition of appropriate supplies through BHP' existing OSRL, AMOSC and private contract arrangements. • Collects Request Forms from DoT to action via the BHP IMT. • (Note this individual must have intimate knowledge of the relevant BHP logistics processes and contracts).
Deputy Waste Management Coordinator	• As part of the Operations Team, assist the Waste Management Coordinator in the performance of their duties in relation to the provision of the management and disposal of waste collected in State waters. • Facilitate the acquisition of appropriate services and supplies through BHP' existing private contract arrangements related to waste management. • Collects Waste Collection Request Forms from DoT to action via the BHP IMT.
Deputy Finance Officer	• As part of the Finance Team, assist the Finance Officer in the performance of their duties in relation to the setting up and payment of accounts for those services acquired through BHP' existing OSRL, AMOSC and private contract arrangements. • Facilitate the communication of financial monitoring information to BHP to allow them to track the overall cost of the response. • Assist the Finance Officer in the tracking of financial commitments through the response, including the supply contracts commissioned directly by DoT and to be charged back to BHP.
Deputy Operations Officer	• As part of the Operations Team, assist the Operations Officer in the performance of their duties in relation to the implementation and management of operational activities undertaken to resolve an incident. • Facilitate effective communications and coordination between the BHP Operations Section and the DoT Operations Section. • Offer advice to the DoT Operations Officer on matters pertaining to BHP incident response procedures and requirements. • Identify efficiencies and assist to resolve potential conflicts around resource allocation and simultaneous operations of BHP and DoT response efforts.

[1] In the event of an incident, access to media and communications response strategy and a comprehensive stakeholder list inclusive of all potentially relevant stakeholders, including indigenous organisations are contained via Santos' internal intranet site for use by CMT/IMT members

BHP roles within DoT IMT (State MEECC)	Key duties
Deputy Division Commander (FOB)	• As part of the Field Operations Team, assist the Division Commander in the performance of their duties in relation to the oversight and coordination of field operational activities undertaken in line with the IMT Operations Section's direction. • Provide a direct liaison between BHP Forward Operations Base/s (FOB/s) and the DoT FOB. • Facilitate effective communications and coordination between BHP FOB Operations Commander and the DoT FOB Operations Commander. • Offer advice to the DoT FOB Operations Commander on matters pertaining to BHP incident response policies and procedures. • Assist the Safety Coordinator deployed in the FOB in the performance of their duties, particularly as they relate to BHP employees or contractors. • Offer advice to the Senior Safety Officer deployed in the FOB on matters pertaining to BHP safety policies and procedures.

12.6.5 Emergency Management Team

The role of the EMT is to provide strategic leadership and support. The EMT Leader is notified within 15 minutes of IMT Activation by the Incident Commander or the BHP Emergency and Crisis Centre (ECC). The BHP EMT is based in Houston, USA. The EMT structure is show in Figure 12-6 and the roles and responsibilities are described in Table 12-10.

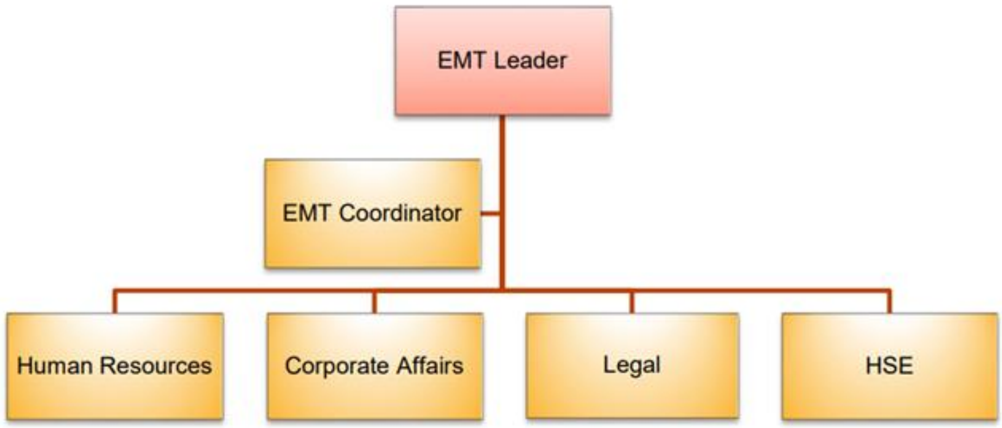


Figure 12-6: EMT structure

Table 12-10: EMT roles and responsibilities

Role	Responsibilities
EMT Leader	Overall responsibility for managing the strategic response to an incident by setting strategic objectives, assigning tasks and providing updates to the Asset General Manager, Petroleum President and Group Chief Executive Officer (CEO).
EMT Coordinator	The EMT Coordinator is responsible for coordinating all information management needs for the EMT. This includes documentation of incident information and providing administrative support to the EMT.
Legal	The Legal representative provides legal advice relating to (1) response activities, (2) potential liabilities or investigative issues, (3) regulatory requirements, and (4) in collaboration with Corporate Affairs, communications and disclosures to third parties, the public, employees, and other stakeholders.
Corporate Affairs	The Corporate Affairs function is responsible for managing internal and external stakeholders as well as the media and any communications relating to the incident.
Human Resources	The Human Resources (HR) function is responsible to determine and coordinate strategic response to the emergency from a human resources perspective. HR identifies and tracks all employees involved in the incident, coordinates and provides feedback to employees, ensures that consistent messages are conveyed internally (in consultation with Corporate Affairs), advises on HR issues.
HSE	Responsible for the safety and effective risk management of incident response and providing functional oversight and planning expertise for health, safety and environment.

12.6.6 Oil Spill Response Organisations

In line with BHP Crisis and Emergency Management arrangements, BHP has established formalised third-party contracts and agreements with defined performance standards/criteria for the provision of resources, services or equipment in support of emergency response activities. These resources will be activated, dispatched and deactivated prior to and during an emergency.

BHP maintains contracts with a number of Oil Spill Response Agencies (OSRAs). The main relationships are detailed in the sub-sections.

AMOSC

The Australian Marine Oil Spill Centre (AMOSC) is an industry funded oil spill response facility based in Geelong, Victoria. AMOSC resources include:

- AMOSC spill response equipment stored at AMOSC and at other locations;
- Oil company equipment based at various locations; and
- Trained industry response (“Core Group”) personnel.

AMOSC form part of BHP’s First Strike and primary response strategy to a spill, and will be deployed within 12 hours of notification. Only nominated BHP personnel can request the assistance of AMOSC (see APU Emergency Contact Directory, AOHSE ER-0002-005) and this is usually conducted via the Perth IMT. AMOSC can be placed on the levels of advice listed in Table 12-11. Information regarding activation and mobilisation is outlined in the petroleum activity OPEP (Appendix F).

Table 12-11: AMOSC advice levels

AMOSC Advice Level	Status	AMOSC Requirements
Level 1	Forward Notice	Advise a potential problem. Provide or update data on oil spill. Update information on spill and advise 4 hourly.
Level 2	Standby	AMOSC resources may be required. Assessment of resources and destination to be made. Update information on spill and advise 2 hourly.
Level 3	Callout	AMOSC resources are required. Detail required resources and destination.

AMOSC maintains a core group of approximately 84 key personnel from oil industry member companies around the country who are trained and regularly exercised in oil spill response operations. Access to the Core Group is via AMOSC.

The cooperative arrangements for response to oil spills by Australian oil and associated industries are brought together under the AMOSPlan. The AMOSPlan will be activated by BHP when the response to an oil spill incident is regarded by BHP as requiring resources beyond those of the company itself.

In the event that the oil spill response requires the call out of AMOSC’s own resources, the call out request is made directly to AMOSC by the Perth IMT. Should the response require mutual aid from equipment owned and personnel employed by another company, the request for assistance is made directly company to company via each company’s nominated Mutual Aid Contact.

In addition, BHP will also be required to contact AMOSC to activate the Standing Agreement (92032701.WP5) and the Service Contract (for the borrowing company), in the event that BHP require equipment from another company.

Oil Spill Response Limited (OSRL)

BHP is a member of the OSRL group. OSRL is an industry-funded oil spill response organisation with offices in Singapore, Bahrain, Southampton, Aberdeen, and London. OSRL have capacity to mobilise additional equipment and personnel to APU from their Singapore location.

Updates on the availability of OSRL’s equipment availability is provided via a weekly Equipment Stockpile Status Report from OSRL’s website at:

http://www.oilspillresponse.com/activate-us/equipment-stockpile-status-report

The Equipment Stockpile Status Report provides a quick and timely overview of the availability of OSRL's equipment stockpile globally and is especially useful in assuring OSRL's readiness. It also provides a vital overview of the resources that BHP would be able to access in the event of a spill. Under OSRL's Service Level Agreement (SLA), the first member who initiates mobilisation of OSRL will be entitled to a maximum 50% of the stockpile, while the second member is entitled to a maximum 50% of the remaining stockpile (and so on).

In addition to the Equipment Stockpile Status Report, OSRL provides a response equipment list that provides an overview of the size, type and ancillaries required for the equipment that is available at their bases. To ensure efficient and timely response capability, OSRL also have also pre-packaged some of the equipment into loads ready for dispatch, that are suitable for general spill situations and operating environments.

The equipment list (Appendix B of the OPEP) can also be found at:

http://www.oilspillresponse.com/files/OSRL_Equipment_List.pdf

In addition to providing response equipment, OSRL also supply a selection of ground staff who have the practical skill and experience to assist and support BHP in a spill response and are trained in using the Incident Command System (ICS) structure. Response teams will comprise:

- Team Manager;
- Operations Manager; and
- Senior technicians/ technicians.

OSRL can be called upon to provide immediate technical advice and begin to mobilise personnel if required. OSRL would be called on to lead small specialist teams and/or provide supplementary labour and equipment if ongoing response is required. Any OSRL resources being mobilised from Singapore would be expected to be on the scene in Perth following notification by the IMT in a similar timeframe to resources being mobilised from eastern Australia. Only nominated BHP personnel may request the assistance of OSRL via the IMT Leader.

OSRL also has a Memorandum of Understanding (MoU) with AMOSC, and OSRL may also be activated by AMOSC to provide resources to AMOSC to respond to a situation. Following initial spill notification, OSRL may be mobilised if required within 8 hours.

The Response Group

BHP has a contract in place with The Response Group, located in USA, for the provision of oil spill response personnel and resources for combating an oil spill. They can provide support remotely or deploy personnel to the APU (IMT or FRT).

The Response Group maintain a 24-hour Support contact: +1 (281) 880-5000.

Technical Support (Environmental Monitoring)

BHP maintains a list of pre-approved vendors who can be called upon at short notice to provide environmental monitoring services in the event of an oil spill.

General Support

BHP has arrangements in place and access to providers to supply personnel as required, for example 40-50 per provider to populate the response teams. BHP has tested these arrangements and considers that personnel for shoreline clean-up operations can be sourced to match and maintain the consequence of a worst-case spill. BHP will aim to mobilise shoreline crews prior to the predicted arrival of hydrocarbons. These crews will focus on pre-cleaning beach areas (e.g., removing debris such as seaweed to areas above the high tide mark) and establishing staging areas to enable a more efficient response when hydrocarbons are arriving ashore.

Additional labour resource requirements above the arrangements described for a temporary contract workforce can be drawn from the significant staff resources of BHP's global petroleum operations, Iron Ore and other divisions that operate in Western Australia and more broadly across Australia. For example, BHP Iron Ore can use direct employees, contractor workforce or utilise current arrangements with Contractors to source additional personnel for shoreline clean-up, if required.

During the first strike response phase, BHP will rely on the skilled personnel (i.e., AMOSC Core Group, OSRL) to supervise and lead any unskilled workforce. In addition, personnel from the National Response Team (NRT), Aerial Operation staff from Aerotech 1st response will be mobilised. OSRL may also supply a selection of ground staff who have the practical skills and experience to assist and support BHP during a spill response and are trained in using the Incident Command System (ICS) structure.

Gaps in the trained personnel numbers during the sustained response phase would be filled by providing pre-mob training (1–2 days) to responders to skill up the workforce and reduce the dependency on the current trained personnel.

12.6.7 Spill Response Logistics

Coordination of logistical arrangements for the response will be the responsibility of the Logistics Section in the IMT (refer to Section 12.6.4). BHP has a number of existing arrangements for the storage and transport of equipment in the Exmouth area, which will be initially used in a response. These arrangements include agreements with logistics providers for air, marine and land.

The current facilities in Exmouth can be supplemented by regional resources within appropriate timeframes for the response. Regional locations such as Onslow, Karratha and Port Headland are equipped to manage the logistical arrangements for construction, mining and petroleum projects, which are similar in scale to a Level 3 response. BHP maintains a supply base in Dampier, which is immediately available to support response operations. These resources involve the movement of personnel, freight and equipment over large distances.

BHP has internal resources (Supply Team) and utilises third-party logistics providers for movements of freight from overseas locations by air or sea. The Supply team, along with the specialist contractors, are highly experienced in procurement and supply chain management for large scale projects and ongoing offshore operational activities. These skills are directly transferable to a Level 2 response.

Road transportation of personnel will be by hire cars (for team leaders, SCAT teams, small teams) and by charter buses for large movements of teams such as shoreline responders. BHP has arrangements in place with providers (i.e., Budget, Avis, Exmouth Bus Charters) that are based in Exmouth that can call on additional resources regionally as well as other regional providers. Regional providers can supplement the Exmouth arrangements within 2-3 days. BHP Minerals has a large Non-Process Infrastructure (NPI) team who will support BHP Petroleum with aviation, accommodation, and power logistics, making charter flights, mine camps and aerodromes in the Pilbara available for the response. BHP has experience in moving large numbers of personnel over large distances during cyclone de-manning and for the construction phases of the Macedon project and Minerals projects.

Freight logistics by road will utilise existing local contracts (i.e., Exmouth Freight and Logistics) and other local operators supplemented by larger regional providers (i.e., Centurion and Toll). BHP has existing arrangements in place for large scale freight movements by road in the North West and has recent experience in moving large volumes of equipment for the Macedon project as well as our multiple Iron Ore operations, particularly during recent major construction projects.

Exmouth is a permanent home to 2,400 people although during tourist months the figure swells to up to 6,000. It is therefore accustomed to accommodating large influxes of people. Accommodation is likely to be a restraint in the response as the lack of suitable accommodation may restrict the numbers of responder personnel that could be brought into the region. There is a variety of accommodation options in Exmouth ranging from hotel/motel, backpacker, holiday home rental and caravan and camping sites. This can be supplemented by FIFO arrangements with mine camps, accommodation and aerodromes within the iron ore side of the business.

Dampier and Karratha currently have additional accommodation with large accommodation villages (i.e., Gap village) previously used for large construction projects available. These facilities can be used to accommodate responders to address shorelines in the Onslow – Dampier region if required or as a base for long commute by road or air to locations further south.

The modelling indicates that islands may be affected by hydrocarbons in a Level 2 spill. BHP has undertaken an assessment of the requirements that would be needed to support clean-up operations on these islands. A Tactical Response Plan has been developed for the Muiron Islands. Other islands in the worst-case spill EMBA have similar coastal characteristics and can expect similar scale of response in terms of personnel and equipment. Small commercial vessels/utility vessels can be used to access these islands; however, the preferred method would be the use of landing craft for transport of equipment and waste. BHP has assessed that there are a number of suitable vessels that would be able to be contracted in a response that are operating regionally.

12.6.8 State and National Resources

In accordance with the State Hazard Plan – Maritime Environmental Emergency (SHP-MEE), and following consultation with the DoT, additional personnel to assist with labour intensive aspects of a response (if required) will be sourced through the State Response Team. Depending on the level of response required, sources of labour may include the local shire and DBCA.

Under the National Plan, a National Response Team (NRT), comprising experienced personnel from operator to senior spill response manager level from Commonwealth/State/NT agencies, industry and other organisations, has been developed.

The services of the NRT will be obtained through AMSA, which has made arrangements with the respective government and industry agencies, for the release of designated personnel for oil spill response activities. These services will be activated when it is assessed that an oil spill incident exceeds the resource availability at the state level.

During a National Plan incident, the BHP Perth IMT or the Marine Pollution Controller appointed by a Control Agency may submit a request to AMSA for personnel from other States/NT to become part of the Incident Management Team or the incident response team.

A request should be made initially through the Environment Protection Duty Officer via the Joint Rescue Coordination Centre on 1800 641 792 or 02 6230 6811. This request must be followed by written confirmation (email: rccaus@amsa.gov.au) within three (3) hours of the verbal request.

The following information will be provided when making such a request:

- Roles or skills required (e.g., Planning Officer, Aerial Observer);
- Number of personnel required to fill each role;
- Contact name, address, and time of where personnel are to initially report; and
- Brief overview of the work to be undertaken.

Suitable personnel will then be selected by AMSA from the National Response Team or the National Response Support Team (NRST) unless special circumstances exist.

12.6.9 Industry Resources

BHP is a Full Member of AMOSC and as such has access to Industry Mutual Aid Arrangement equipment and National Plan equipment held as part of the contingency plans of the Australian Oil Industry and the Australian Government. AMOSC require confirmation from mobilisation authorities to access equipment listed under the National Plan.

All National Plan, AMOSC and those industry equipment resources that are registered with AMOSC, which are potentially available for response to an incident, are listed in the Marine Oil Spill Equipment System (MOSES) database. The MOSES database is a computer database that lists the type, quantity, location, status and availability of pollution control equipment. It is also used to manage audits, maintenance and repair of AMSA-owned equipment (Appendix B of the OPEP).

Normal requests for assistance are directed to AMOSC in Geelong to coordinate, but equipment may also be accessed through the MOSES database, or AMSA – Marine Environmental Protection Services (MEPS).

12.6.10 Government Agency Notification

BHP response teams are hierarchical in nature, and response teams and resources are progressively activated depending on the severity of an incident. Government Agencies and Industry Organisations may also be mobilised (refer to Appendix A: First Strike Plan of the OPEP (Appendix E)). The Griffin decommissioning activities Stakeholder Database will be used to maintain contact with identified stakeholders.

12.6.11 Exmouth Working Group

BHP, in conjunction with Santos and Woodside, has established an Exmouth Working Group to mutually assist in oil spill preparedness and response in the Exmouth region. All three operators have similar assets in the region and, therefore, similar risk profiles.

12.6.12 Industry Joint Venture Programmes

BHP undertake Joint Venture Programmes with other operators and organisations including, but not limited to, Santos, Woodside, Vermillion, DoT and AMOSC. These programmes aim to develop operational guidelines, operational tests, training processes and plans to inform and prepare oil spill response strategies. The programmes also provide guidance and training around First Strike incident plans, key operational considerations, understanding of shoreline sensitivities and lists of resources required to implement response.

12.6.13 Review and Testing of the OPEP

Control and Distribution of the OPEP

The Griffin Field Decommissioning OPEP (411012-00328-20000-REP-0004) (Appendix E) shall be controlled as described by the BHP Australian Production Unit (APU) Document Control Procedure (AOIM-0001). This procedure describes the process of approval, issue and withdrawal of APU controlled documents. The OPEP shall be issued as per the distribution list. The APU Document Controller is responsible for the distribution of the OPEP.

Review of the OPEP

The Regional HSE Lead is responsible for assessing any changes and deciding if the changes require a resubmission of the OPEP under Section 17 of the Environment Regulations.

Response Testing

Testing of response arrangements described in this EP and OPEP (Appendix E) will align with the BHP APU Incident Management Team Desktop Exercises Procedure (AOHSE-ER-0020). In a typical year across the APU, there are six desktop exercises, of which at least two are oil spill related.

BHP will conduct a desk-based emergency response exercise that will include an oil spill scenario related to the Griffin decommissioning activities at least 14 days before commencing the activity. The exercise objectives will include testing the interface of the source control arrangements between the contracted support vessel and the BHP IMT.

Observations during this exercise will be noted and findings from the exercise will be recorded and tracked to closure to ensure continual improvement.

Schedule of Response Testing

BHP maintains a schedule of testing of response arrangements of the various OPEPs. The schedule will be revised if any of the conditions identified in Regulation 14(8C) change. The objectives of the response exercises are to test BHP oil spill response arrangements for Australian offshore operations, which includes the activities covered under the petroleum activity.

BHP undertakes testing of response arrangements in accordance with the Petroleum Health Safety and Environment - Crisis and Emergency Management Standard (PET-HSE00-HX-STD-00001). This describes the performance requirements to conduct emergency response training and exercises, including the review of role requirements and applicable plans. The mechanism for examining the effectiveness of each test against the objectives is determined by: Exercise Facilitator(s), Crisis and Emergency Management Subject Matter Experts, and Regional HSE Lead during the planning and execution of each exercise. Actions from exercises are tracked and closed out via the BHP 1SAP system.

12.6.14 Response Personnel Training [Management]

The Regional HSE Lead is responsible for the overall management of the IMT including:

- Training and competency;
- Ensuring the IMT is adequately resourced; and
- Maintaining the associated training documentation for Emergency Response.

The IMT is mainly resourced by personnel from the BHP Australian Production Unit (APU), except for the Legal team where additional external specialists make up part of the team. An individual is assigned to join the APU IMT roster by their line manager and the Regional HSE Lead. Where possible the IMT role is aligned to the individuals' current role responsibilities (refer to Table 12-2). For example, the Operations Section Chief is drawn from the Engineering and Operations teams. This ensures that a person assigned to an IMT role brings a depth of technical knowledge to the APU IMT.

Table 12-12: IMT competencies

IMT Position	Selected from	CEM Induction	ICS100	ICS 200
Incident Commander	Functional Managers	Y	Y	Y
Operations Section Chief	Engineers and Operations Specialists	Y	Y	Y
Planning Section Chief	Engineers / HSE	Y	Y	Y
Logistics Section Chief	M&L Specialists	Y	Y	Y
Human Resources Coordinator	HR Specialists	Y	Y	N
Environment Unit Leader	Technical Assistants	Y	Y	Y
Public Information Officer	External Affairs Specialists	Y	Y	N
Legal	Legal Specialists and Internal Counsel	Y	Y	N
Safety Officer	HSE Specialists	Y	Y	Y

Once nominated for an IMT role, the candidate must complete the following Training and Assessment before engagement in an IMT role:

- An online BHP Crisis and Emergency Management (CEM) induction program;
- ICS 100/200; and
- IMT Role Specific Training Session.

Once in the role IMT members are required to participate in regular desktop exercises and major exercises as described above. The ad hoc mobilisation (EMQnet) drills are also arranged to test a range of IMT responses, including oil spill response, as per the exercise schedule in BHP APU Incident Management Team Desktop Exercises Procedure AOHSE-ER-0020.

The APU IMT is mobilised to the IMT Room located in the BHP offices 125 St Georges Terrace, Perth, Western Australia and is capable of responding to an incident within 1 hour of activation. Test call-out notifications are conducted each Thursday. In addition, a weekly unscheduled test notification is made to check response times to the call out message. IMT members will be identified to undertake further training to further develop in-house capabilities and knowledge around oil spill response. Alternative providers for the identified courses may also be used if they meet the required outcomes.

In order to implement and maintain core group competencies, BHP will align with current AMOSC practice of a skills maintenance program, which requires that members complete skills maintenance activity before the end of the 36 month timeframe (as outlined in the AMOSC Core Group Program and Policies). As part of the weekly IMT handovers, set desktop exercise's and additional oil spill response training, BHP maintain a continual improvement cycle of core group competences and training in relation to oil spill response readiness.

12.6.15 Field Response Personnel Competency

The personnel required for all phases of the field environmental monitoring response studies outlined in BHP Environmental Monitoring Procedures must have a sound knowledge of environmental science with appropriate levels of experience operating in the field within the oil and gas industry (Table 12-13).

Table 12-13: Minimum competencies and training requirements for field environmental monitoring response personnel

Role	Tertiary Qualification	>5 years Field Experience; Knowledge of Sampling Designs	>2 years Field Experience	MSIC, TBOSIET	Coxswains, Marine Radio Operators
Principal Environmental Scientist	✓	✓	✓	R	R
Environmental Scientist	R	N/A	✓	R	R

R = Recommended
MSIC (Maritime Security ID)
TBOSIET = Tropical Basic Offshore Safety Induction and Emergency Training

12.6.16 Audits

Audits of External Organisations

A formal audit of AMOSC is done by representatives of member companies annually. At the conclusion of an audit, improvement opportunities and corrective actions are formally noted, and corrective actions assigned. In some instances changes may be required to the OPEP, but changes will only be made in accordance with the Environment Regulations.

Audits of Internal Actions

Following an emergency spill incident there may be a requirement for legal and/ or other regulatory or formal HSE incident investigations to be conducted in accordance with the BHP HSE Management System.

In addition to this, it is essential that the IMT response actions are reviewed as soon as practicable after an incident. The aim of the incident review is to identify any particular lessons that should be shared across the Company, and that can be used to improve the plans or response actions in the future.

Post-spill debriefs address:

- Spill causes, if known;
- Spill response;
- Speed;
- Operation;
- Effectiveness;
- Equipment suitability;
- Health and safety issues, as appropriate; and
- Integration of plan and procedures with other response organisations, consultants, and or agencies.

12.6.17 Incident Reporting Requirements

BHP employees and contractors are required to report all environmental incidents and non-conformance with commitments made in the EP. A computerised database called 1SAP is used for the recording and reporting of these incidents. Detailed investigations are completed for all actual and high potential environmental incidents. The classification, reporting, investigation and actioning of environmental incidents are undertaken in accordance with BHP HSE Management Standards. Incident corrective actions are monitored using 1SAP and closed out in a timely manner. In addition to the internal notification and reporting requirements outlined above, the reporting requirements for environmental incidents are outlined in previous Section 10.5.

12.6.18 OPEP Consultation

The BHP Regional HSE Lead shall arrange for copies of the OPEP requirements to be forwarded to the following key Response Agencies:

- Australian Maritime Oil Spill Centre (AMOSC); and
- WA DoT Maritime Environmental Emergency Response (MEER) Unit.

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Appendix A

BHP Charter

BHP

Our Charter

We are BHP, a leading global resources company.

Our Purpose

To bring people and resources together to build a better world.

Our Strategy

Our strategy is to have the best capabilities, best commodities and best assets, to create long-term value and high returns.

Our Values

Sustainability
Putting health and safety first, being environmentally responsible and supporting our communities.

Integrity
Doing what is right and doing what we say we will do.

Respect
Embracing openness, trust, teamwork, diversity and relationships that are mutually beneficial.

Performance
Achieving superior business results by stretching our capabilities.

Simplicity
Focusing our efforts on the things that matter most.

Accountability
Defining and accepting responsibility and delivering on our commitments.

We are successful when:

Our people start each day with a sense of purpose and end the day with a sense of accomplishment.

Our teams are inclusive and diverse.

Our communities, customers and suppliers value their relationships with us.

Our asset portfolio is world-class and sustainably developed.

Our operational discipline and financial strength enables our future growth.

Our shareholders receive a superior return on their investment.

Appendix B

Relevant Legislation, Regulations and Other Requirements

Commonwealth Legislation and Regulations

Legislation or Regulation	Description	Relevance	EP Section
Australian Maritime Safety Authority Act 1990	AMSA is a Commonwealth agency responsible for regulation of maritime safety, search and rescue, and ship sourced pollution prevention functions under the *Navigation Act 1912* (Cth), protection of the sea legislation, including the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cth) and subordinate legislation made pursuant to these Acts.	Applies to the use of any vessel associated with operations, and is relevant to the activity in regard to the unplanned pollution from ships.	Section 9.2
Australian Ballast Water Management Requirements (Commonwealth of Australia, 2020), Version 8	The Australian Ballast Water Management Requirements (Version 8) set out the obligations on vessel operators with regards to the management of ballast water and ballast tank sediment when operating within Australian seas.	Applies to all internationally sources vessels operating in Australian Waters which could have the potential for the introduction of IMS and potential ballast water exchange.	Section 9.4
Biosecurity Act 2015	This Act is about managing diseases and pests that may cause harm to human, animal or plant health or the environment. The proposed amendments also strengthen Australia's ability to manage ballast water in ships. They will provide additional protection for coastal environments from the risk of marine pest incursions by fostering new ballast water treatment technologies and phasing out ballast water exchange.	Applies to all internationally sources vessels operating in Australian Waters which could have the potential for the introduction of IMS and potential ballast water exchange.	Section 9.4
Biosecurity Regulation 2016	The Biosecurity Regulation prescribes a number of measures and obligations that are common between the *Biosecurity Act*. Pre-arrival reporting, cost recovery and the isolation and export power provisions all support business as usual activities that were available under the *Quarantine Act* and therefore represent no substantive change.	Applies to all internationally sources vessels operating in Australian Waters which could have the potential for the introduction of IMS and potential ballast water exchange.	Section 9.4
Corporations Act 2001	This Act is the principal legislation regulating matters of Australian companies, such as the formation and operation of companies, duties of officers, takeovers and fundraising.	The titleholder has provided ACN details within the meaning of the Act.	Section 1.7

Legislation or Regulation	Description	Relevance	EP Section
Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act) Environment Protection and Biodiversity Conservation Regulations 2000	Commonwealth Department of Sustainability, Environment, Water, Population & Communities administers Act that provides legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places—defined in the EPBC Act as matters of national environmental significance (NES). These include nationally threatened species and ecological communities, migratory species and Commonwealth marine areas. The Act regulates assessment and approval of proposed actions likely to have a significant impact on a matter of NES. The approval decision is made by a delegate of the Australian Government Environment Minister. Regulations provide for a wide range of detail essential for the operation of the Act, including regulations relating to management of Commonwealth reserves, information requirements for assessment processes, enforcement, granting of various permits, publication requirements and criteria that need to be met in relation to a wide variety of decision making processes provided for under the Act.	This Act applies to all aspects of the activity that have the potential to impact MNES. NOPSEMA manages compliance with the relevant regulations and plans under the Act for this EP. Where activities have existing approvals under the Act, these will continue to apply.	Section 8.2 Section 8.3 Section 8.5 Section 8.7 Section 9.2 Section 9.3
Environment Protection (Sea Dumping) Act 1981 Environment Protection (Sea Dumping) Regulations 1983	The Act regulates the dumping at sea of controlled material (including certain wastes and other matter), the incineration at sea of controlled material, loading for the purpose of dumping or incineration, export for the purpose of dumping or incineration, and the placement of artificial reefs. Permits are required for any sea dumping activities. Operational discharges from vessels are not defined as 'dumping' under the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 and therefore not regulated under the Act.	Prior to permanently leaving any structure *in situ*, BHP will obtain a Sea Dumping Permit in accordance with the requirements of the *Environment Protection (Sea Dumping) Act 1981*.	N/A
Hazardous Waste (Regulation of Exports and Imports) Act 1989	Relates to controls over import and export of hazardous waste material. Permits are required to import waste into Australia.	Activity does not involve transboundary movement of hazardous wastes.	N/A

Legislation or Regulation	Description	Relevance	EP Section
Industrial Chemicals (Notification and Assessment) Act 1989	The Act establishes the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) to regulate the supply of chemicals into Australia, and importers or manufacturers of chemicals or chemical products must comply. The Act involves assessing and registering industrial chemicals in a national scheme and applies to solvents, adhesives, plastics, laboratory chemicals and paints, as well as chemicals used in cleaning products. Chemicals are defined by exclusion: a substance is an industrial chemical if it is not an agricultural or veterinary product, medicine or medicinal product, food additive, contaminant or natural toxicant.	Chemicals are assessed to ensure they are ALARP and acceptable in accordance with Section 4.11.	Section 4.11
National Environment Protection (National Pollutant Inventory) Measure 1998	The National Pollutant Inventory (NPI) is a database established to provide information on substances being emitted to the air, land and water, and transported in waste. The inventory tracks the magnitude of emissions and the amounts transported in waste of 93 substances. While the NPI National Environmental Protection Measures (NEPM is a federal initiative, each state has legislation giving effect to the program.	The act enables implementation of NEPMs, which are a set of national objectives designed to assist in protecting or managing aspects of the environment. Requires demonstration that the activity will be performed in line with the principles of ecologically sustainable development, and that impacts and risks resulting from these activities relevant to NEPM national objectives are ALARP and acceptable.	Section 8.4
National Greenhouse and Energy Reporting Act 2007	This Act provides for the reporting and dissemination of information related to greenhouse gas emissions, greenhouse gas projects, energy production and energy consumption, and for other purposes.	This Act applies to the atmospheric emissions through combustion engine use to operate the project vessels and associated with the activity. The Act aims to reduce the impact of GHG emissions associated with vessel use for the installation and commissioning activity, through compliance with MARPOL Annex VI (Marine Order 97: marine pollution prevention – air pollution), and require the use of low sulphur fuel.	Section 8.4

Legislation or Regulation	Description	Relevance	EP Section
Navigation Act 2012	This Act establishes framework for controls on navigation, marine safety and shipping for ships in Australian waters or territories primarily proceeding on international or interstate voyages.	Vessel movements will be governed by marine safety regulations and Marine Orders under the Act	Section 8.1 Section 9.2
Navigation (Orders) Regulations 1980	Details the penalty where Marine Orders are prescribed as 'Penal Provisions'.	Vessel movements will be governed by marine safety regulations and Marine Orders under the Act	Section 8.1 Section 9.2
Marine Orders	Marine Orders are subordinate rules made pursuant to the *Navigation Act 1912* and *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* affecting the maritime industry. They are a means of implementing Australia's international maritime obligations by giving effect to international conventions in Australian law.	Vessel movements, safety, discharges and emissions will be governed by the Marine Orders	Section 8.1 Section 8.2 Section 8.5 Section 9.2 Section 9.5 Section 9.6
Marine Order 32 – Cargo Handling Equipment	Marine Order 32 relates to loading and unloading of cargo, and the safe transfer of persons, from ships, off-shore industry vessels and off-shore industry mobile units.	Unloading of cargo, and the safe transfer of persons, from ships, offshore industry vessels will be governed by Marine Order 32.	Section 9.6
Marine Order 41 Carriage of Dangerous Goods	MO41 gives effect to Part A Chapter VII of SOLAS, in particular the International Maritime Dangerous Goods Code (IMGDC) which deals with the carriage of dangerous goods in packaged form, together with prescribing other matters related to carriage of dangerous goods in ships, notice of intention to ship dangerous goods, and provisions related to the loading, stowing, carriage or unloading in ships of cargo.	Carriage of dangerous goods on vessels will be governed by Marine Order 41.	N/A
Marine Order 58 – International Safety Management Code	MO58 specifies the requirements of the International Safety Management (ISM) Code and gives effect to Chapter IX of SOLAS. The purpose of the ISM Code is to provide an international standard for the safe management and operation of ships and for pollution prevention.	Applies to management and operation or vessels.	N/A

Legislation or Regulation	Description	Relevance	EP Section
Marine Order 59 – Offshore Industry Supply Vessels	MO59 specifies a number of performance-based requirements for safe navigation and a safe system of operations for off-shore industry vessel operations, including arrangements for safe operations during emergencies. The Order specifies guidelines considered to satisfy these performance-based requirements. The Order also allows alternative practices to be considered and approved as equivalent to those practices in the specified guidelines (NWEA Guidelines). MO59 applies to vessels not registered in Australia, if vessel is engaged in operations associated with or incidental to petroleum exploration or production activity.	Applies to safe navigation and a safe system of operations of vessels.	Section 8.1 Section 9.2
Marine Order 91 – Marine Pollution Prevention – Oil	MO91 gives effect to Annex I of the International Convention for the Prevention of Pollution from Ships 1973, as amended by the Protocol of 1978 (MARPOL 73/78).	Applies to pollution prevention on vessels.	Section 9.2
Marine Order 93 – Marine Pollution Prevention – Noxious Liquid Substances	MO93 gives effect to Annex II of the International Convention for the Prevention of Pollution from Ships 1973, as amended by the Protocol of 1978 (MARPOL 73/78). Details the discharge criteria and measures for the control of pollution by noxious liquid substances carried in bulk. It subdivides substances into and contains detailed operational standards and procedures. Some 250 substances are appended to the London Convention. The discharge of their residues is allowed only to reception facilities until certain concentrations and conditions (which vary with the category of substances) are compiled with. In any case, no discharge of residues containing noxious substances is permitted within 12 miles of the nearest land.	Applies to operational discharges from vessels.	Section 8.5
Marine Order 94 – Marine Pollution Prevention – Package Harmful Substances	MO94 gives effect to Annex III of the International Convention for the Prevention of Pollution from Ships 1973, as amended by the Protocol of 1978 (MARPOL 73/78) in relation to packaged harmful substances.	Applies to waste management and pollution prevention on vessels.	Section 8.5 Section 9.6
Marine Order 95 - Marine Pollution Prevention - Garbage	MO95 gives effect to Regulation 8 of Annex V (dealing with port State control on operational requirements) and prescribes matters in relation to Regulation 9 of Annex V (dealing with placards, garbage management plans and garbage record-keeping) to the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78).	Applies to operational discharges and waste management on vessels.	Section 8.5 Section 9.6

Legislation or Regulation	Description	Relevance	EP Section
Marine Order 96 Marine Pollution Prevention – Sewage	MO96 sets out MARPOL requirements in relation to survey and certification requirements; how sewage should be treated or held aboard ship; and the circumstances in which discharge into the sea may be allowed.	Applies to operational discharges from vessels.	Section 8.5
Marine Order 97 – Marine Pollution Prevention – Air Pollution	MO96 sets out MARPOL requirements in relation to air pollution.	Applies to air pollution from vessels.	Section 8.4
Offshore Petroleum and Greenhouse Gas Storage Act 2006	Legislation concerning Australian offshore petroleum exploration & production in Commonwealth Waters. National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) is an independent safety and environmental management Authority funded by levies on industry participants and regulates matters with powers conferred directly from OPGGS Act and via Regulations concerned with: • occupational health & safety law at facilities and offshore operations under Schedule 3 • environmental management • structural integrity of Wells under Resource management regulations. NOPSEMA may also declare a 500 metre petroleum safety zone around wells associated with drilling operations.	Refer Section 2.1.1.	Section 2.1.1
Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009	Regulations administered by NOPSEMA to ensure offshore petroleum activity is carried out in a manner consistent with the principles of ecologically sustainable development and in accordance with an accepted environment plan, in particular: • assessment of EPs, including associated OPEPs (previously oil spill contingency plans) • investigation of accidents, occurrences and circumstances with regard to deficiencies in environmental management.	Refer Section 2.1.1.	Section 2.1.1
Offshore Petroleum and Greenhouse Gas Storage (Regulatory Levies) Act 2003	Act to impose levies relating to the regulation of offshore petroleum activity, including well levies and environment plan levy.	A levy will be applied to the petroleum activity under this EP.	N/A

Legislation or Regulation	Description	Relevance	EP Section
Offshore Petroleum and Greenhouse Gas Storage (Regulatory Levies) Regulations 2004	Regulations prescribing the amount and method of calculation for imposition of levies relating to the regulation of offshore petroleum activity, including well levies and environment plan levy.	A levy will be applied to the petroleum activity under this EP.	N/A
Ozone Protection and Synthetic Greenhouse Gas Management Act 1989	This Act gives effect to Australia's obligations under the Vienna Convention and the Montreal Protocol by introducing, a system of controls on the manufacture, import and export of substances that deplete ozone in the atmosphere and synthetic greenhouse gases.	The activity does not include import, export or manufacture activities of ODS. Applies where ODS is found on vessel refrigeration systems; however, this is a rare occurrence.	Section 8.4
Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995	Regulation contains controls relating to: import/export/manufacture licensing; manufacture and disposal of scheduled substances; refrigeration and air-conditioning; methyl bromide; and fire protection; import and export of any products and equipment containing hydrofluorocarbons, perfluorocarbons and SF6; and a requirement for importers and manufacturers to pay a levy incorporating a carbon charge component based on the equivalent carbon price.	The activity does not include import, export or manufacture activities of ODS. Applies where ODS is found on vessel refrigeration systems; however, this is a rare occurrence.	Section 8.4
Protection of the Sea (Powers of Intervention) Act 1981	Act authorises AMSA to take measures for the purpose of protecting the sea from pollution by oil and other noxious substances discharged from ships and implements the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties and the Protocol relating to Intervention on the High Seas in Cases of Pollution by Substances other than Oil. Act enables AMSA to take measures on the high seas to prevent, mitigate or eliminate the danger apparent upon a maritime casualty where there is grave and imminent danger to the coastline of Australia, or to the related interests of Australia from pollution or threat of pollution of the sea by oil which may reasonably be expected to result in major harmful consequences. Similar powers apply in relation to a ship which is in internal waters, is in the Australian coastal sea, or any Australian ship on the high seas where oil or a noxious substance is escaping, and gives AMSA power to take such measures as it considers necessary to achieve a number of objectives detailed in the Act.	This Act applies to vessel discharges and movements associated with the activity.	Section 8.1 Section 8.2 Section 8.5 Section 9.2 Section 9.5 Section 9.6

Legislation or Regulation	Description	Relevance	EP Section
Protection of the Sea (Prevention of Pollution from Ships) Act 1983	Act administered by AMSA, deals with the protection of the marine environment from ship-sourced pollution. The Act implements the International Convention for the Prevention of Pollution from Ships 1973 and the subsequent 1978 Protocol to the Convention (collectively MARPOL 73/78) and setting operational and construction standards for ships to prevent pollution and regulating normal operational discharges from ships. MARPOL 73/78 annexes regulate the discharge of oil (Annex I), noxious liquid substances (Annex II), the disposal from ships of sewage (Annex IV) and garbage (Annex V) and prohibit the disposal of harmful substances carried by sea in packaged forms (Annex III).	This Act applies to vessel discharges and movements associated with the activity.	Section 8.1 Section 8.2 Section 8.5 Section 9.2 Section 9.5 Section 9.6
Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994	Sets penalty levels for non-compliance.	Relates to vessel non-compliance to Marine Orders.	N/A
Protection of the Sea (Civil Liability of Bunker Oil Pollution Damage) Act 2008	This Act implements the requirements for the International Convention on Civil Liability for Bunker Oil Pollution Damage.	This Act applies to diesel refuelling which may be performed at sea as part of the activity.	Section 9.2
Underwater Cultural Heritage Act 2018	The Act replaces the *Historic Shipwrecks Act 1976* with a modernised framework for protecting and managing Australia underwater culture heritage. The Act protects shipwrecks, sunken aircraft that are at least 75 years old, whether their location is known or unknown, and associated relics. It also enables the Minister to protect shipwrecks that have been sunk for less than 75 years if they are of historic significance, such as ships wrecked during World War II. All relics associated with historic shipwrecks are protected both while associated with the shipwreck and after their removal, provided that they went down with the ship. The Act also enables the Minister to declare protected zones around historic shipwrecks. A permit is required to carry out prescribed activities, such as trawling, diving or mooring or using ships in a protected zone. The Act prohibits conduct that may interfere with protected shipwrecks and their associated relics.	Anyone who finds the remains of a vessel or aircraft, or an article associated with a vessel or aircraft, needs to notify the relevant authorities, as soon as possible but ideally no later than after one week, and to give them information about what has been found and its location.	Section 9.2

Western Australian Legislation and Regulations

Legislation or Regulation	Description
Aboriginal Heritage Act 1972	Enacted to ensure all Aboriginal cultural heritage within Western Australia could be properly protected and preserved. The Act provides recognition, protection and preservation of Aboriginal sites in Western Australia. It is an offence under s.17 of the Act to excavate, destroy, damage, conceal, or in any way alter an Aboriginal site.
Conservation and Land Management Act 1984	DBCA is responsible for the day-to-day management of marine parks vested with Marine Parks and Reserves Authority (MPRA) and provide administrative support to the MPRA. MPRA is responsible for the preparation of management plans for all lands and waters which are vested in it. Marine nature reserves, marine parks and marine management areas are the three reserve categories vested in the MPRA. Offshore operations must comply with specific marine park conditions when navigating or conducting activities in or near areas designated as marine sanctuaries for conservation, recreational, ecological, historical, research, educational, or aesthetic qualities, such as Ningaloo Marine Park (state waters) (Class A reserve) and Muiron Islands Marine Management Area.
Conservation and Land Management Regulations 2002	Details further requirements for protection of flora and fauna including restrictions on approaches to fauna, fishing restrictions and operation of vessels in marine protected areas. Also includes prohibition of pollution in marine protected areas.
Dangerous Goods Safety Act 2004	Act relating to the safe storage, handling and transport of dangerous goods and for related purposes.
Dangerous Goods Safety (Explosives) Regulations 2007	Relevant to storage and handling of explosives on marine support vessels.
Dangerous Goods Safety (Goods in Ports) Regulations 2007	'Goods in Ports' Regulations give legal status to the provisions of Australian Standard AS 3846 The handling and transport of dangerous cargoes in port areas. Requires classification of Dangerous Goods loads based on the International Maritime Dangerous Goods Code (IMDG) rather than ADG Code. Additional requirements are for safety management and emergency plans.
Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007	Regulations adopt NOHSC Standard for the Storage and Handling of Workplace Dangerous Goods. Western Australia has retained a licensing system for dangerous goods. In relation to dangerous goods, 'handling' includes manufacture, process, pack, use, sell, supply, carry and disposal of dangerous goods. References to the Australian Dangerous Goods Code (the ADG Code) in the regulations relate to the 7th edition of the ADG Code.
Emergency Management Act 2005	WestPlan-MTE details the emergency management arrangements relating to the prevention of, preparation for, response to and recovery from Marine Transport Emergencies that occur in WA waters.
Emergency Management Regulations 2006	DoT Marine Safety is the prescribed Hazard Management Agency for response under the Emergency Management Regulations 2006 for all emergencies in which there is an actual or impending event involving a ship that is capable of causing loss of life, injury to a person or damage to the health of a person, property or the environment.

Legislation or Regulation	Description
Environmental Protection Act 1986	Act contains measures for preventing or minimising pollution, which includes a general prohibition against pollution. Applicable areas include discharge of operational waste (sewage, galley waste) and oily water from vessels, gaseous emissions from diesel engines and ballast water exchange and discharge.
Environmental Protection Regulations 1987	Prescribes further matters to give effect to the Act including control of pollution and licence fees.
Environmental Protection (Unauthorised Discharges) Regulations 2004	Prescribes further details of materials that are prohibited from discharge into the environment.
Fish Resources Management Act 1994 Fish Resources Management Regulations 1995	Act establishes framework for management of fishery resources. Commercial fishing is licensed or under a Fisheries Management Plan. Fisheries in WA waters are subject to the Act and include a wide range of aquatic organisms, other than protected species. Threatened aquatic species may be protected under State and Commonwealth biodiversity conservation laws. Department of Fisheries manages commercial and recreational fishing in Western Australia within four regions: the West Coast, Gascoyne, South Coast and North Coast. The Act also has power to declare Fish Habitat Protection Areas.
Marine and Harbours Act 1981	Act to provide for the advancement of efficient and safe shipping and effective boating and port administration through the provision of certain facilities and services.
Marine and Harbours (Fuelling) Regulations 1985	Refuelling businesses in ports to be licensed.
Maritime Archaeology Act 1973	Maritime Archaeology Act of 1973 protects maritime archaeological sites in state waters, such as bays, harbours and rivers. Other than shipwrecks, it includes single relics, such as an anchor, and land sites associated with exploration, early settlements, whaling and pearling camps and shipwreck survivor camps.
Pollution of Waters by Oil and Noxious Substances Act 1987	Act relating to the protection of the sea and certain waters from pollution by oil and other noxious substances discharged from ships and places on land.
Port Authorities Act 1999	Local Pilotage Directions apply to vessels navigating within declared ports such as the Dampier Port Authority (DPA) port limits however DPA complies with the Port Authorities Act 1999 (WA) and Port Authorities Regulations 2001 (WA) Part 3. The Regulations take precedent over Port Directions in the event of any conflict.
Port Authorities Regulations 2001	Pilotage services within the Port are licensed by DPA in the form of a pilotage provider’s licence issued under the terms of the Port Authorities Regulations 2001.
Port of Dampier Marine Notice (002/2005)	Addresses sewage and putrescible waste discharge requirements whilst vessel in Port of Dampier.
Shipping and Pilotage Act 1967	Act relating to shipping and pilotage in and about the ports, fishing boat harbours and mooring control areas of the State.
Navigable Waters Regulations 1958	Prescribes further matters on navigational safety in WA waters, use of jetties, obstruction and wrecks, berthing and mooring of vessels.
Western Australian Marine (Sea Dumping) Act 1981	An Act to provide for the protection of the environment by regulating the dumping into the sea, and the incineration at sea, of wastes and other matter and the dumping into the sea of certain other objects.

Legislation or Regulation	Description
Western Australian Marine (Sea Dumping) Regulations 1982	Primarily concerns fees and prescribed information for reports of dumping.
Western Australian Marine Act 1982	Before any commercial vessel can operate in the State of Western Australia, the vessel is required to have onboard a valid Certificate of Survey. Certificate of Survey is only issued when the vessel satisfactorily complies with the Western Australian Marine Act in respect to its hull, machinery and equipment and is crewed according to the *Western Australian Marine Act 1982*.
WA Marine (Surveys and Certificates of Survey) Regulations 1983	Marine Safety is responsible for approving plans, inspecting, approving construction and carrying out periodical surveys of all commercial vessels under WA jurisdiction, be they passenger carrying, trading, fishing, or offshore industry vessels.
W.A. Marine (Certificates of Competency and Safety Manning) Regulations 1983	Marine Safety is responsible for administering national and internationally agreed competency standards; and for the examination of candidates for commercial Certificates of Competency as master, mate or engineer in WA vessels.
Prevention of Collisions at Sea Regulations 1983	Regulations largely comprise the Rules set out in the International Regulations for Preventing Collisions at Sea 1972 (COLREGs) applicable in state and internal waters.
Wildlife Conservation Act 1950 Wildlife Conservation Regulations 1970	An Act to provide for the conservation and protection of wildlife.
Wildlife Conservation (Specially Protected Fauna) Notice 2006	Declaration of specially protected fauna in WA, including fauna that is rare of is likely to become extinct. List includes over 199 species, itemising scientific and common name.

Industry Standards, Codes of Practice, Guidelines and Commonwealth Guidance Material

AMSA Technical guidelines for preparing contingency plans for marine and coastal facilities (2015)
AMSA National Plan for Maritime Environmental Emergencies (the NatPlan)
APPEA Australian Offshore Titleholder's Source Control Guideline (June 2021)
Australia's Oceans Policy - Western Australia South-West, Western-Central and North-West Marine Plans
Australian Petroleum Production and Exploration Association (APPEA) Code of Practice 2008
Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000
Australian Ballast Water Management Requirements, Version 8, 2020
Australian National Guidelines for Whale and Dolphin Watching 2005
EPBC Act Policy Statement 2.1 - Interactions between Offshore Seismic Activities and Whales (May 2007)
DAWR Offshore Installations - Biosecurity Guide (2019)
DAWE Policy Statement: 'Indirect consequences' of an action: Section 527E of the EPBC Act (2013): https://www.environment.gov.au/system/files/resources/f96c4a92-ffb1-4b77-befe-e2fd9130b0d8/files/epbc-act-policy-indirect-consequences.pdf
Guidelines on Minimising Acoustic Disturbance to Marine Fauna 1997 – WA Department of Mines and Petroleum
IOGP Risk Assessment Data Directory: Blowout Frequencies, September 2019
IOGP Report 592 - Subsea Capping Response Time Model Toolkit User Guide
IOGP Report 594 - Subsea Well Source Control Emergency Response Planning Guide for Subsea Wells (2019)
National Biofouling Management Guidance for the Petroleum Production and Exploration Industry 2009
National Light Pollution Guidelines for Wildlife, January 2020
National Marine Safety Committee principal technical standard, the National Standard for commercial vessels. National Standard for Commercial Vessels (NSCV)
National Strategy for Ecologically Sustainable Development 1992
National Maritime Emergency Response Arrangement (NMERA)
NOPSEMA (2012). Control Measures and Performance Standards Guidance Note. N040300-GN0271 Revision No. 4. December 2012
NOPSEMA (2020). Information Paper: Reducing Marine Pest Biosecurity Risks through Good Practice Biofouling Management, N04750-IP1899, Rev 1, March 2020
NOPSEMA Guidance note: Environment plan content requirements – (GN1344) 11.9.2020
NOPSEMA Guidance note: Petroleum activity and Australian marine parks – (GN1785) 3.6.2020
NOPSEMA Guidance note: Oil pollution risk management – Rev 2 (GN1488) (2018)
NOPSEMA Guidance note: Notification and reporting of environmental incidents – (GN0926) 8.6.2020
NOPSEMA Guidance note: ALARP – Rev 6 (GN0166) (2015)
NOPSEMA Policy: Environment plan assessment - (PL1347) 19.5.2020
NOPSEMA Guideline: Environment plan decision making – Rev 7 (GL1721) (2021)
NOPSEMA Guideline: Making submissions to NOPSEMA – (GL0255) 4.5.2020
NOPSEMA Guideline: Consultation with Commonwealth agencies with responsibilities in the marine area (GL1887) 3.7.2020
NOPSEMA Information paper: Operational and scientific monitoring programs – Rev2 (IP1349) (2016)
NOPSEMA Information Paper: Source Control Planning and Procedures (2021)
NOPSEMA Bulletin #1: Oil Spill Modelling – Rev 0 (A652993) (2019)
NOPSEMA Bulletin #2: Clarifying Statutory Requirements and Good Practice Consultation – Rev 0 (A696998) (2019)

NOPSEMA Explanatory Note: Australian dispersant acceptance process (N-04750-IP1597 A446655) (06/07/2020)
NOPSEMA Policy Section 572 Maintenance and removal of property (N-00500-PL1903) 20/11/2020 This document sets out the principles that NOPSEMA will apply in compliance oversight, and where necessary, enforcement of section 572 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) which requires titleholders to: • Maintain all structures, equipment and property in a title area in good condition and repair • Remove all structures, equipment and property when it is neither used nor to be used in connection with operations authorised by the title.
Offshore Petroleum Industry Guidance Note; Marine Oil pollution: Response and Consultation Arrangements (Western Australian Department of Transport, July 2020).
SPE Technical Report; Calculation of Worst-Case Discharge (WCD), Rev 1 2016 (Society of Petroleum Engineers, 2015)

Appendix C

Example GEP within Commonwealth Waters Images

2008 ROV Footage – GEP at KP50.24, Water Depth 115.0m

2017 ROV Footage – GEP at KP40.16, Water Depth 69.5m

2017 ROV Footage – GEP at KP40.25, Water Depth 68.9m

Appendix D

Existing Environment and EPBC Protected Matters Searches

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1 Introduction

This Appendix describes the environment that may be affected (EMBA), including relevant values and sensitivities, by both planned activities (routine and non-routine) and unplanned events (accidents/incidents), associated with proposed petroleum activities for the Griffin Gas Export Pipeline (GEP) Decommissioning. The level of detail is appropriate to the nature and scale of the impacts and risks to the particular values and sensitivities.

Throughout this document the Griffin GEP Decommissioning EP (GV-HSE-E-00GA-BHPB-N00-0016) will be referred to as the 'EP'

Figure 5-1 of the EP shows the location of the operational area and the boundaries of the EMBA..

2 Description of Environment

2.1 Regional Setting

Australia's offshore waters have been divided into six marine regions to facilitate their management by the Australian Government under the Environment Protection and Biodiversity Conservation (EPBC) Act. The EMBA sits entirely within the North-West Marine Region (NWMR). Within this marine region, the EMBA intersects six smaller bioregions based upon the Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0; Commonwealth of Australia, 2006) (see Table 2-1).

The operational area and EMBA for this activity are located in Commonwealth waters within the Northwest Shelf Province, in water depths of around 197 to 200 m (Figure 5-2 in the EP). These bioregions fall within the NWMR, as defined under IMCRA, and are based on fish, benthic habitats and oceanographic data.

Table 2-1: Australian Bioregions Within the EMBA

Name	Hydrocarbon Presence	
	Operational area	EMBA
Northwest Shelf Province	✓	✓
Northwest Province	×	✓
Northwest Transition	×	✓
Central Western Transition	×	✓
Central Western Shelf Transition	×	✓
Central Western Shelf Province	×	✓

The NWMR encompasses Commonwealth waters from the Western Australia (WA)/Northern Territory (NT) border in the north, to Kalbarri in the south (Director of National Parks, 2018). The region's north-western boundary is defined in accordance with the Perth Treaty, negotiated with the Republic of Indonesia, and includes area over which Australia exercises jurisdiction over both the water column and the seabed and its associated resources (DEWHA, 2008).

The NWMR consists entirely of continental slope and is characterised by muddy sediments and water depths that predominantly range between 1000 to 3000 m (DEWHA, 2008). The Exmouth Plateau is the dominant topographical feature within the North West Province and is an important feature, as it modifies the flow of deep waters and contributes to uplifting of deeper, more nutrient-rich waters.

The inner shelf component of the Northwest Province, with water depth ranges from 30 to 60 m, is virtually flat and overlain by sparse sandy substrata. Relict sediments are also present and rhodolith beds of coralline red algae growing on rocks occur between 30 to 90 m (DEWHA, 2007). In the deeper waters of the mid shelf (60 to 100 m), sediments comprise sands and gravels on cemented hard grounds. It is reasonably barren substratum with 50% comprising relict reworked material, such as ooid old shoal; hence, there is little recent organic material, and the substrata support a generally low biota (DEWHA, 2007). The sediments of the outer shelf (100 to 200 m) comprise sands and gravels, transitioning to muds with increasing distance offshore. Detrital rain transports some organic material to the seafloor; however, there is believed to be very few benthic living organisms on this outer shelf (DEWHA, 2007).

2.2 Physical Environment

2.2.1 Climate and Meteorology

The EMBA experiences an arid sub-tropical climate and a distinct summer monsoonal 'wet' season from November to February, followed by a typically cooler winter 'dry' season (ANRA, 2013). Historical rainfall data shows the highest mean monthly rainfall occurs from January to June (BoM, 2021). The climate is controlled by two major atmospheric pressure systems: Indian Tropical Maritime air moving in from the west or north-west, and tropical continental air from the inland (ANRA, 2013).

The northwest coast between Broome and Exmouth experiences on average about five tropical cyclones between November to April each year (BoM, 2021). Cyclones can bring vast amounts of rain to the area, with strong swell and rough seas common during these meteorological events. Most cyclones approach the region from the east-northeast, veering to a southerly track the further south they go (BoM, 2021). Observations from the Onslow Airport weather station are summarised in Table 2-2.

Historical rainfall data indicates the highest rainfall occurs in February and March, while the lowest rainfall occurs in late spring/early summer (September to December).

Table 2-2: Meteorological Conditions (for Onslow Airport) Representative of the Operational area Within the EMBA (Bureau of Meteorology, 2021)

Month	Mean Maximum Monthly Temperature (ºC)	Mean Minimum Monthly Temperature (ºC)	Mean Rainfall (mm)
January	36.5	24.5	37.1
February	36.3	25.1	58.4
March	36.2	24.3	71.0
April	34.0	21.6	11.7
May	29.4	17.4	47.8
June	26.0	14.4	45.4
July	25.6	13.1	19.2
August	27.4	13.7	8.2
September	30.2	15.5	1.3
October	33.0	18.0	0.8
November	34.4	20.2	2.6
December	36.0	22.5	3.3
Annual Average	32.1	19.2	304.2

Sea surface wind data was sourced from the National Centre for Environmental Predictions' (NCEP) Climate Forecast System Reanalysis. Table 2-3 presents wind data from the nearest NCEP wind station to the Griffin operational area. The data indicates winds across the region are relatively strong (average 12.6 knots, maximum 55.9 knots) and varied throughout the year. The average wind speeds are weakest during April (10.2 knots) and predominantly from the south-southwest; strongest average winds occur during November (14.2 knots) when they are predominantly from the southwest.

Table 2-3: Predicted average and maximum winds from the closest station to the operational area. Data derived from CFSR hindcast model from 2009-2013 (inclusive) (RPS-APASA, 2014)

Month	Average wind (knots)	Maximum wind (knots)	General Direction
January	13.3	50.5	southwest
February	12.7	55.9	southwest
March	11.7	36.9	southwest
April	10.2	25.6	south-southwest
May	11.7	3.2	east
June	13.0	32.4	east- southeast
July	12.7	34.3	south-southeast
August	11.2	29.1	south
September	13.7	29.4	south-southwest
October	13.5	28.8	southwest
November	14.2	26.9	southwest
December	13.4	31.1	southwest
Minimum	10.2	25.6	-
Maximum	14.2	55.9	-
Annual Average	12.6	34.5	-

2.2.2 Oceanography

Currents and Tides

The oceanography within the EMBA is strongly influenced by the warm, low-salinity waters of the Indonesian Throughflow (ITF), which influences the upper 1250 m of the water column (DEHWA, 2007). While the origin and movement of shelf waters such as those in the permit areas are not well understood, it is believed ITF waters flood the shelf via the Eastern Gyral Current and the Leeuwin Current (Figure 2-1). Surface currents are subject to strong seasonal variations; the Eastern Gyral Current intensifies during July to September and the Leeuwin Current is strongest in autumn and weakens from December to March.

Below the main thermocline, the water column is influenced by Banda Intermediate Water from the north, and Sub-Antarctic Mode Water and Antarctic Intermediate Water from the south (DEHWA, 2007). In addition to the major surface and subsurface currents, smaller, localised currents also occur nearshore, such as the Capes, Ningaloo and Shark Bay currents (Figure 2-1). In addition to seasonal variability, the oceanography of the region exhibits inter-annual variability, with winds driving the thermocline to shallower depths, reducing sea level and sea surface temperature, resulting in a weakening of the ITF and Leeuwin Current during El Niño/Southern Oscillation and reversing in La Niña years (DEHWA, 2007). There is evidence of a strong northward current between 200 m and 500 m in this area, which may be an offshoot of the eastern gyre (DEHWA, 2007).

Tides in the region are semi-diurnal (there are two high tides and two low tides each day). Spring tides (the highest tidal range each month) are about 1.6 m, while neap tides (the lowest tidal range) are about 0.6 m. The tides run on a northeast and southwest axis and the maximum speed of the tidal streams is about 0.5 m/sec. Wind-driven surface currents reflect the prevailing seasonal wind directions, which are predominantly from the southwest during summer and from the east, southeast and south during winter. These prevailing winds generate surface currents of about 0.2 to 0.3 m/sec in the direction of the prevailing wind (Woodside, 2002).

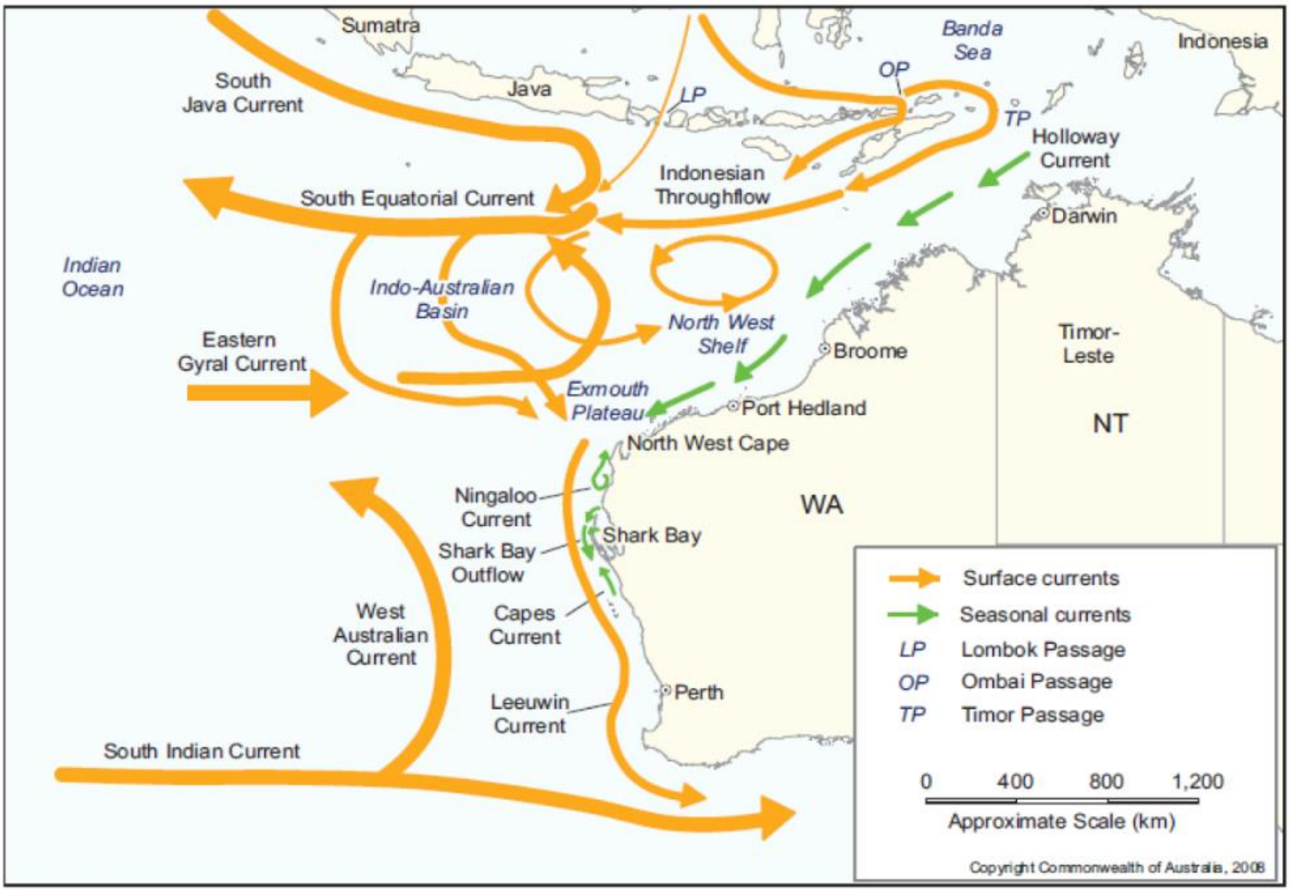

Figure 2-1: Major Ocean Currents Influencing Western Australia (DEWHA, 2008a)

Waves

The wave regimes in the EMBA are caused by the combination of sea waves and swells. Sea waves occur predominantly from the southwest throughout the year, with more easterly waves experienced in winter, while the largest swells generally occur from June to October (Woodside, 2002; Pearce et al., 2003). Therefore, the largest total waves (sea waves combined with swell) occur from June to September, with April and May the calmest months, noting only 10% of significant wave heights off Dampier exceed 1.2 m, with average wave height being 0.7 m (Pearce et al., 2003). However tropical cyclones can generate extreme swells, generally from the northeast.

Water Temperature and Salinity

The average sea surface temperature within the EMBA ranges from 20°C to 24°C during winter and 24°C to 28°C during summer (BoM, 2021). There is likely to be a distinct thermocline in deep offshore waters, associated with the warming influence of the Leeuwin Current, which overlays colder, more saline, deeper ocean waters that vary seasonally (DEWHA, 2008). Salinity is relatively uniform at 35 parts per thousand (ppt).

Although the Leeuwin Current is a core movement of the EMBA region, it is overall dominated by the ITF. The ITF is one of the primary links in the global exchange of water and heat between ocean basins and is an essential element in the global climate system. It delivers warm, oligotrophic (low in nutrients) and low-salinity water from the western Pacific Ocean to the Indian Ocean, and is a fundamental driver of oceanographic and ecological processes in the EMBA region (DEWHA, 2008).

Bathymetry and Geomorphology

The seafloor of the EMBA consists of four general feature types: continental shelf, continental slope, continental rise and abyssal plain (or deep ocean floor). Most of the region consists of either continental slope or continental shelf. Seabed sediments are expected to comprise of bio-clastic, calcareous and organogenic sediments that were deposited by relatively slow and uniform sedimentation rates. The region is made up of a tropical carbonate shelf dominated by sand and gravel to 15° latitude, while the outer shelf/slope zone is dominated by mud (Baker et al., 2008). It has a relatively homogenous rise and abyssal plain/deep ocean floor that is dominated by non-carbonate mud because it occurs below the carbonate compensation depth (Baker et al., 2008).

Major contributors to sediment mobilisation in the EMBA include storm events such as tropical cyclones, internal tides, and ocean currents including the Leeuwin current (Baker et al., 2008). Sediments of the middle shelf region are predominantly influenced by tidal processes, including internal tides (Baker et al., 2008).

The two main elements of the continental shelf in this region are the Dirk Hartog Shelf to the west of North West Cape and Rowley Shelf to the northeast. The Griffin Field and GEP PLEM is located on the Outer Rowley Shelf, which is on the middle shelf of the North West Shelf Province and covers 47% of the North-West Marine Bioregion (Baker et al., 2008). The water depths of the middle shelf range from 30 to 200 m. The general geomorphology of the Rowley Shelf seabed is gentle and smooth, although the Inner Rowley Shelf features island reefs and geomorphological features such as small terraces, trenches/troughs and plateaus that run parallel to the coast (Baker et al., 2008).

The Dirk Hartog Shelf varies in width from 40 km wide to the south of North West Cape, to approximately 7 km wide at Ningaloo Reef (Baker *et al*., 2008). It is relatively gently sloping and underlain by Pleistocene limestone or mudstone, occasionally exposed but mostly covered by a veneer of sediments of varying thickness. Where the sediment forms a thin layer over the base, the sediment veneer typically consists of coarser sands. Medium and fine sands interspersed with patches of coarser sands usually characterise the deeper sediments.

Approaching the coastline, the Dirk Hartog Shelf rises abruptly to the outer barrier reef, which consists of limestone and coral. The Ningaloo Reef comprises a partially dissected basement of Pleistocene marine or Aeolian sediments, or tertiary limestone covered by dead or living coral. The reef flat is on average several hundred metres wide (CALM/MRPA, 2005) and separated from the coastline by a lagoonal area. Sediments in the lagoon are generally coarse calcareous sand with finer calcareous sand or silt in deeper basins and gutters (CALM/MRPA, 2005). These longshore drainage channels skirt the shoreward edge of the reef and may be up to 12 m deep (CALM/MRPA, 2005). The underlying limestone may occasionally be exposed as bare pavement where the sand veneer has been swept away.

Continuing on from North West Cape, the Muiron Islands are low dome-shaped, limestone islands separated by a deep navigable channel. The continental shelf is much broader to the northeast of the Cape, sloping away from the Muiron Islands to the shelf break some 30 km seaward. The western shores of the islands are characterised by limestone cliffs fronted by sandy beaches, reef flats and intertidal limestone pavements and rubble deposits. The eastern shores of the islands comprise sandy beaches backed by low dunes. They have gently sloping subtidal sand with patch reefs and coral bommies, eventually levelling out to muddy, soft substrata.

2.3 Biological Environment

2.3.1 Deep-Water Benthic Habitats

The operational area falls within the continental slope and shelf. The continental slope and shelf are, for the most part, ecosystems built on a soft sediment habitat with gradational variation in species composition due to depth, water temperature, light penetration and sediment composition/structure. It consists of generally sparse populations of sessile sponges, soft corals and algae (at shallower depths), with a mobile population of burrowing crustaceans, echinoderms and molluscs. The EMBA falls within continental shelf, continental slope, continental rise and abyssal plain.

The Griffin Field on the Outer Rowley Shelf contain benthic assemblages comprising predominantly crustaceans, cephalopods and small fish that live within a structural habitat formed by a sparse community of sponges, soft corals, sea pens and gorgonians. Findings of remotely operated vehicle surveys conducted in 2009 for the Griffin Field Subsea Operations identified epibiota, such as oysters, barnacles and soft and hard corals, to have colonised the subsea infrastructure (Figure 2-2). Epibiota varied from 5 to 15% cover of the seabed infrastructure, predominantly hydroids with entrapped sediment (up to 250 mm) in the deeper water sections and up to 75% cover of soft corals and sponges (up to 1 m long) in the shallow water sections up to 80 m water depth (Surespek, 2008).

Figure 2-2: Epibiota and macroalgae on the GEP

2.3.2 Shallow Water Benthic Habitats

The Muiron Islands and the Ningaloo Marine Park are approximately 44 km and 58 km south west of the operational area, respectively. The EMBA completely overlaps the Muiron Islands and Ningaloo Marine Park. Additionally, the EMBA overlaps Barrow Island Marine Park (Western Barrow Island Sanctuary Zone), located approximately 74 km north east from the operational area. It is unlikely that shallow benthic habitat is located within the operational area.

The distribution of shallow water and coastal benthic habitats of the Ningaloo Reef and Muiron Islands is well understood. Perhaps the most comprehensive study of habitats of Ningaloo Reef and Muiron Islands is the work conducted by the Ningaloo Collaboration Cluster (Kobryn et al., 2011), funded in part by BHP, to provide a highly-resolved classification of benthic habitats associated with the reef and coastal shallow waters. In summary, analysis of the habitat characterisation showed most (54%) of the benthic cover is composed of macroalgal and turfing algae communities, while hard and soft coral cover represents only 7% of the mapped area (762 km²).

The Western Barrow Island Sanctuary Zone includes Biggada Reef, which is a significant fringing, shallow benthic habitats including macroalgal limestone reef and seagrass communities (DEC, 2006). Macroalgal meadows are the most extensive benthic habitat within the Barrow Island Marine Park, occupying (approximately 86,920 ha) of the area (DEC, 2007). These communities are most commonly found on shallow limestone pavement in depths of 5 to 10 m. The macroalgal assemblages are dominated by species of brown algae, particularly of the genera *Sargassum, Turbinaria* and *Padina*. Seagrasses have not formed extensive meadows within the reserve but are sparsely interspersed between the macroalgae. A total of six seagrass species have been recorded including, *Cymodocea angustata, Halophila ovalis, Halophila spinulosa, Hadodule uninervis, Thalassia hemprichii and Syringodium isoetifolium* (DEC, 2006).

Coral Reefs

The EMBA overlaps several areas which would contain extensive coral communities including the Ningaloo Marine Park, Montebello/Barrow Islands Marine Conservation Reserves, and the Muiron Islands. The Muiron Islands and the Ningaloo Coast is approximately 43 km south west of the operational area. The operational area is unlikely to contain extensive coral reef environments.

Corals are both primary producers and filter feeders and thus play a role in providing food to marine fauna and in recycling nutrients to support ecosystem functioning (CALM/MRPA, 2005). Corals create settlement substrate and shelter for marine flora and fauna. Studies have shown declines in the abundance, or even marked changes in species composition of corals, have a marked impact on the biodiversity and productivity of coral reef habitats (Pratchett et al., 2008).

Coral reefs within the region can be categorised into three general groups, being:

- scleractinian corals (hard corals) – reef-building corals
- non-scleractinian corals (often referred to as calcified soft corals) – generally not considered to be reef-building
- soft corals belonging to the Order Alcyconacea (soft corals) – non-reef-building corals.

The distribution of corals is governed by the availability of hard substrate for attachment and light-availability. Hard habitats, such as limestone pavements of the NWS and reefs on the edge of the shelf and offshore islands, support coral reef systems. Particularly, the coral reef system of Ningaloo is globally significant as it is the only extensive coral reef in the world that fringes the west coast of a continent (DSEWPaC, 2012). As part of the reef-building process, scleractinian corals are also important for protecting coastlines through accumulating and cementing sediments and dissipating wave energy (CALM/MRPA, 2005).

Coral reefs are dynamic environments that regularly undergo cycles of disturbance and recovery. Depending on how frequent and severe the disturbances are, recovery can take a few years or more than a decade. Disturbances can include sedimentation, cyclones and disease outbreaks (Haapkylä et al., 2013). Coral susceptibility to bleaching and their ability to recover is an important consideration in the context of potential anthropogenic impacts.

In Western Australia, 318 species of scleractinian corals from 70 genera have been recorded. Of these, 53 genera and more than 250 different species of coral have been recorded so far on Ningaloo Reef, including representatives from all 15 families of corals dominated by *Acroporidae* and *Faviidae* (Veron and Marsh, 1988).

Reef-building corals are the most visible and identifiable component of coral reef ecosystems. Smaller coral communities tend to form in the region wherever a hard substratum is available. Reef-building corals are generally restricted to the upper photic zone due to the dependence of their unicellular endosymbionts (commonly known as zooxanthellae) on light. This in turn drives photosynthesis, providing reef-building corals with most of their energy requirements (Muscatine, 1990). Consequently, most coral habitat is present in shallow water, particularly on subtidal platforms that border most of the mainland and islands.

Each year, most of the corals on the reef undergo one or two mass synchronous spawning events. These spawning events usually happen over three or four nights in March and April, during the evening neap tide seven to ten days after the full moon (Simpson et al., 1993). There may also be smaller synchronous spawning events during other times of the year. Coincident with these events, large swarms of krill have been detected in the shallow coastal waters offshore from Ningaloo Reef from March to June.

The hyperspectral data collected via Kobryn et al. (2011) (125 spectral bands between 450 to 2500 nm and an average spectral resolution of 15 nm) was acquired in 2006 at 3.5 m ground resolution. The total area of the survey covered 3400 km², encompassing Ningaloo Reef to a depth of around 20 m, as well as the coastal strip adjacent to the Ningaloo Marine Park. There were 5854 ha of coral mosaics mapped along the Ningaloo Reef. The single largest coral mosaic type was continuous tabulate coral (2155 ha or 37% of all corals). Most coral classes (66%) were a mix of dense to continuous tabulate coral, sparse digitate coral, soft coral and sparse sub-massive and massive corals. Continuous to patchy digitate and tabulate coral made up around 10% of the coral cover, while the branching coral species *Acropora* was around 8.5%. Most of the hard coral occurred as either very dense (continuous >90%) cover or as patchy distribution (20 to 45%). Around 15,200 ha (21%) of the mapped habitats were close to the shore (0 to 500 m).

This dataset represents an unprecedented baseline dataset, with a spatial extent that spans about 300 km from Bundegi in the north to Red Bluff in the south and includes the Muiron Islands.

Ningaloo Reef and the reefs around the Muiron Islands support many habitats, including:

- The outer reef slope is relatively short and steep, extending from sea level to about 10 m depth. It may be undercut or extend seaward into a series of spurs and grooves, often supporting a rich coral growth. The fore reef community is highly diverse with live coral cover over the sloping spur and groove reef.
- The reef crest or outer reef rim is the highest part of the reef and thus most frequently exposed on low tides. It occurs as a narrow band only a few metres wide and distinguishable because of its height. There are occasional reef passes (deep channels), which allow the exchange of seawater and provide access to the lagoon for larger fauna on low tides. Reef crests, which have variable coral cover, are dominated by digitate *Acropora* and massive forms of *Goniastrea* and *Platygyra*.
- The reef flat is the extensive shallow area located on the shoreward side of the crest. At Ningaloo, it may be several hundred metres wide. Live corals occur throughout this area but do not frequently form a total cover, due to frequent storm damage and other natural perturbations. The living coral overlies recently dead corals superimposed on Pleistocene aeolian and marine limestone/sandstone deposits. Reef flats have varying cover of rubble deposits and live coral, and sand can be a dominant feature of this area (such as evidenced by the extensive sand areas in the northern section of the Yardie Creek region and adjacent to Point Cloates).
- There is an extensive lagoon system inside the Ningaloo Reef front along the western side of North West Cape. Different habitats in the lagoons include coral bommies, exposed rocky and sandy seabeds, and deep holes and channels. The more stable sandy bottoms provide habitat for seagrasses and macroalgae (such as the area to the north of Coral Bay).

The most extensive coral reef communities around Barrow Island are Biggada Reef on the west coast, Dugong Reef and Batman Reef off the south-east coast and along the edge of the Lowendal Shelf on the east side of Barrow Island. It is likely that the EMBA overlaps coral reef communities within the eastern side of Barrow Island including Biggada Reef. The coral reef reserves of Barrow Island have a high diversity of hard corals with at least 150 species (54 genera) of hard corals recorded to date, from limited surveys (Berry, 1993). Species diversity and community structure vary with different environmental conditions such as exposure to wave action, currents and water clarity (DEC, 2006).

Macroalgae Beds

The EMBA overlaps several areas which would contain extensive limestone macroalgae habitats including the Ningaloo Marine Park, Montebello/Barrow Islands, and the Muiron Islands. The Muiron Islands and the

Ningaloo Coast are approximately 43 km south west of the operational area. The operational area is unlikely to contain extensive macroalgae environments.

Macroalgae are large, visible plants such as kelp, typically attached to hard substrata such as intertidal and subtidal rock platforms, limestone reefs, rock/rubble areas and dead or partially dead corals, typically in water depths less than 10 m, but can occur in up to about 50 m (LeProvost Dames & Moore, 2000). Macroalgae are divided into three groups: Phaeophyceae (brown algae), Rhodophyta (red algae) and Chlorophyta (green algae). Macroalgal communities occur predominantly in the intertidal and subtidal waters of the region (up to depths of about 50 m), including limestone pavements, reefs and platforms, coral rubble and dead or partially dead corals (LeProvost Dames & Moore, 2000). *Ecklonia radiata* and *Sargassum* sp. are typically common in deeper areas.

The principal physical factors affecting the presence and growth of macroalgae include temperature, nutrients, water motion, light, salinity, substratum, sedimentation and pollution (Sanderson, 1997). They occur in moderate to high cover on exposed hard substrates, but typically have lower cover on hard substrates that have a veneer of sediment (SKM, 2009). Macroalgae exhibit very high seasonal and inter-annual variation in biomass (Heyward et al., 2006), distribution, abundance and biodiversity (BHPBIO, 2011). The distribution of hard substrates therefore indicates areas that may support macroalgal communities, although abundance and diversity may fluctuate annually.

Macroalgae are susceptible to disturbance from factors such as sedimentation, scouring and turbidity but the marked seasonality in biomass, abundance, diversity and distribution suggests macroalgae are likely to be resilient to acute, short-term disturbance acting at local scales. Macroalgae may be more susceptible to impacts acting over longer time scales (years) and at certain times of the year, where recruitment at a regional scale could be affected. Indirect impacts affecting the numbers, distribution and community structure of herbivorous fish can also be expected to have impacts (either positive or negative) on macroalgal habitats (Vergès et al., 2011).

Brown algae (*Phaeophyte*) and red algae species such as *Sargassum* and *Dictyotales* tend to dominate the macroalgal communities in terms of biomass and abundance. Macroalgal communities are ecologically important, being highly productive and providing complex habitat for invertebrates, cryptic fish and juvenile fish of various species, and a direct food source for many species such as green turtles.

Beds of macroalgae, along with seagrass (see below), provide a major source of benthic production in coastal waters, and support a benthic invertebrate faunal community of high diversity and abundance. Large beds of macroalgae are known to occur around the Muiron Islands and on the eastern side of Exmouth Gulf (McCook et al., 1995). Well-developed macroalgal communities also occur extensively along the Ningaloo Reef tract.

Barrow Island waters contain extensive macroalgal meadows which make up the major contribution to primary production. These communities are typically found in shallow limestone pavement in 5 to 10 m of water. The macroalgal assemblage of the island is dominated by brown algae, particularly of the genera *Sargassum, Turbinaria* and *Padina.* Green algae from the genera *Caulerpa, Cladophora* and *Rhodophyta* are also commonly found (DEC, 2006).

Seagrass

The EMBA overlaps several areas which would contain extensive seagrass habitats including the Ningaloo Marine Park, Montebello/Barrow Islands, and the Muiron Islands. The Muiron Islands and the Ningaloo Coast are approximately 43 km south west of the operational area. The operational area is unlikely to contain extensive seagrass environments.

Seagrasses are highly productive habitats that occur on intertidal flats and in shallow coastal waters worldwide, from Arctic to tropical climates. Seagrass generally grows in soft sediments within intertidal and shallow subtidal waters, where there is sufficient light, and are common in sheltered coastal areas such as bays, lees of islands and fringing coastal reefs (McClatchie et al., 2006; McLeay et al., 2003). Water temperature, light penetration, sediment type, salinity, and wave or current energy control seagrass distribution.

Twenty-five species of seagrass have been recorded in WA, the highest diversity in the world (Masini et al., 2009). Waters extending from Busselton to the NT border support predominantly tropical species, although temperate species are also found, particularly between Busselton and Exmouth (Walker et al., 1987). One species, *Cymodocea angustata*, is endemic to WA.

Areas occupied by seagrass exhibit marked seasonal and interannual variability and it is not clear why some areas of suitable substrate will support seagrass in one year but not the next. It appears recruitment to what may otherwise be suitable substrate is haphazard, lending weight to the description of these seagrass communities as ephemeral (CALM/MRPA, 2005).

Most of the known occurrences of seagrasses in the EMBA are from shallow waters less than 5 m deep, although one species, *Halophila spinulosa*, has been observed in deeper water (10 to 20 m). Available information suggests seagrasses in the region on the western side of Exmouth Gulf tend to form small meadows, which are sparse (rarely greater than 5 to 10% density) with a patchy distribution (McCook et al., 1995). Seven different species have been recorded in the region, of which *Halophila ovalis* is the most common of the seagrasses found on the western side of Exmouth Gulf. It is a tropical species and, although widespread throughout the Ningaloo Reef and Rowley Shelf region, it is usually restricted to sparse and patchy occurrences. Seagrasses, including *Halophila*, are eaten by dugongs and also provide a complex habitat for juvenile fish and invertebrates of various species, and are therefore ecologically important.

Seagrass species are generally patchily distributed within the Muiron Islands Marine Management Area and are not a major component or a major primary producer. No comprehensive survey of seagrass diversity and abundance has been undertaken. However, the biogeography of several species such as *Cymodocea angustrata, Cymodocea serrulate, Halodule uninervis, Halophila ovalis, Halophila spinulosa, Syringodium isoetifolium*, and *Thalassodendron ciliatum* suggest that these species are likely to occur in the reserves.

Seagrasses within the waters of Barrow Island appear to not form extensive meadows but are rather sparsely interspersed between the extensive macroalgal habitats. A total of seven seagrass species have been recorded to date, these including *Cymodocea angustata, Halophila ovalis, Halophila spinulosa, Halodule uninervis, Thalassia hemprichii, Thalassodendron ciliatum* and *Syringodium isoetifolium*. However, the level of knowledge on seagrass distribution within the Barrow Island Marine Reserve is low (DEC, 2006). *Halophila* spp. are the most common seagrasses on shallow soft substrates and sand veneers throughout the area. They extend from the intertidal zone to approximately 15m water depth.

Benthic Invertebrate Habitats

The EMBA overlaps several areas which would contain benthic invertebrate habitats including the Ningaloo Marine Park, Montebello/Barrow Islands, and the Muiron Islands. The Muiron Islands and the Ningaloo Coast are approximately 43 km south west of the operational area. The operational area contains suitable environment for benthic invertebrates (Gardline, 2015).

The offshore marine environment from Busselton to the NT border is dominated by soft sediment seabeds; sandy and muddy substrates, occasionally interspersed with hard substrates covered with sand veneers; and rarely-exposed hard substrate. In shallow waters, non-coral benthic invertebrates may form part of the mosaic of benthic organisms found on hard substrates, alongside macrophytes and coral colonies. As light reduces with water depth, non-coral benthic invertebrates are the dominant community, albeit at low densities.

Benthic invertebrates comprise several types of feeding groups, including deposit feeders, filter feeders, grazers and predators. The abundance, diversity, biomass and species composition of benthic invertebrates can be used as indicators of changing environmental conditions. The distribution and abundance of benthic invertebrate species may be influenced by a wide variety of physical parameters, such as substrate composition, water temperature, depth, dissolved oxygen concentrations, pH, salinity, sediment C/N ratios and hydrography. Spatial and temporal differences in benthic species composition may also be influenced by a range of biological factors, such as primary productivity, competition and acclimatisation. Natural seasonal and interannual changes in these variables can also modify recruitment success and mortalities of individual species, and consequently the community structure of the benthos (OzCoasts, 2020).

2.3.3 Shoreline Habitats

Mangroves

The EMBA overlaps several areas which would contain mangrove habitats including the Ningaloo Marine Park, Montebello/Barrow Islands, and the Muiron Islands. The Muiron Islands and the Ningaloo Coast are approximately 43 km south west of the operational area.

Mangroves are woody plants adapted to salty conditions which most other vegetation cannot tolerate. They occur in the intertidal zone, running parallel to the shoreline or in estuaries and tidal creek systems, usually at the mean high-water level. Mangroves exist in a constantly changing environment. Periodically the sea inundates the communities with salty water while, at low tide, especially during periods of high rainfall, they may be exposed to freshwater flows. Mangroves grow in intertidal mud and sand and are found wherever suitable conditions are present, including wave-dominated settings of deltas, beach/dune coasts, limestone barrier islands and ria-archipelago shores (Semeniuk, 1993). Mangrove plants have specially adapted aerial roots (pneumatophores) that provide for gas exchange during low tide (McClatchie et al., 2006) and have evolved to adapt to fluctuating salinity, tidal inundation and fine, anaerobic, hydrogen-sulfide-rich sediment (Duke et al., 1998).

Mangroves are an important source of primary production and are an important ecological component to the marine and coastal environment, as they are a food resource for a range of species. Mangroves provide habitat and shelter for various birds and marine species, including juvenile reef fish species, rock lobster and prawns, increasing the importance of protecting the discrete stands within the region. Their root system acts as a breeding ground and nursery for crustaceans and fish species by providing protection from predation. Their extensive root system also reduces water velocity and energy, causing entrapment and deposition of suspended sediments. This provides stability and protection of coastlines by acting as a buffer zone and attenuating wave energy and current flow, reducing erosion and storm surge damage in coastal areas.

Six different species of mangroves are reported to occur in the region, with three species identified within the Ningaloo Marine Park. The dominant species is the white mangrove (*Avicennia marina*), with the spotted-leaved red mangrove (*Rhizophora stylosa*) and the ribbed-fruit orange mangrove (*Bruguiera exaristata*) existing in limited numbers (CALM/MRPA, 2005).

Well-developed white mangrove communities occur along the eastern and southern sides of Exmouth Gulf, with a small fringing mangal occurring on the western shore of the Gulf to the south of Bundegi Reef. The largest mangrove community within the Marine Park is found within Mangrove Bay. The mangal is characterised by established trees to 5 m high. Established mangrove stands can also be found associated with the Park’s tidal creek systems, including a well-developed mangal within Yardie Creek. While the area of mangal is less than 0.1% of the Marine Park, the mangroves are considered to represent a unique community within the Ningaloo Reef system.

Sandy Beaches and Intertidal Sediments

The EMBA extends over a number of sandy beaches and intertidal sediment habitats that vary in length, width and gradient. There is a wide range of variation in sediment type, composition and grain size along the EMBA. Bessieres Island Nature Reserve and Thevenard Island would contain these environments and are south of the operational area approximately 7 km and 20 km, respectively.

Sandy beaches are those areas within the intertidal zone where unconsolidated sediment has been deposited (and eroded) by wave and tidal action. Sandy beaches can vary from low- to high-energy zones; the energy experienced influences the beach profile due to varying rates of erosion and accretion.

Sandy beaches provide habitat to various burrowing invertebrates and subsequently provide foraging grounds for shorebirds (Garnet and Crowley, 2000). The number of species and densities of benthic macroinvertebrates that occur in the sand typically inversely correlate with sediment grain size and exposure to wave action, and positively correlate with sedimentary organic content and the amount of detached and attached macrophytes (Wildsmith et al., 2005). However, the distributions of these fauna among habitats will also reflect differences in the suite of environmental variables that characterise those habitats (Wildsmith et al., 2005).

Within the NWMR, sandy beaches and intertidal sediments occur extensively along the Ningaloo Coast, the western side of Exmouth Gulf and on the northwest mainland (Onslow region). They are also found on many of the northwest offshore islands, including the Muiron Islands, the Barrow-Lowendal-Montebello island group and Thevenard Island. They represent an important habitat that supports burrowing crabs, mainly ghost crabs, and burrowing bivalve molluscs, as well as a diverse community of benthic infauna comprising polychaetes, crustaceans and gastropods. The beaches also provide seasonally important habitat for turtle nesting and migratory seabirds and shorebirds. Further details about coastline sensitivities can be found in the Joint Carnarvon Operations North West Shelf Sensitivity Mapping Report Part A (June 2012).

Some of the offshore islands with limestone and sandstone features are also biologically important for breeding seabirds and migratory wading birds; for example, Caspian terns, little terns, wedge-tailed shearwaters and ospreys breed on Serrurier Island and Airlie Island, and wedge-tailed shearwaters breed on Bessieres Island. The intertidal beaches of some of the offshore islands, such as the Muiron Islands and Serrurier and Thevenard islands, are also important nesting areas for turtles.

Rocky Shores and Limestone Platforms

Rocky shorelines are found in several places within the EMBA and often indicate high-energy areas (wave action) where sand deposition is limited or restricted, perhaps seasonally or during a cyclone. It is likely that rocky shores and limestone platforms are present within the waters of the Muiron Islands (approximately 43 km south west of the operational area).

Rocky shore habitats are common along the Ningaloo coastline, offshore islands and western side of the Exmouth Gulf and Onslow mainland region. They range in physical structure from relatively planar limestone/sandstone pavement to dissected low cliffs that provide a range of habitat niches. Rocky shores can include pebble/cobble, boulders and rocky limestone cliffs, often at the landward edge of reef platforms.

Rocky shorelines provide important foraging areas for seabirds and habitat for invertebrates found in the intertidal splash zone (Morton and Britton, cited in Jones, 2004). The diversity of fauna increases with the increasing complexity of the substrate and is dominated by sedentary fauna of rock oysters, barnacles and burrowing bivalves, and mobile fauna comprised largely of crabs, chitons and gastropod molluscs. Further details about coastline sensitivities can be found in the Joint Carnarvon Operations North West Shelf Sensitivity Mapping Report Part A (June 2012).

Wetlands

The EMBA does not overlap any wetlands of international importance (Ramsar wetlands) but does intersect one wetland (Cape Range Subterranean Waterway) and is identified in the Directory of Important Wetlands in Australia (DIWA) spatial database (Sections 2.4.5 and 2.4.6). Eighty-mile Beach located 541 km north east of the operational area is the closest wetland of international importance.

Wetlands are areas of land where water covers the soil – all year or just at certain times of the year. Wetlands may be natural or artificial and the water within a wetland may be static or flowing, fresh, brackish, saline or underground.

Wetlands play a critical role in protecting our shores from wave action, reduce the impacts of floods, absorb pollutants and improve water quality. They provide habitat for animals and plants and many contain a wide diversity of life, supporting plants and animals found nowhere else. Wetlands provide an important range of environmental, social and economic services. Many wetlands are areas of great natural beauty and many are important to Aboriginal and Torres Strait Islander people (DAWE, 2020a). Wetlands also provide important benefits for industry. For example, they form nurseries for freshwater and marine species including fish, provide important habitat for migratory shorebirds, and are critical to Australia's commercial and recreational fishing industries (DAWE, 2020a).

2.3.4 Pelagic Environments

Plankton

Plankton consists of microscopic organisms typically divided into phytoplankton (algae) and zooplankton (fauna including larvae). Plankton plays a major role in the trophic system, with phytoplankton being a primary producer and zooplankton a primary consumer. They are both in turn consumed by other faunal species.

Phytoplankton are autotrophic planktonic organisms living within the photic zone and spend either part or all of their lifecycle drifting with the ocean currents. Phytoplankton depend on oceanographic processes, such as currents and vertical mixing, that supply nutrients needed for photosynthesis. Thus, phytoplankton biomass is typically variable (spatially and temporally) (Evans et al., 2016) but greatest in areas of upwelling, or in shallow waters where nutrient levels are high. Peak primary productivity, however, varies on a local and regional scale.

The trophic system in the pelagic zone of the NWMR is based on phytoplankton (DEWHA, 2008). The distribution of plankton is often associated with localised and seasonal productivity that results in sporadic bursts of phytoplankton and zooplankton communities (DEWHA, 2008). However, in general, the mixing of warm surface water with deeper, more nutrient-rich water generates phytoplankton production and zooplankton blooms.

According to the Australia State of the Environment 2016 Report (Jackson et al., 2017), warming ocean temperatures have extended the distribution of tropical phytoplankton species (which have a lower productivity), further south resulting in a decline in primary productivity in oceanic waters north of 35°, especially the NWS (Evans et al., 2016). However, trends in primary productivity across Australia vary, with the southwest of Australia experiencing an increase in productivity and northern Australia experiencing no change between 2002 to 2016 (Evans et al., 2016).

Cyclones can influence the distribution and abundance of plankton. Observations of Cyclone Tiffany, which affected the NWS in January 1988, noted that communities of phytoplankton rapidly recovered as a result of changed nutrient conditions, while zooplankton species were transported into areas beyond their normal range due to changes in current, wind and wave patterns (DEHWA, 2008).

Fish

The subsea infrastructure in the operational area has created an artificial reef system which displays a higher abundance, species richness and overall biomass of fish (per unit area) on well structures compared to flowlines and the adjacent sandy substrate (UTS Decommissioning Ecology Group, 2020). There have been eighty-eight commercial and recreational valuable fish species observed within the operational area including Lutjanidae (tropical snappers) and Epinephalidae (groupers), mangrove jacks and dhufish (UTS Decommissioning Ecology Group, 2020).

Some 1400 species of finfish are known to occur in the region, mostly of a tropical Indo-West Pacific affinity, with a greater proportion occurring in shallow coastal waters (DEWHA, 2008). In general, most fish in the region are associated with coral reefs. For example, the abundance, species richness and assemblage structure of juvenile fishes was quantified in 2009 to 2011 at 20 locations extending from Bundegi to 3-Mile Camp and covering around 280 km of the Ningaloo coastline. Sampling included back reef and lagoonal reef zones as well as sanctuary and recreational management zones. In total, 36,791 juvenile fishes from 120 species were observed over the three recruitment years, providing an average of 53 individuals (± 2.6 standard error) per 30 m^2 transect.

Interestingly, recruitment rates varied significantly among sampling times (in other words, temporal variation). Transect abundance means ranged from 82 ± 6.3 individuals (2009), 19 ± 1.2 individuals (2010) to 77 ± 4.6 individuals (Depczynski et al., 2011). The authors of this study noted the 75% drop in abundance in 2010 coincided with a small increase in mean species richness. Different pelagic fish occur in the deeper offshore waters of the region. Pelagic fish species are seasonally abundant and may pass through the area during annual migrations. The most notable species of deep-water pelagic fishes in the area are the billfish, which include sailfish, marlin (both family Istiophoridae) and swordfish (*Xiphias gladius*).

The region also supports diverse and abundant shark and ray populations. Whaler sharks (Family Carcharhinidae) are the most numerous and diverse, occurring in a wide range of habitats such as intertidal (black-tip reef shark – *Carcharhinus melanopterus*), offshore reefs (grey reef shark – *C. amblyrhynchos*) and deep ocean areas (oceanic white-tip shark – *C. longimanus*).

The Ningaloo Marine Park (State Waters) Management Plan 2005–2015 (CALM/MRPA, 2005) outlines a suite of management strategies to protect marine plants and animals found in the region. The offshore waters of the Ningaloo Reef and Muiron islands have diverse and abundant shark and ray populations. Section 7.1.14 of the Ningaloo Marine Park (State Waters) Management Plan 2005–2015 references several locations in the Ningaloo Marine Park, including Pelican Point, Bundegi Sanctuary Zone, Mangrove Bay and Bills Bay, which are suggested aggregation points (nursery areas) for juvenile sharks and ray populations. The best known of these is Bills Bay, where up to 100 sharks have been witnessed in water depths as shallow as 0.5 m. Aggregations recorded in other locations of the reserves have so far represented fewer individuals. Due to stable diversity and abundance of shark and ray numbers, there is presently a low level of threat to these populations. The current major pressure is from commercial and recreational fishing; however, population information is limited.

Information about commercial fisheries and recreational fishing activities in the EMBA are provided in Section 2.10.5.

2.4 Matters of National Significance

Conservation values and sensitivities listed and protected under the EPBC Act include matters of environmental significance (MNES) and other protected matters. Other internationally significant conservation values have been identified via the World Database on Protected Areas and UNESCO data sources.

Terrestrial or (solely) freshwater species that occur in the EPBC Protected Matters searches of the EMBA have been excluded, as they are not relevant for considering potential effects from marine hydrocarbons exposure. Species that may occur on shorelines include shorebirds, but terrestrial mammals, reptiles (such as pythons) and bird species that do not have habitats along shorelines have also been excluded. Refer to the EPBC Protected Matters search results included in this Attachment 1 of this Appendix.

2.4.1 Commonwealth and International Marine Areas

The operational area and EMBA are within Australia's exclusive economic zone (EEZ) and Territorial Sea, which is a Commonwealth marine area. The Commonwealth marine area is any part of the sea, including the waters, seabed and airspace, within Australia's EEZ or over the continental shelf of Australia, that is not State or NT waters. The Australian Commonwealth marine area stretches from 3 to 200 nm from the coast.

2.4.2 World Heritage Properties

World Heritage Properties represent the best examples of the world's cultural and natural heritage. There are no World Heritage Properties within the operational area. The EMBA intercepts the boundary of one World Heritage Property: the Ningaloo Coast (Table 2-4).

Note: heritage properties that are terrestrial and not linked to the shoreline EMBA have been excluded, as they are not relevant for considering potential effects from marine hydrocarbon spills.

Table 2-4: Summary of Listed World Heritage Sites

Name	Operational area	EMBA
The Ningaloo Coast, Australia	×	✓

Ningaloo Coast

The Ningaloo Coast was included on the World Heritage List in June 2011 for its natural beauty, aesthetic importance and significant habitats of biological diversity containing threatened species. Located on WA’s remote coast along the East Indian Ocean, it covers an area of 6045 km² and includes one of the longest nearshore reefs in the world (UNESCO, 2020). The Ningaloo Coast World Heritage Area comprises the Ningaloo Marine Park (State waters and the adjoining Commonwealth waters section), the Muiron Islands Marine Management Area and Nature Reserve, the Bundegi and Jurabi coastal parks and the Cape Range National Park, in addition to Crown leasehold and freehold land. The values recognised by the World Heritage listing are:

- Landscapes and seascapes of the property comprise mostly intact and large-scale marine and terrestrial environments (see Section 2.3.2).
- Whale shark aggregations follow the mass coral spawning and seasonal upwelling each autumn at Ningaloo Reef, one of the few places in the world where this species congregates (see Section 2.8.1).
- It forms part of the annual migration route for the endangered humpback whale and other whales and turtles (see Section 2.6.1 and Section 2.7.1).
- Marine turtle density is exceptionally high, with green turtles being most abundant (see Section 2.7.1).
- The Ningaloo Coast is on the migratory route of many trans-equatorial wader bird species and provides feeding grounds for many migratory seabirds (see Section 2.9.1).
- More than 300 coral species and 155 species of sponges have been documented (see Section 2.3.2).
- More than 700 species of reef fish and more than 650 species of mollusc (shellfish, sea snails, octopus and cuttlefish) are present (Section 2.3.4).
- There are 600 species of crustacean (see Section 2.3.2).
- A high diversity of echinoderms (sea stars, sea urchins, sea cucumbers) are present, including 25 new species (see Section 2.3.2).

2.4.3 National Heritage Properties

There are 13 National Heritage Places located in WA, of which none are in the operational area. One National Heritage Property lies within the boundaries of the EMBA (Table 2-5).

Table 2-5: Summary of Listed National Heritage Sites

Name	Approx. Distance from Operational area	Operational area	EMBA
The Ningaloo Coast	38 km	×	✓

Ningaloo Coast

The Ningaloo Coast was included on the National Heritage List in May 2007. Refer to Section 2.4.2 for a description of the heritage values.

2.4.4 Commonwealth Heritage Places

The Commonwealth Heritage list is a list of the historic, cultural and natural heritage places on Commonwealth land, in Commonwealth waters, or owned or managed by the Commonwealth Government. These include places connected to defence, maritime safety, communications, customs and other government activities that also reflect Australia's development as a nation. No Commonwealth heritage places exist within the operational area. One relevant Commonwealth heritage place with potential ocean connectivity exist within the wider EMBA (Table 2-6).

Heritage places that are terrestrial and not linked to the shoreline, but occur in the EPBC Protected Matters search of the EMBA, have been excluded as they are not relevant to consideration of potential affects from marine hydrocarbon spills. Refer to the EPBC Protected Matters searches results included in Attachment 1 of this Appendix.

Table 2-6: Summary of Listed Commonwealth Heritage Places

Name	Approx. Distance from Operational area	Operational areas	EMBA
Ningaloo Marine Area – Commonwealth Waters	38 km	×	✓

Ningaloo Marine Area – Commonwealth Waters

The Ningaloo Marine Area was included in the Commonwealth Heritage List in June 2004 (DAWE, 2021b). Refer to Section 2.4.2 for a description of conservation values.

2.4.5 Wetlands of International Importance

There are 12 wetlands of international importance under the Convention on Wetlands of International Importance (the Ramsar Convention) in WA. There are no Ramsar wetlands within the operational area or EMBA.

The nearest Ramsar wetland is Eighty Mile Beach, located near Port Hedland (around 541 km to the east of the Griffin GEP Operations Area).

2.4.6 Wetlands of National Importance

Wetlands of national importance are those that are a good example in a particular area, an important habitat for native species, or have outstanding heritage or cultural significance. The EMBA overlaps with one nationally-important wetland (see Table 2-7).

Table 2-7: Summary of Listed Nationally Important Wetland

Name	Approx. Closest Distance to Operational area	Operational area	EMBA
Cape Range Subterranean Waterways	97 km	×	✓

Cape Range Subterranean Waterways

The Cape Range Subterranean Waterways site is the subterranean waterways, sinkholes, general groundwater and artificial wells (notably Billy, Five Mile, Javis, Kubara, Kudumurra, Milyering, Mowbowra, Pilgramunna, Tantabiddi and Tulki wells, Tantabiddi and Wobiri rockholes, Bundera Sinkhole, and connecting caves) of the coastal plain and foothills of Cape Range north of a line between Norwegian Bay, at the foot of the peninsula on the west coast, and the Bay of Rest in Exmouth Gulf (DAWE, 2020a). The site represents a good example of a subterranean karst wetland system and the only one (apart from Barrow Island) in arid northwestern Australia. Identified as meeting two Ramsar criteria for listing as a wetland of international importance and recommended as a World Heritage site, the total area is 175 000 ha, and it sits 0 to 2 m above sea level.

2.4.7 Threatened Ecological Communities

Listing threatened ecological communities is a form of landscape or systems level protection. These communities provide vital wildlife corridors and habitat refuges for many plant and animal species, including threatened species and other Australian plants and animals in decline.

The Protected Matters Search reports identified no threatened ecological communities within the operational area or the EMBA.

2.4.8 Protected Species

The EPBC Act Protected Matters Search Tool (PMST) was used to identify listed threatened and migratory species that may occur within the operational area and the EMBA (Table 5-9 in the EP).

Descriptions of the threatened and migratory species are provided in this section. The full list of marine species from the protected matters search is provided in Attachment 1 of this Appendix.

Refer to Section 5.6.2 of the EP for information on Biologically Important Areas and Habitat Critical to the Survival of a Species.

2.5 Summary of Windows of Ecological Sensitivity

Table 2-8 summarises the windows of ecological sensitivity for values identified within the operational area and the EMBA. These receptors are considered throughout the EP in terms of the identified potential risk.

Table 2-8: Key Environmental Sensitivities and Timing of Biologically Important Activity

Category	Environmental Sensitivity	Location	Season
Marine mammals	Dugongs – breeding, calving, foraging, nursing	Exmouth Gulf	Year-round
	Humpback migration	The migration corridor extends from the coast to out to around 100 km offshore in the Kimberley region extending south to North-west Cape	Northern migration, late July to September
	Humpback resting	Exmouth Gulf	Winter
	Pygmy blue whale migration	WA coastline	Northern migration (enter Perth canyon January to May, pass Exmouth April to August) Southern migration (October to late December)
	Pygmy blue whale – foraging	Ningaloo	November to May
Marine reptiles	Flatback turtle – foraging	String of islands between Cape Preston and Onslow, inshore of Barrow Island	July
	Flatback turtle – internesting	Thevenard Island (South), Montebello Islands (Hermite Island	Summer
	Flatback turtle – nesting	Thevenard Island (South), Barrow Island, Montebello Islands (Hermite Island, NW Island, Trimouille Island	Summer
	Green turtle – basking	Middle Island, West Coast Barrow Island	Summer
	Green turtle – internesting	Barrow Island, Montebello Islands	Summer
	Green turtle – mating	Montebello Islands, Middle Island, West Coast Barrow Island	Summer

Category	Environmental Sensitivity	Location	Season
	Green turtle – nesting	North and South Muiron Island, Middle Island, West Coast Barrow Island, North West Cape, Montebello Islands, Serrurier Island	Summer
	Hawksbill turtle – foraging	Shallow water coral reef and artificial reef (pipeline) habitat	All year
	Hawksbill turtle – foraging	String of islands between Cape Preston and Onslow, inshore of Barrow Island	July
	Hawksbill turtle – mating	Barrow Island, Montebello Islands	All year
	Hawksbill turtle – nesting	Thevenard Island	All year
	Hawksbill turtle – nesting	Barrow Island	Peak nesting in spring and early summer
	Hawksbill turtle – nesting	Montebello Islands (Hermite Island	Spring and early summer, peak nesting October
	Loggerhead turtle – nesting	Muiron Island, Ningaloo coast and Jurabi coast, Montebello Islands	October to March
Sharks/fish	Whale shark – foraging	Northwards of Ningaloo	Spring
	Whale shark – foraging	Ningaloo Marine park and adjacent Commonwealth waters	April to June, Autumn
Birds	Fairy tern – breeding	Pilbara and Gascoyne coasts and islands	July to late September
	Roseate tern – breeding and foraging	Kimberley, Pilbara and Gascoyne coasts and islands	Mid-March to July
	Wedge-tailed shearwater – breeding	Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef	Breeding visitor arriving in mid-August and leaving in April in Pilbara and mid-May in Shark Bay
	Lesser Crested Tern - breeding	Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef Breeding on islands off north and west Kimberley also Bedout Island, Lowendal Islands, Thevenard Island and island off Dirk Hartog.	Breeding March to June

2.6 Marine Mammals

Table 5-9 in the EP presents the marine mammal with the potential to occur within the operational area and EMBA, based on the search of the EPBC Protected Matters database. The below section provides further details on these species.

2.6.1 Threatened and Migratory Species

Antarctic Minke Whale

The Antarctic minke whale (*Balaenoptera bonaerensis*) is listed as migratory under the EPBC Act. This large baleen whale swims alone or in pairs; numbers are not well documented. The distribution of this species in WA is unknown; however, they are known to occur offshore within cold temperate to Antarctic waters (DAWE, 2021). The species migrates between Antarctic feeding grounds to warmer tropical and subtropical waters and calving occurs in warmer waters during late May and early June after winter migration from Antarctic waters.

According to the PMST report, Antarctic minke whales were identified as likely to occur within the EMBA.

Sei Whale

Sei whales (*Balaenoptera borealis*) are listed as vulnerable and migratory under the EPBC Act. Sei whales are not commonly recorded in Australian waters and their similarity to Bryde's whales has resulted in confusion about their distributional limits and the accuracy of recorded observations (DoE, 2020a). There are no known mating or calving areas in Australian waters. The species migrates between Australian waters and Antarctic feeding areas, but their movements are unpredictable and not well documented. They have been sighted inshore (in the proximity of the Bonney upwelling in Victoria) as well as in deeper offshore waters, and have only been sighted in summer and autumn (DAWE, 2021).

According to the PMST report, sei whales are likely to occur or have habitat within the operational area and are likely to occur within the EMBA for foraging or feeding; however, due to infrequent sighting in Australia, the likelihood of these whales being present is very low.

Bryde's Whale

Bryde's whale (*Balaenoptera edeni*) is listed as migratory under the EPBC Act. It is considered the least migratory of the whale species in Australian waters and is typically found in tropical waters between 40°S and 40°N year-round (Bannister et al., 1996; DAWE, 2020). The species frequents oceanic waters as well as nearshore areas following zones of upwelling around the continental shelf (Mustoe and Edmunds, 2008).

According to the PMST report, Bryde's whales were identified as likely to occur or have habitat within the operational area and EMBA.

Blue Whale

Blue whales (*Balaenoptera musculus*) are listed as endangered and migratory under the EPBC Act. There are two recognised subspecies of blue whale in the southern hemisphere that are both recorded in Australian waters, the southern (or 'true') blue whale (*Balaenoptera musculus intermedia*) and the 'pygmy' blue whale (*Balaenoptera musculus brevicauda*). In general, southern blue whales occur in waters south of 60°S and pygmy blue whales occur in waters north of 55°S (not in the Antarctic). By this definition, all blue whales in waters from Kalbarri to the NT border are assumed to be pygmy blue whales and are discussed below.

Pygmy blue whales have a southern hemisphere distribution, migrating from tropical water breeding grounds in winter to temperate and polar water feeding grounds in summer (Bannister et al., 1996; Double et al., 2014). Passive acoustic data documented pygmy blue whales migrating along the WA shelf break at depths of 500 to 1000 m (McCauley & Jenner, 2010).

During the southern migration, pygmy blue whales pass south of the Montebello Islands and Exmouth from October to the end of January, peaking in late November to early December (Double et al., 2012). On the return journey, tagging surveys have shown pygmy blue whales migrating northward relatively near to the Australian coastline (100 km) until reaching North West Cape, after which they travelled offshore (240 km) to Indonesia. Blue whales have been detected off Exmouth and the Montebello Islands between April and August (Double et al., 2012; McCauley & Jenner, 2010) (Figure 2-3).

According to the PMST report, pygmy blue whales were identified as likely to occur or have habitat within the operational area and to use the wider EMBA for migration. A distribution BIA overlaps the operational area. Foraging, distribution and migration BIAs overlap the wider EMBA. Considering the known usage of the area it is likely the pygmy blue whale will be regionally present, particularly over the summer season between April and August (north-bound migration) and October to January (south-bound migration).

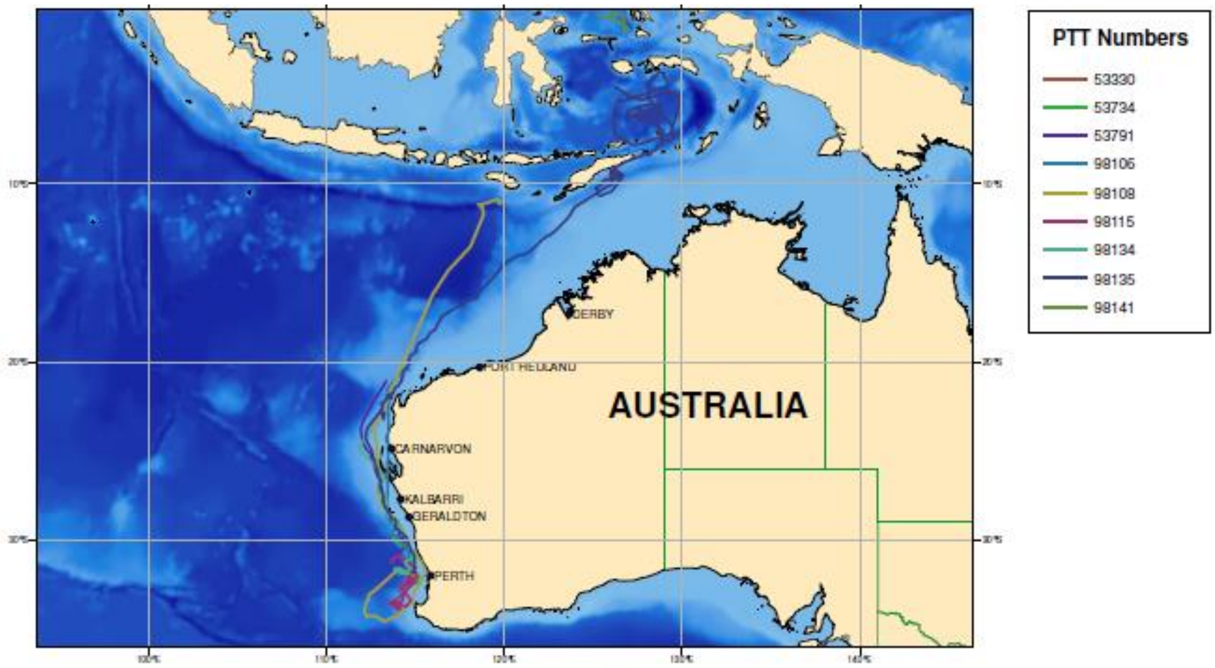

Figure 2-3: Satellite Tracking of Blue Whales in 2010/2011, Modified from Double et al. (2012)

Fin Whale

The fin whale (*Balaenoptera physalus*) is listed as vulnerable and migratory under the EPBC Act. It is the second-largest whale species after the blue whale. Fin whale distribution in Australian waters is known primarily from stranding events and whaling records. Due to scarcity of sighting records, the distribution cannot be accurately determined, although it is thought to be along the western coast of Australia, southern Australia around to Tasmania. The Australian Antarctic waters are important feeding grounds but there are no known mating or calving areas in Australian waters (Morrice et al., 2004). The migration routes and location of winter breeding grounds are uncertain, but presence in Australian waters has been detected in summer and autumn months (DoEE, 2017).

According to the PMST report, fin whales were identified as likely to occur or have habitat in the operational area and to use the wider EMBA for foraging or feeding activities; however, due to infrequent sightings in Australia, the likelihood of these whales being present is low.

Dugong

Dugongs (*Dugong dugon*) are protected under the EPBC Act, which lists them as marine and migratory species. They are large, herbivorous marine mammals that feed on seagrass and mostly inhabit shallow (up to 5 m) waters fringing coasts and offshore islands, occurring in close conjunction with the seagrass and algae beds on which they feed. There is little data about the presence of dugongs in deeper offshore waters, although the absence of food would suggest this is unlikely.

The distribution of dugongs in Australia ranges from Shark Bay in WA, extending around the NT coastline to Moreton Bay in Queensland. Dugongs are long-lived and slow-breeding. Breeding occurs from September through to April.

According to the PMST report, dugongs are likely to occur or have habitat in the operational area, and have a known breeding area within the EMBA and a known BIA (breeding, calving, foraging and nursing) intersects the EMBA.

Southern Right Whale

The southern right whale (*Eubalaena australis*) is listed as endangered and migratory under the EPBC Act. The species is seasonally present on the Australian coast between May and November and recorded in the coastal waters of all Australian states (Bannister et al., 1996). Major calving areas are located in WA at Doubtful Island Bay, east of Israelite Bay in the southwest; and in South Australia at Head of Bight (Bannister et al., 1996). The distribution of southern right whales in Australian waters other than near the coast is unknown and very little information is known about the migratory patterns, habitats, calving areas or feeding habits, but peak periods for mating are known to be from mid-July through to August (DAWE, 2020).

Isolated individuals have been seen outside the normal season, but a summer sighting would be very unusual. Australian southern right whales migrate seasonally between higher and middle latitudes. The general timing of migratory arrivals and departures varies slightly each year. Migratory pathways are not well known (Bannister et al., 1996). A circular, anticlockwise migration pattern south of the Australian continent was proposed by Hart et al. (1842), based on the seasonal location of whaling activity. This generalised migratory pattern is further supported by most inter-year coastal movements, being in a westerly direction, and between-year coastal movements, being in an easterly direction (Burnell, 2001).

According to the PMST report, the southern right whale and its habitat may occur within the operational area and likely to occur in the EMBA.

Humpback Whale

The humpback whale (*Megaptera novaengliae*) is listed as vulnerable and migratory under the EPBC Act. Humpback whales occur throughout Australian waters, their distribution being influenced by their migratory pathways and aggregation areas for resting, breeding and calving. In the southern hemisphere, humpback whale populations spend the summer months feeding in the Antarctic polar region before migrating north to tropical breeding/calving grounds in the coastal waters of the Kimberley.

Aerial surveys and noise logger recordings for Chevron's Wheatstone Project show most distributions of humpback whales were sighted at an average distance of 50 km from the mainland during the northern migration and 35 km during the southbound migration (RPS, 2010). The southbound migration moves down the coast between late August and November, although females with calves have been documented leaving the calving areas last, with a later peak in abundance observed from mid-August to mid-September (Jenner et al., 2001). Figure 2-4 illustrates the results of aerial surveys conducted during a single year between the North West Cape and Barrow Island.

Humpback whales were identified as known to occur within the operational area and breeding is known within the EMBA. The operational area intersects the humpback whale migration BIA and waters out to around 50 km offshore as part of the migratory corridor for these whales. The EMBA intersects a portion of the Exmouth Gulf resting area. Individuals may be sighted, particularly between June and December, while transiting through to rest areas of the Exmouth Gulf.

According to the PMST report, the humpback whale and its habitat is known to occur within the operational area and breeding is known to occur within the EMBA. Considering the likely utilisation of the waters as feeding ground, this assessment is believed to be accurate.

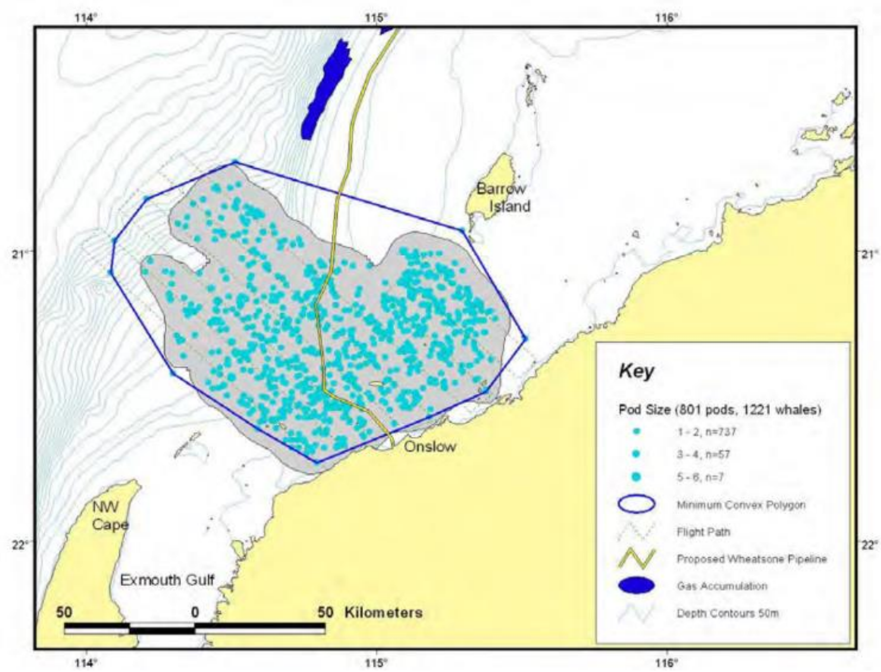

Figure 2-4: Aerial Survey Sightings of Humpback Whales from June to December 2009 (taken from Jenner et al., 2010)

Killer Whale (Orca)

The orca (*Orcinus orca*) is listed as migratory under the EPBC Act and is the largest member of the dolphin family. Orcas are found in both tropical and temperate waters in oceanic, pelagic and neritic waters (DAWE, 2020). Orcas usually travel in groups of ten to 30 individuals and make seasonal migrations, and may follow regular migratory pathways; however, this has not been proven. No specific information about migratory pathways along the WA coast is documented. Orcas have been recorded relocating to Antarctic waters during summer months and back to warmer waters during winter. This suggests that during the winter months would be the highest likelihood of occurrence of orcas on the NWS.

According to the PMST report, the orca has been identified as may occur or have habitat within the operational area and EMBA.

Sperm Whale

The sperm whale (*Physeter macrocephalus*) is listed as migratory under the EPBC Act. It has a wide distribution extending from the polar regions to the equator, although it is usually found in deeper oceanic waters near continental breaks and canyons (DAWE, 2020). Females and young males tend to remain in warmer waters, whereas adult males venture further away from the equator to colder waters. Limited information exists about sperm whale distribution in Australian waters.

According to the PMST report, sperm whales have been identified as may occur or have habitat within the operational area and EMBA.

Australian Humpback Dolphin

The Australian humpback dolphin (*Sousa sahulensis*) is listed as migratory under the EPBC Act. The species are typically found in tropical to subtropical waters off the Sahul Shelf from northern Australia to the southern waters of the island of New Guinea (Jefferson and Rosenbaum, 2014). Australian humpback dolphins are found primarily in coastal waters (Parra & Cagnazzi, 2016).

According to the PMST report, the Australian Humpback Dolphin was identified as may occur or have habitat within the operational area and EMBA.

Indo-Pacific Humpback Dolphin

The Indo-Pacific humpback dolphin (*Sousa chinensis*) is listed as migratory under the EPBC Act. The species is known to occur along the Exmouth Gulf around the North West Cape round to the Queensland/New South Wales (NSW) border. The total population size of the Indo-Pacific humpback dolphin in Australian waters is not known. The dolphin inhabits shallow coastal, estuarine and occasionally riverine habitats, usually in waters less than 20 m, but have occasionally been seen as far offshore as 55 km in relatively shallow water (Corkeron et al., 1997). The Indo-Pacific humpback dolphin's migratory patterns in the NWS region are not well documented.

According to the PMST report, the Indo-Pacific humpback dolphin was identified as known to occur or have habitat within the EMBA.

Spotted Bottlenose Dolphin

The spotted bottlenose dolphin (Arafura/Timor Sea population) (*Tursiops aduncus*) is listed as migratory under the EPBC Act. Occurring Australia-wide, this species resembles the common bottlenose dolphin. This species prefers shallower inshore bays and estuaries and travels in groups consisting on average of between five and 16 individuals (DAWE, 2020). Migratory movements in Australia vary and are likely to be triggered by baitfish movements. This species can spend all year in one location but can also make long-range movements.

According to the PMST report, the spotted bottlenose dolphin was identified as known to occur or have habitat within the operational area and EMBA. As the species prefers shallower, inshore waters they are most likely to occur within the coastal waters of the EMBA and not in the operational area or deeper waters.

2.7 Marine Reptiles

Table 5-9 in the EP presents the marine reptiles with the potential to occur within the operational area and EMBA, based on the search of the EPBC Protected Matters database. The below section provides further details on these species.

2.7.1 Threatened and Migratory Species

Short-Nosed Seasnake

The short-nosed seasnake (*Aipysurus apraefrontalis*) is listed as critically endangered under the EPBC Act. It is a fully aquatic, small snake and is endemic to WA. It has been recorded from Exmouth Gulf, WA, to the reefs of the Sahul Shelf, in the eastern Indian Ocean. This species is believed to show strong site fidelity to shallow coral reef habitats in less than 10 m of water, with most specimens having been collected from Ashmore and Hibernia reefs (Minton & Heatwole, 1975; Guinea & Whiting, 2005).

The species prefers the reef flats or shallow waters along the outer reef edge in water depths to 10 m (McCosker, 1975; Cogger, 2000). The species has been observed during daylight hours, resting beneath small coral overhangs or coral heads in 1 to 2 m of water (McCosker, 1975). Guinea and Whiting (2005) reported that very few short-nosed seasnakes moved even as far as 50 m away from the reef flat and are therefore unlikely to be expected in high numbers in offshore, deeper waters.

According to the PMST report, the short-nosed seasnake was identified as likely to occur within the EMBA.

Leaf-Scaled Seasnake

The leaf-scaled seasnake (*Aipysurus foliosquama*) is listed as critically endangered under the EPBC Act. The species is usually solitary but is sometimes found in groups at particular coral outcrops, together with other species of seasnake, including the short-nosed seasnake (*A. apraefrontalis*) described above (McCosker, 1975). These congregations contain gravid (pregnant) females (Guinea & Whiting. 2005).

The leaf-scaled seasnake is found only on the reefs of the Sahul Shelf in WA, especially on Ashmore and Hibernia reefs (Cogger, 2000; Minton & Heatwole, 1975; Storr et al., 2002) in the NWMR (DEWHA, 2008).

The current extent of occurrence is estimated to be 750 km² and the area of occupancy is around 228 km² (Guinea and Whiting, 2005).

The leaf-scaled seasnake was the most common seasnake encountered on the reef flat at Ashmore Reef (Guinea & Whiting, 2005; Minton & Heatwole, 1975). However, sightings of this species have become rare on both Ashmore Reef and Hibernia Reef (Guinea, 2006; 2007) and it has not been reported in surveys since 2001 (Guinea, 2007; Lukoschek et al., 2013). In 2010, a dead specimen was collected from Barrow Island and deposited in the WA Museum, although it is unknown whether the individual was a resident or a waif (displaced from original habitat) (Lukoschek et al., 2013).

According to the PMST report, the leaf-scaled seasnake was identified as known to occur or have habitat within the EMBA, however, considering the species is most common at Ashmore Reef (outside of EMBA) and only one specimen was observed on Barrow Island from unknown origin it is reasonable to assume the species may be present in very low numbers.

Loggerhead Turtle

The loggerhead turtle (*Caretta caretta*) is listed as endangered and migratory under the EPBC Act. It has a worldwide distribution, living and breeding in subtropical to tropical locations (Limpus, 2008a). The annual nesting population in WA is thought to be 3000 females annually (Baldwin et al., 2003), and this is considered to support the third largest population in the world (Limpus, 2008a).

Nesting and breeding occur from October to March, with a peak in late December/early January (DoEE, 2017). Major nesting beaches include the Muiron Islands, Ningaloo Coast south to Carnarvon.

Foraging areas are widespread for loggerhead turtle populations and migrations from nesting to feeding grounds can stretch thousands of kilometres, including feeding grounds as far north as the Java Sea of Indonesia for the WA population (Limpus, 2008a). Loggerhead turtles are carnivorous and feed primarily on benthic invertebrates from depths ranging from around 50 m to nearshore tidal areas (DAWE, 2020), including areas of rocky and coral reef, muddy bays, sand flats, estuaries and seagrass meadows (Limpus, 2008a).

According to the PMST report, the loggerhead turtle or its habitat is known to occur within the operational area and breeding was known within the EMBA. No BIAs for the species lie within the operational area; however, the EMBA intersects known BIA (internesting) and habitat critical to the survival of the species (Figure 4-8 in the EP). Considering the known habitat utilisation and presence, this assessment is believed to be accurate.

Green Turtle

The green turtle (*Chelonia mydas*) is listed as vulnerable and migratory under the EPBC Act. It has a worldwide tropical and subtropical distribution and is widespread and abundant in WA waters, with an estimated

20,000 individuals occurring in WA, arguably the largest population in the Indian Ocean (Limpus, 2008b). The principal rookeries in WA include the Lacepede Islands, Barrow Island, Montebello Islands (all sandy beaches), Muiron Islands, Browse Island, Northwest Cape, and Ningaloo Coast North. Nesting occurs between November and March, with the peak period between January and March.

Green turtles are omnivores, mainly feeding in shallow benthic habitats on seagrass or algae, but are also known to feed on sponges, jellyfish and mangroves (Limpus, 2008b). Green turtles are unlikely to forage or dwell within deeper offshore waters due to the water depths; however, they may occasionally migrate through it.

According to the PMST report, the green turtle or its habitat is known to occur within the operational area and breeding was known within the EMBA. No BIAs for the species lie within the operational area. However, the wider EMBA intersects known BIAs (aggregation, basking, foraging, mating, nesting and internesting habitat (refer Table 5-10 in the EP). A habitat critical to the survival of the species for internesting overlaps the operational area and EMBA (refer to Table 5-11 of the EP). Considering the known habitat utilisation and presence, this assessment is believed to be accurate.

Leatherback Turtle

The leatherback turtle (*Dermochelys coriacea*) is listed as endangered and migratory under the EPBC Act. It has the widest distribution of any marine turtle and can be found from tropical to temperate waters throughout the world (Márquez, 1990). There are no major centres of nesting activity that have been recorded in Australia, although scattered isolated nesting (one to three nests per annum) occurs in southern Queensland and the NT (Limpus & McLachlin, 1994). There have been several records of leatherback turtles off the coast of WA but no confirmed nesting sites (Limpus, 2009).

According to the PMST report, the leatherback turtle was identified as likely to occur or have habitat within the operational area and known to occur or have habitat within the EMBA; however, no BIAs or habitat critical to the survival of the species lie within the operational area or EMBA.

Hawksbill Turtle

The hawksbill turtle (*Eretmochelys imbricata*) is listed as vulnerable and migratory under the EPBC Act. Hawksbill turtles have a global distribution throughout tropical and subtropical marine waters. The WA stock is concentrated on the NWS, one of the largest hawksbill populations in the world. The most significant breeding areas are around the sandy beaches of the Dampier Archipelago and the Montebello Islands. Hawksbill turtles also nest at North West Cape/Ningaloo Coast, Muiron Islands, Varanus Island, the Lowendal Islands and Rosemary Island. Nesting occurs throughout the year in WA, peaking between October and January.

Adults tend to forage in tropical tidal and subtidal coral and rocky reef habitat where they feed on an omnivorous diet of sponges, algae, jellyfish and cephalopods (DAWE, 2020).

According to the PMST report, the hawksbill turtle was identified as known to occur or have habitat within the operational area and breeding is known within the EMBA. The operational area and EMBA both intersect a known internesting buffer around the North West Cape, Muiron Islands, Thevenard Island and Montebello Islands and Lowendal Islands) (refer Table 5-10 in the EP) and habitat critical to the survival of the species for internesting (refer to Table 5-11 of the EP). Considering the water depth, it is unlikely hawksbill turtles forage in this area but may migrate through it.

Flatback Turtle

The flatback turtle (*Natator depressus*) is listed as vulnerable and migratory under the EPBC Act. It has an Australasian distribution, with all recorded nesting beaches occurring within tropical to subtropical Australian waters (Limpus, 2007). They are known to feed on mid-water plankton and benthic organisms and can forage in mid-shelf water depths (up to about 50 m). Breeding and nesting is restricted to northern WA (Limpus, 2007). The Pilbara genetic stock of flatback turtles is concentrated on islands of the Pilbara coastal change, Barrow Island and Dampier Archipelago (DAWE, 2017). Significant rookeries are centred on Barrow Island, especially the east coast beaches (DoEE, 2017). While internesting flatback turtles can travel up to 62 km away from their rookery between nesting events, these movements were in a longshore direction and individuals were restricted to shallow water depths (Whittock et al., 2014).

Unlike other sea turtles, the flatback turtle lacks a wide oceanic dispersal phase and adults tend to be found in soft sediment habitats within the continental shelf of northern Australia (DAWE, 2020).

According to the PMST report, the flatback turtle was identified as known to congregate within the operational area and breeding was known within the EMBA. The operational area and EMBA intersect with an internesting buffer BIA (refer Table 5-10 in the EP). A habitat critical to the survival of the species for internesting overlaps the operational area and EMBA (refer to Table 5-11 of the EP).

2.8 Fish, Sharks and Rays

Table 5-9 in the EP presents the fish, shark and rays with the potential to occur within the operational area and EMBA, based on the search of the EPBC Protected Matters database. The below section provides further details on these species.

In addition, there are three conservation-dependent species that may occur within the EMBA (Section 2.8.2).

2.8.1 Threatened and Migratory Species

Grey Nurse Shark

The grey nurse shark (*Carcharias taurus*, west coast population) is listed as vulnerable under the EPBC Act. Globally, the species is listed as vulnerable in the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. Grey nurse sharks are now restricted to two populations, one on the east coast from southern Queensland to southern NSW and the other around the southwest coast of WA. The grey nurse shark is now considered extinct in Victorian waters. It is believed the east and west coast populations do not interact. The west coast population has a broad inshore distribution, primarily in subtropical to cool temperate waters (Last and Stevens, 2009). The population of grey nurse sharks (west coast population) is predominantly found in the southwest coastal waters of WA (DoE, 2014) and has been recorded as far north as the NWS (Stevens, 1999; Pogonoski et al., 2002).

Adult grey nurse sharks feed on a wide range of fish, other sharks, squid, crabs and lobsters, and the greatest threat to grey nurse sharks is considered to be incidental bycatch in commercial fisheries.

Individuals are thought to have a high degree of site fidelity, although some studies have suggested the species exhibits some migratory characteristics, moving between different habitats and localities (McCauley, 2004). The high endemism of the species ensures the grey nurse shark is vulnerable to localised pressures in certain areas. The status of the west coast population is poorly understood, although it is reported to remain widely distributed along the WA coast and individuals are regularly encountered, albeit with low and indeterminate frequency (Chidlow et al., 2006).

Grey nurse sharks are frequently observed hovering motionless just above the seabed in or near deep sandy-bottomed gutters or rocky caves, and in the vicinity of inshore rocky reefs and islands (Pollard et al., 1996). The species has been recorded at varying depths but is generally found between 15 to 40 m (Otway and Parker, 2000). Grey nurse sharks have also been recorded in the surf zone, around coral reefs, and to depths of around 200 m on the continental shelf (Pollard et al., 1996).

According to the PMST report, the grey nurse shark has known habitat within the operational area and EMBA. Considering that the operational area is located in water depth of 130 m and grey nurse sharks have been recorded at depths of ~200 m on the continental shelf, this assessment is believed to be accurate.

White Shark

The white shark (*Carcharodon carcharias*) is listed as vulnerable and migratory under the EPBC Act. It occurs in almost all coastal and offshore waters of the major oceans that have water temperature between 12 and 24°C with greater concentrations in the United States of America (Atlantic Northeast and California), South Africa, Japan, Australia/Oceania, Chile and the Mediterranean. In Australian waters, they are widely but not evenly distributed, and sightings are considered uncommon to rare compared to most other large sharks. Great white sharks can be found in areas close inshore around rocky reefs, surf beaches and shallow coastal bays, and as far out as the outer continental shelf and slope areas (Pogonoski et al., 2002).

This shark reaches its maturity around 15 years of age and can have a life span of more than 30 years. White sharks are known to prey on marine mammals and various other marine animals, including fish and seabirds, and have been frequently recorded in WA, particularly during humpback whale migrations.

According to the PMST report, the white shark may occur or have habitat within the operational area and known to occur or have habitat within the EMBA.

Dwarf Sawfish

The dwarf sawfish (*Pristis clavata*) is listed as vulnerable and migratory under the EPBC Act. Dwarf sawfish are rays, somewhat resembling sharks, with elongated and serrated rostrums. The distribution of dwarf sawfish is considered to be restricted to northern Australia, ranging from northern Queensland to the Pilbara coastline. Sawfish generally inhabit shallow coastal waters along with estuaries, which are used as nurseries for juveniles. Surveys have found most captures of dwarf sawfish over soft sediment environments. The diets of sawfish are primarily made up of small fish, which they stun using their serrated rostrums (DAWE, 2020).

According to the PMST report, the dwarf sawfish was identified as known to occur or have habitat within the operational area and EMBA, particularly shallower coastal mainland locations.

Green Sawfish

The green sawfish (*Pristis zijsron*) is listed as vulnerable and migratory under the EPBC Act and is also classified as critically endangered on the IUCN Red List of Threatened Species. This species has been recorded across northern Australia, generally in coastal waters off Broome for WA populations. As with other species of sawfish, the green sawfish mainly inhabits shallower soft sediment coastal and estuarine environments but has also been recorded in up to 70 m of water (DoEE, 2017).

According to the PMST report, the green sawfish was identified as known to occur or have habitat within the operational area and the EMBA in some shallower coastal mainland locations. Considering that the operational area is located in water depth of 130 m and green sawfish have only been recorded at depths of ~70 m it is unlikely the species will be present within the operational area.

Whale Shark

The whale shark (*Rhincodon typus*) is listed as vulnerable and migratory under the EPBC Act and it is also classified as endangered on the IUCN Red List of Threatened Species.

The whale shark is an oceanic and coastal, tropical to warm-temperature pelagic fish, generally found in areas where the surface water temperature is 21 to 25°C. The whale shark is widely distributed in Australian waters and is known to frequent the region, aggregating at Ningaloo reef each year between March and June, with the largest numbers generally recorded in April (Meekan et al., 2006). The Ningaloo population of whale sharks has been shown to be part of a wider Indian Ocean whale shark stock that is likely to encompass much of the south eastern Indian Ocean and the waters of South East Asia (Meekan et al., 2006). Figure 2-5 illustrates satellite tracking of whale sharks along the northwest coast.

According to the PMST report, whale sharks were identified as known to forage within the operational area and the EMBA. A foraging BIA intersects with the operational area and a foraging (high density prey) BIA intersects with the EMBA (refer Table 5-10 in the EP).

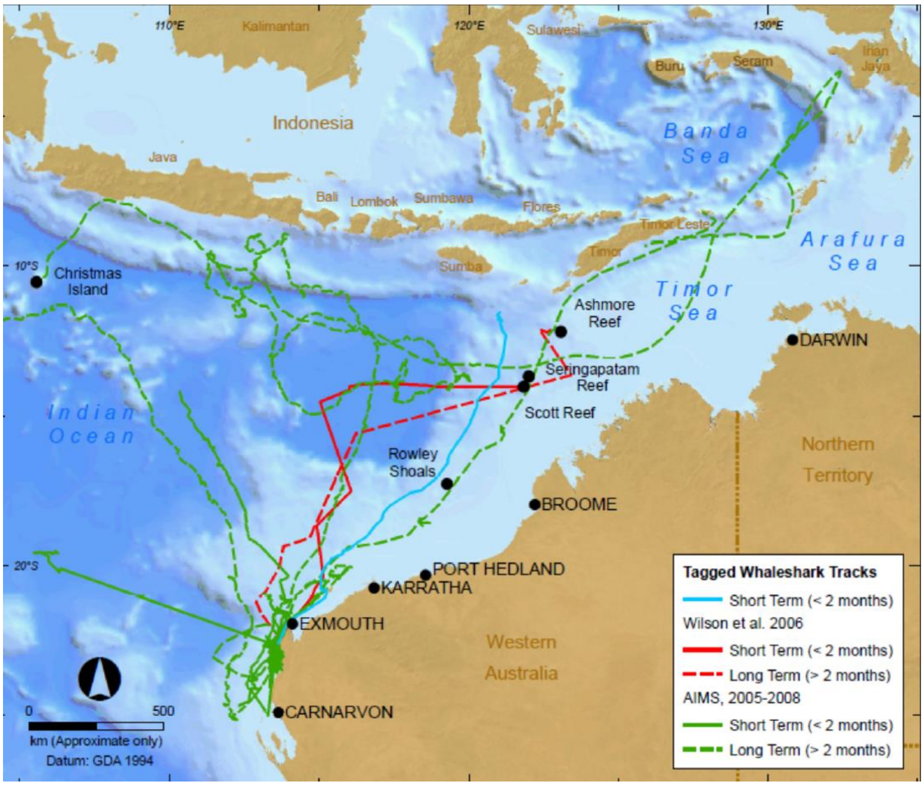

Figure 2-5: Satellite Tracking of Whale Sharks 2002 to 2008

Narrow Sawfish

The narrow sawfish (*Anoxypristis cuspidata*), also known as the knifetooth sawfish, is listed as a migratory species under the EPBC Act. It inhabits estuarine, inshore and offshore waters to at least 40 m depth (Last & Stevens, 2009). Inshore and estuarine waters are important for juveniles and pupping females, while adults predominantly occur offshore (Peverell, 2005).

According to the PMST report, the narrow sawfish is likely to occur or have habitat within the operational area and EMBA. As the species prefers shallower, inshore waters they are most likely to occur within the coastal waters of the EMBA and not in the operational area or deeper waters.

Shortfin Mako

The shortfin mako shark (*Isurus oxyrinchus*) is listed as a migratory species under the EPBC Act. It is a coastal, oceanic species occurring from the surface to at least 500 m depth and is widespread in temperate and tropical waters of all oceans, from about 50°N (up to 60°N in the northeast Atlantic) to 50°S. It is occasionally found close inshore where the continental shelf is narrow.

According to the PMST report, the shortfin mako shark is likely to occur or have habitat within the operational area and the EMBA.

Longfin Mako

The longfin mako (*Isurus paucus*) is listed as a migratory species under the EPBC Act. It is a widely distributed but rarely encountered oceanic shark. This species is known to be caught as bycatch in tropical pelagic longline fisheries for tuna, swordfish and sharks and in other oceanic fisheries. This species appears to be cosmopolitan in tropical and warm temperate waters. However, present records are sporadic, and the complete distribution remains unclear.

According to the PMST report, the longfin mako shark is likely to occur or have habitat within the operational area and the EMBA.

Giant Manta Ray

The giant manta ray (*Manta birostris*) is listed as a migratory species under the EPBC Act and is the largest of the rays. The species has a tropical and semi-temperate distribution worldwide that includes WA. The giant manta ray appears to be a seasonal visitor to coastal sites and satellite tracking studies have revealed it to be capable of migrations of more than 1000 km in distance. The migratory pattern in WA is not well documented however giant manta rays have been recorded in abundance off Ningaloo Reef (Sleeman et al, 2007).

According to the PMST report, the giant manta ray is likely to occur or have habitat within the operational area and known to occur or have habitat within the EMBA.

Reef Manta Ray

The reef manta ray (*Manta alfredi*) is listed as a migratory species under the EPBC Act. It has a widespread distribution in tropical and subtropical waters worldwide, including WA. Reef manta rays are thought to have relatively sedentary behaviour, with precise areas for cleaning and feeding still close to coasts, reefs or islands. The migratory pattern in WA is not well documented.

According to the PMST report, the reef manta ray is known to have habitat within the operational area and EMBA.

Oceanic Whitetip Shark

The oceanic whitetip shark is listed as a migratory species under the EPBC Act. The oceanic whitetip shark is a widespread pelagic species that has been subject to overfishing throughout much of its distribution. The oceanic whitetip shark is widespread throughout tropical and subtropical pelagic waters of the world (30ºN to 35ºS). Within Australian waters, it is found from Cape Leeuwin (WA) through parts of the NT, down the east coast of Queensland and NSW to Sydney (DAWE, 2021b).

According to the PMST report, the oceanic whitetip shark was identified as likely to occur or have habitat within the operational area and the EMBA.

Porbeagle

The porbeagle, also named mackerel shark (*Lamna nasus*) is listed as a migratory species under the EPBC Act. It is a wide-ranging, coastal and oceanic shark found in temperate and cold temperate waters worldwide (DAWE, 2020). The migratory movements of the porbeagle on Australia's NWS are not well documented.

According to the PMST report, the porbeagle may occur or have habitat within the EMBA, however, considering the species prefer temperate and cold temperature waters it is reasonable to assume the species wouldn't be present in large numbers in the warmer, tropical waters in the EMBA.

2.8.2 Conservation-Dependent Species

Scalloped Hammerhead Shark

The scalloped hammerhead shark (*Sphyrna lewini*) is classified as critically endangered on the IUCN Red List of Threatened Species (last assessed November 2018) and was listed as a conservation-dependent species on 15 March 2018 in the EPBC Act. There is no adopted or made recovery plan for this species. The following information is sourced from the Commonwealth Listing Advice (TSSC, 2018).

The scalloped hammerhead is a coastal and semi-oceanic shark. Pups are born in shallow intertidal habitats where they remain in shallow inshore habitats for the first few years. Information collected from deeper water fisheries (but still on the continental shelf) suggests juveniles and some adults, particularly males, remain in coastal waters, while some mature adults may move into deeper pelagic waters.

The principal threat to the species is fishing activity. The species has a circum-global distribution in tropical and subtropical waters and the Australian stock is likely to be shared with Indonesia and possibly a broader Indo-Pacific population. Within Australian waters, scalloped hammerheads are found across northern and temperate Australian waters, extending from NSW, around the north of the continent and then south into WA, to around Geographe Bay (see Figure 2-6). The distribution of the species in WA is sparse. They have been recorded in WA in the catch of the Pilbara Fish Trawl Fishery.

It is possible scalloped hammerheads are in the operational area and the EMBA.

Figure 2-6: Distribution Map of Scallop Hammerhead Sharks (Geosciences Australia, 2014)

Southern dogfish

The Southern dogfish (*Centrophorus zeehaani*) is classified as endangered on the IUCN Red List of Threatened Species (last assessed November 2019) and was listed as a conservation dependent species on the 14th of June 2013 in the EPBC Act. There is no adopted or made recovery plan for this species.

The Southern dogfish are distributed from the continental slope of southern Australia from off Forster in New South Wales, to Bunbury in Western Australia in depths of 208 – 701m (Last, White & Pogonoski, 2008). According to the PMST report, the Southern dogfish was identified as likely to have habitat within the EMBA.

Southern Bluefin Tuna

The southern bluefin tuna (*Thunnus maccoyii*) is classified as critically endangered on the IUCN Red List of Threatened Species (last assessed January 2021) and was listed as a conservation-dependent species on 15 December 2010 in the EPBC Act. There is no adopted or made recovery plan for this species. The following information is sourced from the Commonwealth Listing Advice (TSSC, 2010).

The southern bluefin tuna is a highly migratory species that occurs globally in waters between 30°S and 50°S, though is mainly found in the eastern Indian Ocean and in the south Western Pacific Ocean. In Australian waters, the southern bluefin tuna ranges from northern WA, around the southern region of the continent, to northern NSW (see Figure 2-7). The southernmost portion of the spawning ground lies within Australia's EEZ.

It is possible southern bluefin tuna occur within the operational area and the EMBA.

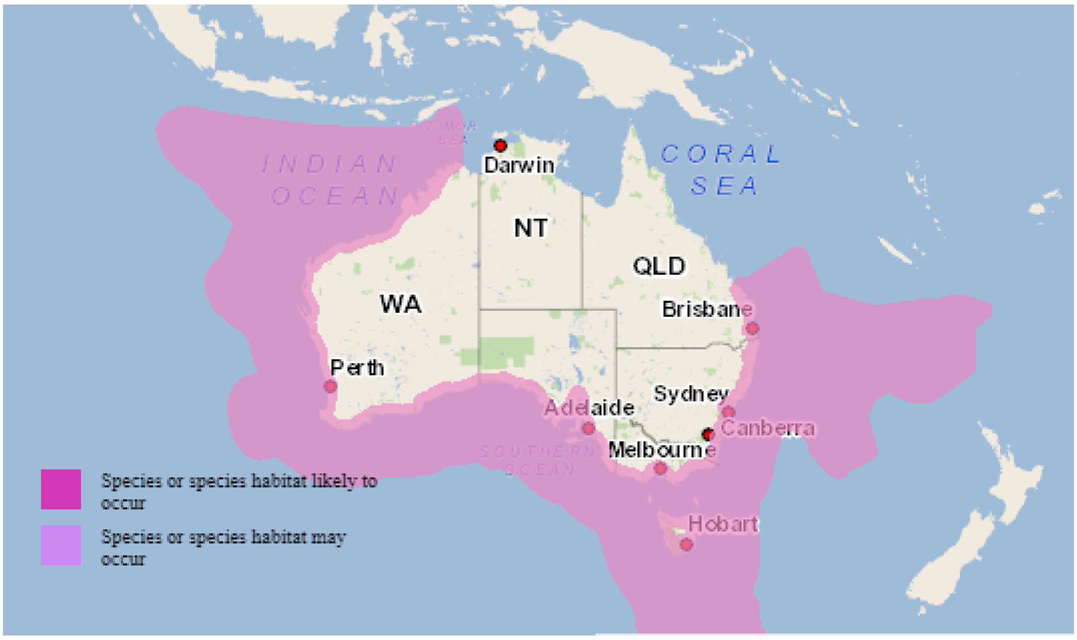

Figure 2-7: Distribution Map of Southern Bluefin Tuna (Geosciences Australia, 2014)

2.9 Seabirds and Migratory Shorebirds

Table 5-9 in the EP presents seabirds and migratory shorebirds with the potential to occur within the operational area and EMBA, based on the search of the EPBC Protected Matters database. The below section provides further details on these species.

2.9.1 Threatened and Migratory Species

Seabirds

Australian Fairy Tern

The Australian fairy tern (*Sternula nereis nereis*) is listed as vulnerable under the EPBC Act and has been identified as a conservation value in the NWMR. The Australian fairy tern is a subspecies of the fairy tern, therefore the identification of fairy terns within the operational area and EMBA would be the subspecies Australian fairy tern.

Breeding occurs between October to February on continental islands, coral cays, on sandy islands and beaches inside estuaries, and on open sandy beaches (DAWE, 2020). The species feeds predominantly on small fish in shallow waters (DSEWPC, 2011d).

The main threat to the subspecies is the disturbance of breeding sites by human activities and predation by introduced species and birds.

According to the PMST report, the Australian fairy tern was identified as known to breed within the operational area and EMBA. The EMBA intersects a known BIA (Figure 4-7 in the EP), with important breeding locations along coastline and offshore islands in the Pilbara region.

Sooty Tern

The Sooty Tern (*Onychoprion fuscatus*) is listed as a marine species under the EPBC Act and has been identified as a conservation value in the SWMR and the Temperate East. Breeding occurs between late August to early May on tropical and subtropical islands in the Indian Ocean and west Pacific.

According to the PMST report, the Sooty Tern is known to breed within the EMBA.

Black-Browed Albatross

The black-browed albatross (*Thalassarche melanophris*) is listed as vulnerable and migratory under the EPBC Act. It breeds within Australian waters on Heard Island, McDonald Islands, Macquarie Island and Bishop and Clerk Islets. Individuals are mostly confined to sub-Antarctic and Antarctic waters surrounding these islands in the breeding season. The population migrates northward towards the end of the breeding season and the species is common in the non-breeding period at the continental shelf and shelf-break of South Australia, Victoria, Tasmania, western and eastern Bass Strait and NSW. Individuals are also observed at these times in lesser numbers at the continental shelf break of southern and south-western WA (DAWE, 2020).

According to the PMST report, the black-browed albatross may occur or have habitat within the EMBA.

Indian Yellow-nosed Albatross

The Indian Yellow-nosed Albatross (*Thalassarche carteri*) is listed as vulnerable and migratory under the EPBC Act. The Indian Yellow-nosed Albatross forages mostly in the southern Indian Ocean and is abundant off Western Australia (Marchant & Higgins 1990). In waters off southern Western Australia and South Australia the species is most abundant between March and May.

According to the PMST report, the Indian Yellow-nosed Albatross may occur within the operational area and EMBA.

Campbell Albatross

The Campbell albatross (*Thalassarche melanophris impavida*) is listed as vulnerable and migratory under the EPBC Act. It is a non-breeding visitor to Australian waters. The Campbell albatross only breeds on Campbell Island, south of New Zealand. The population migrates northward towards the end of the breeding season and the species is common during the non-breeding period in continental shelf waters around Australia, New Zealand and the Pacific Islands (DAWE, 2020).

According to the PMST report, the Campbell albatross may occur or have habitat within the EMBA.

Christmas Island White-Tailed Tropicbird

The Christmas Island white-tailed tropicbird (*Phaethon lepturus fulvus*) is listed as endangered under the EPBC Act. It is endemic to Christmas Island, which is its only known breeding location. It is widely distributed across the island (Director of National Parks, 2014) and roosts and forages over the Indian Ocean. Both adults and juveniles appear to disperse widely and have been recorded south and southeast of Christmas Island (Marchant and Higgins, 1990). The subspecies mostly occurs north of 18°S but may occur up to about 1500 km from Christmas Island, at the edge of the continental shelf off Western Australia at 21°S (Dunlop et al., 2001).

According to the PMST report, the Christmas Island white-tailed tropicbird may occur or have habitat within the EMBA, however, as the operational area is approximately 1960 km away it is unlikely the species will occur within the operational area. The edge of the EMBA is approximately 1200 km from Christmas Island so the species may forage on the fringes of the EMBA.

Common Noddy

The common noddy (*Anous stolidus*) is listed as migratory under the EPBC Act. Four sub-species of the common noddy are recognised, but only the sub-species *Anous stolidus pileatus* occurs in the Australian region. It occurs mainly off the Queensland coast, but also off the northwest and central WA coast.

The migratory movements of the species are poorly known. The common noddy is a gregarious bird, normally occurring in flocks, sometimes of hundreds of individuals, when feeding or roosting. They feed mainly on fish, but are also known to take squid, pelagic molluscs and aquatic insects by dipping or skimming the sea surface. The species usually feeds during the day but will also feed at night when there is a full moon. Timing of breeding varies between sites and may be annual or twice a year. On some islands, the species is known to breed throughout the year. It is known to disperse to the open ocean after breeding (DoEE, 2017).

According to the PMST report, the common noddy may occur or have habitat within the operational area and is likely to occur or have habitat within the EMBA.

Lesser Crested Tern

The lesser crested tern (*Thalasseus bengalensis*) is listed as a marine species under the EPBC Act. The Lesser Crested Tern breeds in subtropical coastal parts of the world mainly from the Red Sea across the Indian Ocean to the western Pacific, and Australia. The species inhabits tropical and subtropical, sandy and coral coasts and estuaries, breeding on low-lying offshore islands, coral flats, sandbanks and flat sandy beaches.

Breeding occurs between March and June on islands off north and west Kimberley also Bedout Island, Lowendal Islands, Thevenard Island and island off Dirk Hartog.

The operational area and wider EMBA intersects a known BIA (refer Table 5-10 of the EP), with important breeding locations along coastline and offshore islands in the Pilbara region. According to the PMST report, the lesser crested tern is known to breed within the operational area and the EMBA.

Flesh-footed Shearwater

The flesh-footed shearwater (*Ardenna carneipes*) is a listed migratory species under the EPBC Act. It is a large broad-winged shearwater that typically forages over continental shelves/slopes and occasionally inshore waters. The distribution of the shearwater is mainly off southern Australia, migrating between breeding colonies in the southern Indian and south-western to north-western Pacific Ocean (Marchant & Higgins, 1993).

According to the PMST report, the flesh-footed shearwater is likely to occur or have habitat within the EMBA. The species are unlikely to use the operational area or EMBA for breeding but may transit the area for migrating and foraging.

Great Frigatebird

The great frigatebird (*Fregata minor*) is a listed migratory species under the EPBC Act. It is widespread and breeds on numerous tropical islands. Within the NWMR, it breeds in small numbers on Ashmore Reef (DSWEPaC, 2012d). This species is pelagic although breeding birds probably forage within 100 to 200 km of the colony during the early stages of the breeding season (DSWEPaC, 2012d). Their diet consists mainly of flying fish with some cephalopods.

The great frigatebird may occur or have habitat within the EMBA.

Lesser Frigatebird

The lesser frigatebird (*Fregata ariel*) is listed as a migratory species under the EPBC Act and is found widespread throughout the northern reaches of Australia, from around Geraldton on the west coast throughout the north to the east coast. The species is found throughout most shorelines. The species is the smallest frigatebird and is well adapted for an aerial existence and may range significant distances from land. This seabird is found in tropical waters of the Indian Ocean and breeds on small, remote tropical and subtropical islands in mangroves or bushes, and even on bare ground. It feeds on fish, cephalopods, seabird eggs and chicks, carrion and fish scraps. Little information is available about the migratory movements of this species. Breeding appears to occur between May and December in Australia. Outside the breeding season, the species is sedentary.

According to the PMST report, the lesser frigatebird is likely to occur or have habitat within the operational area and is known to occur or have habitat within the EMBA.

Roseate Tern

The roseate tern (*Sterna dougallii*) is a listed migratory species under the EPBC Act. It is a coastal seabird that occurs in a variety of habitats, including beaches, reefs and sandy/coral islands. It is a specialist forager for small pelagic fish and prefers nesting sites adjacent to clear shallow hunting areas. Nests are generally a bare scrape in sand, shingle or coral rubble. In large mixed-species colonies from April to June, breeding populations are located around the North West Cape area and the Montebello Islands (DEWHA, 2008), as such, the EMBA includes a BIA for breeding at various locations along coastline and offshore islands (in the Pilbara region) (Figure 4-7 in the EP).

According to the PMST report, the roseate tern was identified as known to breed within the wider EMBA. A breeding BIA for the species intersects the EMBA. As a coastal seabird it is reasonable to assume it would be more present in the eastern portion of the EMBA due to its coastal distribution.

Shy Albatross

The shy albatross (*Thalassarche cauta cauta*) is listed as vulnerable and migratory under the EPBC Act. It appears to occur in all Australian coastal waters below 25°S. It is most commonly observed over the shelf waters around Tasmania and south-eastern Australia (DAWE, 2020). Breeding occurs on Albatross Island, Bass Strait, and Mewstone and Pedra Branca, off southern Tasmania. The shy albatross feeds in waters over the continental shelf and within harbours and bays (DAWE, 2020). This species may occur within the EMBA; although it is not an area this species uses for breeding or resting, it may be used as foraging ground.

According to the PMST report, the shy albatross was may occur or have habitat within the EMBA.

Southern Giant Petrel

The southern giant petrel (*Macronectes giganteus*) is listed as endangered and migratory under the EPBC Act. It is the largest of the petrels and occurs from Antarctic to subtropical waters. The petrel spends most of the warmer months of the year in the southern extents of its distribution range while breeding, before leaving for warmer waters during winter, including the southern portion of the NWS for foraging. The southern giant petrel is both an opportunistic scavenger of carrion and a predator, with prey items ranging from surface marine life (including krill) to smaller seabirds (DoEE, 2017). The southern giant petrel breeds once a year between August and September, returning from foraging locations to breeding grounds in Antarctic waters.

According to the PMST report, the southern giant petrel may occur or have habitat within the operational area and EMBA however it is likely these would be in small numbers.

Streaked Shearwater

The streaked shearwater (*Calonectris leucomelas*) is a listed migratory seabird under the EPBC Act and spends non-breeding periods in the tropical west Pacific (October to March). It has been regularly recorded offshore from Broome to Timor Sea, and from Barrow Island to the Houtman Abrolhos Islands, occurring over pelagic and inshore waters but usually found offshore more than 18 km from the mainland coast (Marchant & Higgins, 1993).

According to the PMST report, the streaked shearwater was identified as likely to occur or have habitat within the operational area and EMBA.

Wedge-Tailed Shearwater

The wedge-tailed shearwater (*Puffinus pacificus*) is listed as a migratory species under the EPBC Act. It is a medium-sized seabird that can nearly always be found over oceanic waters off WA, except when roosting in colonies. It forages at sea, feeding mostly on fish, cephalopods, insects, jellyfish and prawns. The Barrow-Lowendal-Montebello Island complex and northwards are important nesting areas for the species, thus the area is a BIA for breeding and foraging for this species. Islands along North West Cape, Muiron Island, Serrurier Island and near Onslow also house breeding populations (DEWHA, 2008).

According to the PMST report, the wedge-tailed shearwater is known to breed within the EMBA. The operational area and EMBA intersects a breeding and foraging BIA.

White-Capped Albatross

The white-capped albatross (*Thalassarche cauta steadi*) is listed as vulnerable and migratory under the EPBC Act. This is a marine species that occurs in sub-Antarctic and subtropical waters. It occurs in both inshore and offshore waters and has been observed in shelf-waters around breeding islands during breeding and non-breeding seasons. It is thought the species breeds annually and colonially, laying eggs in mid-November (DAWE, 2020).

According to the PMST report, the white-capped albatross may occur or have habitat within the wider EMBA.

Caspian Tern

The Caspian tern (*Hydroprogne caspia*) is a listed migratory species under the EPBC Act. The largest tern in Australia, the Caspian tern is widespread in coastal regions and has been recorded from the Great Australian Bight to the Dampier Peninsula (Higgins & Davies, 1996). The Caspian tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. The species breeds from the Recherche Archipelago to Dirk Hartog Island and Faure Island in Shark Bay, and in the Pilbara region from around Point Cloates to North Turtle Island, and more rarely, in the Kimberley (Higgins & Davies, 1996). On the Montebello Island breeding is protracted with eggs recorded between late April and August (Burbidge & Fuller, 1998). The species is gregarious when breeding however single nesting does occur. Outside of breeding, it occurs mostly singly or in small groups; however occasional larger groups of 30 or more birds are seen, often at rich fishing areas or at nightly roost sites, where they may roost with other terns. The species may also aggregate into flocks on passage (migration) (Higgins & Davies, 1996).

According to the PMST report, the Caspian tern is known to breed within the EMBA. As they prefer sheltered coastal embayments, their presence would be mostly along the coasts.

Shorebirds

Common Greenshank

The common greenshank (*Tringa negularia*) is a listed migratory species under the EPBC Act. It is seen singly or in small to large flocks (sometimes with hundreds) in a variety of coastal and inland wetlands (Higgins & Davies, 1996). It does not breed in Australia; however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia (Higgins & Davies, 1996).

According to the PMST report, the common greenshank is known to occur or have habitat in the coastal sections of the EMBA.

Common Sandpiper

The common sandpiper (*Actitis hypoleucos*) is listed as a migratory species under the EPBC Act, breeding in eastern Europe before migrating to spend its non-breeding season in Australia. In Australia, it can be found singularly or in small groups along all coastlines and many inland areas. The species inhabits a wide range of coastal wetlands and is most often found around the muddy margins, mangroves and rocky shores. Their diet consists of bivalves, crustaceans and a variety of insects. The species is very widespread, and habitats can occur all over Australia, both coastal and inland.

According to the PMST report, the common sandpiper is known to occur or have habitat within the EMBA.

Curlew Sandpiper

The curlew sandpiper (*Calidris ferruginea*) is a listed as a critically endangered and migratory shorebird under the EPBC Act. A small, slender, gregarious sandpiper that is found along the coastlines and inland waters of Australia. In WA, the species occurs extensively between Cape Arid to the Kimberley region (DoEE, 2017). It is most common on sheltered intertidal mudflats, roosts on dry beaches, spits and islets, and breeds only in Siberia. It leaves breeding grounds in July and August, arriving in Australia in late August and early September (Higgins and Davies, 1996). Flocks stop in northern Australia before moving on to south-eastern Australia. Most birds arrive in September. Return migration commences in March (DoEE, 2017).

According to the PMST report, this species may occur or have habitat within the operational area and is known to occur or have habitat within the EMBA. However, considering the distance to its preferred habitat, it is very unlikely the curlew sandpiper will forage in this area but may migrate through it.

Eastern Curlew

The eastern curlew (*Numenius madagascariensis*) is listed as critically endangered and migratory under the EPBC Act. The eastern curlew has a primarily coastal distribution, known from all states in Australia (DoEE, 2017). It has a continuous distribution from Barrow Island and Dampier Archipelago, through the Kimberley and along the NT, Queensland and NSW coasts and the islands of Torres Strait. It is patchily distributed elsewhere. The eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms or rocky islets. They are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves.

The species breeds in the northern hemisphere, migrating into Australia in boreal winter. It arrives in eastern Australia, such as NSW, from mid-August to December (DoEE, 2017; Marchant and Higgins, 1993). The species roosts in large flocks, separate to other waders, and generally roost on sandy spits and islets (Marchant and Higgins, 1993). This shorebird is carnivorous, mainly eating crustaceans (including crabs, shrimps and prawns), small molluscs and some insects.

According to the PMST report, the eastern curlew may occur or have habitat within the operational area and is known to occur or have habitat within the EMBA; however would be restricted to the eastern side of the EMBA due to its coastal distribution.

Northern Siberian Bar-tailed Godwit

The northern Siberian bar-tailed godwit (*Limosa lapponica menzbieri*) is listed as critically endangered under the EPBC Act. This species is closely related to the Baueri sub-species, however, breeds in northern Siberia. During the non-breeding period, the species is most commonly found in the north and northwest region of WA and in South East Asia. The species can be found in most coastal environments, including lagoons, inlets, estuaries and mudflats.

According to the PMST report, the northern Siberian bar-tailed godwit is known to occur or have habitat within the EMBA, however would be restricted to the eastern side of the EMBA due to its coastal distribution.

Red Knot

The red knot (*Calidris canutus*) is listed as endangered and migratory under the EPBC Act. The red knot is a robust wader which breeds in Siberia and spends the non-breeding season in Australia and New Zealand, specifically in north-western WA (Higgins and Davies, 1996). The non-breeding season is spent on tidal mudflats or sandflats where the omnivorous species feeds on intertidal invertebrates, especially shellfish (Garnet et al., 2011). Although the species is found throughout many suitable habitats in Australia, the highest number of the species is found throughout the northwest of Australia, between Eighty Mile Beach and Roebuck Bay.

According to the PMST report, this species may occur or have habitat within the operational area and likely to occur or have habitat with the EMBA; however, considering the distance to its preferred habitat, it is very unlikely the red knot will forage in this area but may migrate through it.

Sharp-Tailed Sandpiper

The sharp-tailed sandpiper (*Calidris acuminata*) is listed as a migratory species under the EPBC Act. It is a stout sandpiper that inhabits the muddy margins of freshwater wetlands. The bird forages on bare substrate or in shallow water and inhabits coastal and inland waters throughout Australia. It is widespread in the southwest of WA (Bamford et al., 2008). The bird breeds in northern Siberia (Higgins and Davies, 1996) and departs the breeding grounds in late June, moving down through Asia and New Guinea where it arrives in Australia mid-August. It returns to breeding grounds in April (DoEE, 2017).

According to the PMST report, these species are known to occur or have habitat within the EMBA. This is considered an accurate assessment when they are migrating.

2.10 Other Values and Sensitivities

2.10.1 Australian Marine Parks

The Commonwealth Marine Reserves Network was established in 2012 to protect the biological diversity and sustainable use of the marine environment. There are six management plans – one for each of the five marine park networks (the North, the North-West, the South-East, the South-West and the Temperate East) and one for the Coral Sea. The operational area does not intersect any marine parks. A number of marine parks of the north-west network fall within the wider EMBA (Table 5-8 and Figure 5-6 in the EP).

The below sections provide further details on the Australian Marine Parks identified in the EMBA.

Gascoyne Marine Park

The Gascoyne Marine Park is located around 20 km off the west coast of the Cape Range Peninsula, adjacent to the Ningaloo Reef Marine Park and the WA Ningaloo Marine Park, and extends to the limit of Australia's EEZ. The marine park covers an area of 81,766 km^2 and lies in waters ranging from 15 m to 6000 m. The marine park was proclaimed under the EPBC Act on 14 December 2013 and renamed Gascoyne Marine Park on 9 October 2017. The marine park includes areas zoned as National Park Zone (IUCN Category II), Habitat Protection Zone (IUCN Category IV) and Marine Use Zone (IUCN Category VI). The conservation values (Director of National Parks, 2018a) of the marine park are that it:

- contains habitats, species and ecological communities associated with the Central Western Shelf Transition, the Central Western Transition and the North West Province
- includes some of the most diverse continental slope habitats in Australia, such as the continental slope area between the North West Cape and the Montebello Trough
- provides a continuous connectivity corridor from shallow depths of around 15 m out to deep offshore waters on the abyssal plain at more than 5000 m in depth
- supports a range of species, including those listed as threatened, migratory, marine or cetacean under the EPBC Act

- includes BIAs (see in Section 2.4.8), being:
  - internesting sites for marine turtles
  - part of the migratory pathway of the protected humpback whale
  - foraging habitat and migratory path for pygmy blue whales
  - breeding habitat for seabirds.
- includes four key ecological features (KEFs), being:
  - canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula
  - Commonwealth waters adjacent to Ningaloo Reef
  - continental slope demersal fish communities
  - Exmouth Plateau (valued as a unique seafloor feature with ecological properties of regional significance).
- contains more than five known shipwrecks listed under the *Underwater Cultural Heritage Act 2018*
- has diverse social values, including commercial fishing, mining and recreation.

Montebello Marine Park

The Montebello Marine Park is located offshore of Barrow Island and 80 km west of Dampier, extending from the WA State waters boundary, and is adjacent to the WA Barrow Island and Montebello Islands Marine Parks. Covering an area of 3413 km² and water depths ranging from less than 15 m to 150 m, the marine park includes one area zoned as Multiple Use Zone (IUCN Category VI). The marine park was proclaimed under the EPBC Act on 14 December 2013 and renamed the Montebello Marine Park on 9 October 2017. The conservation values (Director of National Parks, 2018a) of the marine park are that it:

- includes habitats, species and ecological communities associated with the Northwest Shelf Province
- includes diverse benthic and pelagic fish communities
- supports a range of species, including those listed as threatened, migratory, marine or cetacean under the EPBC Act
- includes BIAs (see in Section 2.4.8), being:
  - internesting, foraging, mating and nesting habitat for marine turtles
  - includes part of the migratory pathway of the protected humpback whale
  - foraging habitat for whale sharks
  - breeding habitat for seabirds.
- includes one KEF for the region, the Ancient Coastline at the 125 m Depth Contour (valued as a unique seafloor feature with ecological properties of regional significance)
- includes a prominent seafloor feature, the Tryal Rocks, consisting of two close coral reefs which emerge at low tide
- includes two known historic shipwrecks listed under *Underwater Cultural Heritage Act 2018*
- has diverse social values, including tourism, fishing, mining and recreation.

Ningaloo Marine Park

The Ningaloo Marine Park includes two zones, National Park Zone (IUCN Category II) and Recreational Use Zone (IUCN Category IV). The marine park covers an area of 2435 km² and a water depth range of 30 m to more than 500 m. Together with the Ningaloo Marine Park and the Muiron Islands Marine Management Area, both in State waters, it makes up the Ningaloo Coastal World Heritage Area (Section 2.4.2). The marine park stretches around 300 km along the west coast of the Cape Range Peninsula near Exmouth, around 1200 km north of Perth. The marine park was originally proclaimed under the *National Parks and Wildlife Conservation Act 1975* on 20 May 1987 as the Ningaloo Marine Park (Commonwealth waters), then proclaimed under the EPBC Act on 14 December 2013 and renamed Ningaloo Marine Park on 9 October 2017. The conservation values (Director of National Parks, 2018a) of the marine park are that it:

- supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act

- includes BIAs (see in Section 2.4.8), being:
  - foraging habitat for the vulnerable and migratory whale shark
  - foraging habitat adjacent to important nesting and internesting sites for marine turtles
  - part of the migratory pathway of the protected humpback whale
  - foraging habitat and migratory path for pygmy blue whales
  - breeding, calving, foraging and nursing habitat for dugong
  - breeding and foraging habitat for seabirds.
- includes three KEFs, being:
  - canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula (valued for unique seafloor features with ecological properties of regional significance)
  - Commonwealth waters adjacent to Ningaloo Reef (valued for high productivity and aggregations of marine life)
  - continental slope demersal fish communities (valued for high levels of endemism and diversity).
- includes shallow shelf environments and provides protection for shelf and slope habitats, as well as pinnacle and terrace seafloor features
- contains more than 15 known shipwrecks listed under the *Underwater Cultural Heritage Act 2018* (replaced the *Historic Shipwrecks Act 1976*)
- includes examples of the seafloor habitats and communities associated with the Central Western Shelf Transition, the Central Western Transition, the Northwest Province and the Northwest Shelf Province
- has diverse social values, including tourism and recreation and fishing.

2.10.2 State Marine Parks and Marine Management Areas

There are no State Marine Parks or Marine Management Areas within the operational area. A number of marine parks of the north-west network fall within the wider EMBA (refer Table 5-8 and Figure 5-6 in the EP).

The below sections provide further details on the State Marine Parks or Marine Management Areas identified in the EMBA.

Muiron Islands Marine Management Area

The Muiron Islands Marine Management Area is the marine conservation area closest in distance to the operational area. The Muiron Islands Marine Management Area was established in 2004 and covers around 280 km². The area was designated to protect the waters surrounding South Muiron Island, North Muiron Island and Sunday Island. The Muiron Islands Marine Management Area is also part of the Ningaloo Coast World Heritage Area.

The Muiron Islands are a continuation of the Cape Range Peninsula and are low, dome-shaped limestone islands separated by a deep navigable channel. The marine fauna and flora of the Muiron Islands are similar to that of the Ningaloo Reef; the western shores of the islands are characterised by limestone cliffs fronted by sandy beaches and intertidal rock platforms, beyond which the seafloor slopes away to the shelf edge some 30 km seaward (CALM/MPRA, 2005). The Muiron Islands Marine Management Area contains a very diverse marine environment, with coral reefs, filter-feeding communities and macroalgal beds. The foreshores and nearshore reefs of the Muiron/Sunday Islands provide important aggregation and nesting areas for turtle populations. Four species of turtle (green, loggerhead, hawksbill and flatback) have been recorded nesting on the Muiron Islands (Rob et al., 2019). The islands are also important seabird nesting areas.

Barrow Island Marine Park and Marine Management Area, Montebello Islands Marine Park

The Barrow Island Marine Park, the Barrow Island Marine Management Area and the Montebello Island Marine Park lie adjacent to one another and cover areas of around 42 km², 1147 km² and 583 km² respectively (DEC, 2006). The Marine Parks and Marine Management Area comprise numerous low-lying limestone islands, islets and rocky stacks with intertidal and subtidal coral reefs, mangrove macroalgal communities and sheltered lagoons. Many of the islands are nature reserves such as Montebello Islands Conservation Park, Barrow Island Nature Reserve and Boodie, Double and Middle Islands Nature Reserve, and the Lowendal Islands Nature Reserve. The boundary of most island reserves extends to the low water mark; therefore, the intertidal communities are part of these terrestrial reserves. The exception is the Lowendal Islands Nature Reserve, which extends to the high water mark (DEC, 2006).

The island group lies entirely within WA waters, with the State-Commonwealth boundary extending out to encompass the islands and waters 3 nm west of Barrow Island and north of the Montebello Islands. Specific ecological values include:

- foraging areas for seabirds and migratory shorebirds (Section 2.4.8).
- foraging areas for whale sharks (Section 2.4.8).
- aggregation and nesting sites for marine turtles (Section 2.4.8).
- part of the migratory pathway of the protected humpback whale (Section 2.4.8).
- feeding grounds for dugongs (Section 2.4.8).
- mangrove communities on the Montebello Islands considered to be globally unique (Section 2.3.3).
- special purpose zones for commercial pearling (Section 2.10.5).
- fringing coral reef communities (Section 2.3.2).

Ningaloo Marine Park

The Ningaloo Marine Park was originally declared in 1987 and in June 2011 became part of the World Heritage listed Ningaloo Coast (refer to Section 2.10.1). The marine area is a multiple-use marine park that stretches around 300 km along the west coast of the Cape Range Peninsula near Exmouth, WA, from Bundegi in the north to Red Bluff in the south. The marine park consists of both State and Commonwealth waters, which are declared under Western Australian and Commonwealth legislation. The combined State and Commonwealth waters of the marine park cover a total area of 5070 km^2.

The marine park provides habitat for a diverse range of marine species, including more than 200 species of corals, more than 460 species of reef fish, as well as populations of marine turtles, manta rays, sharks, whale sharks, dugongs, dolphins and whales. Intertidal systems such as rocky shores, sandy beaches, estuaries and mangroves are also found within the marine park. The most dominant marine habitat is the Ningaloo Reef, comprising a mosaic of substrata that includes hard coral, macroalgae, turfing algae, limestone pavement and sand.

2.10.3 Key Ecological Features

KEFs are areas of regional importance for either biodiversity or ecosystem function and integrity within the Commonwealth marine environment and have been identified through the marine bioregional planning process (DSEWPaC, 2012b). KEFs meet one or more criteria of:

- a species, group of species or a community with a regionally important ecological role (such as a predator, prey that affects a large biomass or number of other marine species)
- a species, group of species or a community that is nationally or regionally important for biodiversity
- an area or habitat that is nationally or regionally important for:
  - enhanced or high productivity (such as predictable upwellings – an upwelling occurs when cold nutrient-rich waters from the bottom of the ocean rise to the surface)
  - aggregations of marine life (such as feeding, resting, breeding or nursery areas)
  - biodiversity and endemism (species which only occur in a specific area).
- a unique seafloor feature, with known or presumed ecological properties of regional significance.

One KEF overlaps the operational area and six KEFs have boundaries that lie within the EMBA (Table 2-9 and 5-5 of the EP).

Table 2-9: Key Ecological Features Within the Environment that May Be Affected

Value / Sensitivity	Approx. Closest Distance to Operational area	Operational area	EMBA
Ancient coastline at 125-m depth contour	Overlaps with operational area	✓	✓
Continental Slope Demersal Fish Communities	5 km	×	✓
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	14 km	×	✓
Commonwealth waters adjacent to Ningaloo Reef	59 km	×	✓
Exmouth Plateau	109 km	×	✓
Glomar Shoals	253 km	×	✓

The below sections provide further details on the KEFs identified in the operational area and EMBA.

Ancient Coastline at the 125 m Depth Contour

This KEF is recognised for its biodiversity values (unique seafloor feature with ecological properties of regional significance), which apply to both the benthic and pelagic habitats within the KEF. The shelf of the NWMR contains several terraces and steps that reflect increases in sea level across the shelf that occurred during the Holocene period. The most prominent of these occurs episodically as an escarpment through the Northwest Shelf Province and the Northwest Shelf Transition, at a depth of around 125 m.

Parts of the ancient coastline, particularly where it exists as a rocky escarpment, are thought to provide biologically important habitats in areas otherwise dominated by soft sediments. Little is known about fauna associated with the hard substrate of the escarpment, but it is likely to include sponges, corals, crinoids, molluscs, echinoderms and other benthic invertebrates representative of hard substrate fauna in the NWS bioregion.

The topographic complexity of the escarpment may also facilitate vertical mixing of the water column, providing relatively nutrient-rich local environments. Enhanced productivity may also attract opportunistic feeding by larger marine life including humpback whales, whale sharks and large pelagic fish.

Continental Slope Demersal Fish Communities

This species assemblage is recognised as a KEF because of its biodiversity values, including high levels of endemism. The diversity of demersal fish assemblages on the continental slope in the Timor Province, the Northwest Transition and the Northwest Province is high compared to elsewhere along the continental slope. The continental slope between North West Cape and the Montebello Trough has more than 500 fish species, 76 of which are endemic, making it the most diverse slope bioregion in Australia. The demersal fish species occupy two distinct demersal community types associated with the upper slope (water depth of 225 to 500 m) and the mid slope (750 to 1000 m).

Canyons Linking the Cuvier Abyssal Plain and the Cape Range Peninsula

This KEF is recognised for its biodiversity values (unique sea-floor feature with ecological properties of regional significance), which apply to both the benthic and pelagic habitats within the KEF. The canyons are associated with upwelling as they channel deep water from the Cuvier Abyssal Plain onto the slope. This nutrient-rich and cooler water interacts with the Leeuwin Current at the canyon heads. Thus, the canyons probably play a part in the enhanced productivity of the Ningaloo Reef system.

The canyons are also repositories for organic and inorganic particulate matter from the shelf and serve as conduits for its transfer from the surface and shelf to greater depths. Aggregations of whale sharks, manta rays, large predatory fish and seabirds are known to occur in the area.

Commonwealth Waters Adjacent to Ningaloo Reef

This KEF is recognised for its biodiversity (aggregations of marine life) values, which apply to both the benthic and pelagic habitats within the KEF. The Commonwealth waters adjacent to Ningaloo Reef include Ningaloo Marine Park (Commonwealth waters) covering an area of 2435 km^2. This feature lies adjacent to the Ningaloo Reef State waters margin at the 3 nm limit. Ningaloo Reef is globally significant as the only extensive coral reef in the world that fringes the west coast of a continent. Upwellings associated with canyons on the adjacent slope and interactions between the Ningaloo and Leeuwin currents result in areas of enhanced productivity in the Commonwealth waters adjacent to Ningaloo Reef.

Exmouth Plateau

This KEF is recognised for its biodiversity values (unique sea-floor feature with ecological properties of regional significance), which apply to both the benthic and pelagic habitats within the KEF.

The Exmouth Plateau is located in the Northwest Province and covers an area of 49,310 km^2 in water depths ranging from 800 m to 4000 m. The Exmouth Plateau is a regionally and nationally unique deep-sea plateau in tropical waters. The plateau is a large topographic obstacle that may modify the flow of deep waters, generating internal tides, and may contribute to upwelling of nutrients, thus serving an important ecological role.

Glomar Shoals

The Glomar Shoals are a submerged littoral feature located around 150 km north of Dampier on the Rowley Shelf at water depths of 33 to 77 m. The shoals consist of a high percentage of marine-derived sediments with high carbonate content and gravels of weathered coralline algae and shells. The area's higher concentrations of coarse material compared to surrounding areas are indicative of a high energy environment subject to strong seafloor currents.

Biological communities found at the Glomar Shoals have not been comprehensively studied; however, the shoals are known to be an important area for commercial and recreational fish species such as Rankin cod, brown striped snapper, red emperor, crimson snapper, bream and yellow-spotted triggerfish. High catch rates for these species indicate the shoals are an area of high productivity.

The Glomar Shoals are regionally important for their potentially high biological diversity and high localised productivity. Biological data specific to the Glomar Shoals is limited; however, the fish of the shoals are probably a subset of reef-dependent species and anecdotal evidence suggests they are particularly abundant.

2.10.4 Cultural Heritage

Indigenous Heritage

Aboriginal sites are of immense cultural, scientific, educational and historic interest and provide an important connection between Aboriginal people and their present and future culture. The Indigenous peoples have ongoing relationship with coastal and marine environments and resources as part of cultural identity, health, wellbeing, and domestic and commercial economies (DEWHA, 2008). Ongoing connections are demonstrated through fishing, hunting and the maintenance of maritime cultures and heritage through ritual, stories and application of traditional knowledge. Although direct use of deeper offshore waters is limited, direct cultural interest in decisions affecting the management of these waters exists.

Barrow Island, Montebello Islands, Exmouth, Ningaloo Reef, the Kimberley Coast and the adjacent foreshores within the EMBA have a long history of occupancy by Indigenous communities. A search through the Aboriginal Heritage Inquiry System determined the coastal areas of the EMBA overlap with multiple registered Aboriginal Heritage Sites (DPLH, 2021). The search also determined there are no registered Aboriginal Heritage sites within the operational area.

Aboriginal heritage sites in WA are protected under the *Aboriginal Heritage Act 1972*, whether or not they are registered with Department of Planning, Lands and Heritage. While sea country is a recognised value, the registered site list contains only land-based sites. Areas covered by registered native title claims are likely to practice Indigenous fishing techniques at various sections of the WA coastline.

Indigenous Protected Areas (IPA) are a component of the National Reserve System, which is the network of formally recognised parks, reserves and protected areas across Australia. IPAs are areas of land and sea country owned or managed by Indigenous groups, which are voluntarily managed as a protected area for biodiversity conservation through an agreement with the Australian Government. No IPAs intersect the EMBA or the operational area. The closest IPA (Nyangumarta Warrarn) is around 313 km south east from the operational area.

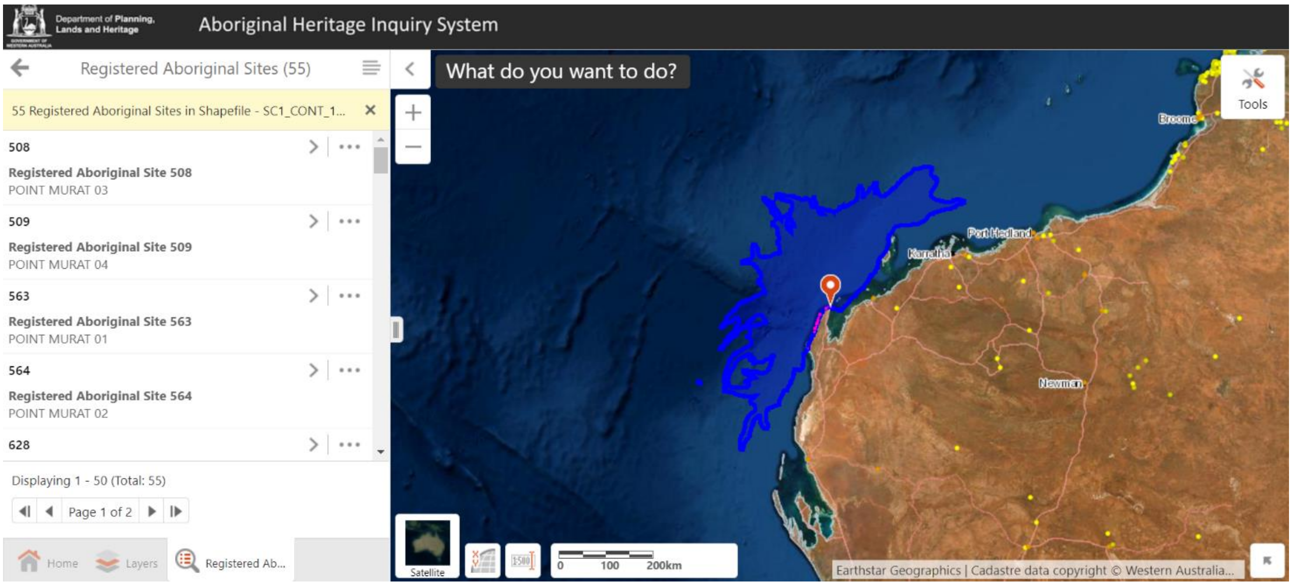

Figure 2-8: Aboriginal Heritage Sites Intersecting the Environment that May Be Affected

Underwater Cultural Heritage

The *Underwater Cultural Heritage Act 2018* protects Australia's underwater cultural heritage, including shipwrecks, sunken aircraft and other types of underwater heritage. Under this Act, shipwrecks, sunken aircraft and their associated artefacts older than 75 years are protected. Shipwrecks dating pre-1900 are protected under the *Maritime Archaeology Act 1973*. There are numerous (more than 1500) known shipwreck and historic (more than 75 years old) shipwreck (1189) and sunken aircraft sites listed to occur within Commonwealth waters offshore WA, as listed in the Australasian Underwater Cultural Heritage Database.

The Underwater Cultural Heritage Database was searched to identify any known shipwrecks protected under the *Underwater Cultural Heritage Act 2018*. There are no known historic shipwrecks within the operational area. The Australasian Underwater Cultural Heritage Database[1] identified 50 shipwrecks within the EMBA. The closest shipwreck is the Rose, which is around 41 km south east of the operational area.

In addition to the general protection provided to underwater heritage sites, the *Underwater Cultural Heritage Act 2018* also provides that an area containing protected underwater heritage may be declared a protected zone. These zones may be established for many reasons, including conservation, management or public safety considerations. For example, sites may contain unexploded military ordnance or unstable structures, or require active management because the underwater heritage and its environment are particularly fragile or sensitive. Figure 2-9 shows Australian locations of Underwater Cultural Heritage Shipwreck Protected Zones. No Underwater Cultural Heritage Shipwreck Protected Zones overlap either the operational area, or the EMBA.

[1] Australasian Underwater Cultural Heritage Database on the Department of Agriculture, Water and the Environment website (http://www.environment.gov.au/heritage/underwater-heritage/auchd)

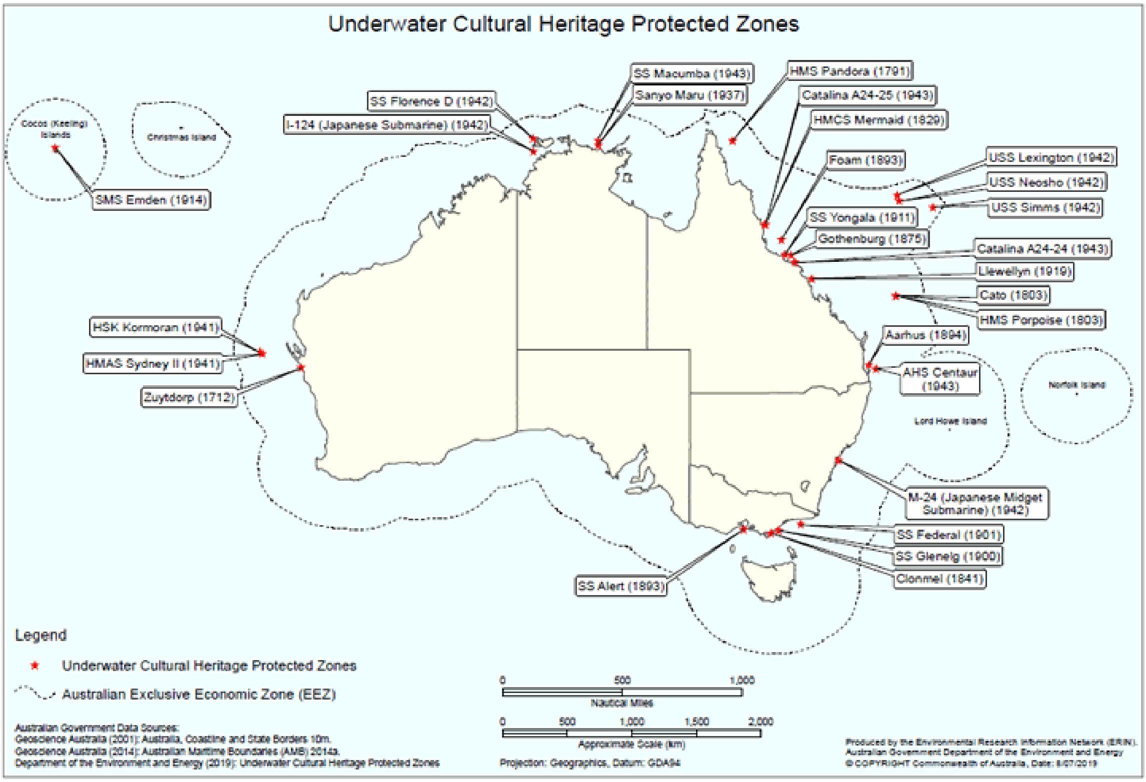

Figure 2-9: Underwater Cultural Heritage Shipwreck Protected Zones

2.10.5 Australian Commercial Fisheries

Commonwealth and State managed fisheries have boundaries that overlap with the operational area and the EMBA). Section 5.7.1 of the EP provides a summary description of the commercial fisheries and the potential for their operations to be affected by the petroleum activities based on their historic level of activity.

2.10.6 Traditional Fisheries

Traditional Aboriginal fisheries are north of Port Hedland within around 854 km northeast of the operational area. Fisheries legislation in Western Australia recognises customary fishing by Aboriginal people as different to commercial and recreational fishing. Western Australia's Draft Aboriginal Fishing Strategy (2003) recognises Aboriginal Customary Fishing as a legitimate fisheries sector in terms of fisheries allocation and management and promotes Aboriginal involvement in commercial fishing industries and their management (DEWHA, 2008). There are not expected to be any traditional fisheries that operate within the operational area. Traditional fisheries are typically restricted to coastal waters and/or areas with suitable fishing structures such as reefs, therefore it is possible traditional fisheries may utilise the coastal waters of the EMBA.

2.10.7 Tourism and Recreation

Marine tourism and recreational activities tend to be concentrated in the vicinity of population centres along the WA coastline. The main population centre which falls within the EMBA is Coral Bay, which is around 224 km from the operational area. The townsite of Exmouth does not fall within the EMBA but is around 14 km southwest of the EMBA boundary. Tourism contributes to State and local economies in terms of both income and employment. Popular water-based activities include fishing, swimming, snorkelling/diving, wildlife-watching and boating.

The population centres nearest to the operational area are Exmouth (around 88 km) and Onslow (around 64 km). Exmouth has become a significant tourist centre based in large part on the natural resources contained in the Cape Range National Park, Ningaloo Marine Park and adjacent inshore waters. Onslow is a coastal town offering easy access to tourists, vacationers and recreational fishers to the Mackerel Islands, a group of ten islands 22 km offshore.

Visitors partaking in tourism and recreational activities stay at the many coastal parks, camping grounds and caravan parks the Ningaloo Marine Park has to offer, such as at Jurabi Point, Mangrove Bay, Turquoise Bay and Yardie Creek. Popular tourist locations of interest include the many sanctuary zones along the Ningaloo coastline, such as Mangrove Bay, Jurabi Point, Turquoise Bay and Oyster Stacks, where visitors can enjoy bird-watching opportunities at Mangrove Bay. The Turtle Centre at Jurabi is a popular tourist attraction and snorkelling is a popular activity for visitors in the numerous embayments such as at Turquoise Bay, and further south at the popular coastal town of Coral Bay. The most popular offshore tourism activities are fishing, diving and whale shark spotting.

Peak tourism occurs from April to October, with marine-based activities concentrated around infrastructure such as boat ramps and camping areas (Smallwood, 2009). Marine facilities, including boat launching ramps, jetties and marinas, within the area are limited, with most located along the Exmouth Gulf side of the peninsula, including:

- Point Murat naval supply jetty (restricted access)
- Bundegi – facilities include a concrete launching ramp, car park and public toilets
- Exmouth Marina – provides launching, mooring, fuelling and supply facilities for commercial fishing, charter fishing, and tourist and commercial/private vessels.

Boat ramps on the Ningaloo side are located at:

- Tantabiddi Creek – facilities include a concrete launching ramp, car park and public toilets
- Coral Bay – concrete launching ramp.

Recreational fisheries and charter boat operators are managed by the WA Department of Primary Industries and Regional Development (DPIRD). With an estimated 740,000 people fishing recreationally in WA, it makes a significant contribution to the economy and attracts vast numbers of visitors to the region each year. The Ningaloo Marine Park also provides high-quality fishing for species such as spangled emperor, Spanish mackerel and coral trout.

Within the Gascoyne Bioregion, recreational fishing activities make up a significant component of the tourist visits, with Ningaloo Marine Park attracting thousands of tourists and fishers each year. The mix of tropical and temperate conditions in the bioregion reflects the range of fish species found, with around 100 species of fish caught by recreational fishers. To the north of the bioregion, near Exmouth, tropical species such as emperors and mackerel dominate. Mangrove jack and mud crabs are popular target species in the extensive mangrove system in the Exmouth Gulf. The Ningaloo Marine Park also provides high-quality fishing for species such as spangled emperor, Spanish mackerel and coral trout. Farther south, there are temperate species such as western rock lobster, tailor, snapper (pink snapper) and mulloway.

The Montebello Island Marine Park provide a wide variety of wildlife, the natural land and seascapes, complex system of reefs, and lagoons, and an abundance of good recreational fishing for tourism and recreation.

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Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 07-Feb-2022

- Summary
- Details
  - Matters of NES
  - Other Matters Protected by the EPBC Act
  - Extra Information
- Caveat
- Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	25
Listed Migratory Species:	37

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	63
Whales and Other Cetaceans:	26
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	3

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	14
Key Ecological Features (Marine):	3
Biologically Important Areas:	8
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
EEZ and Territorial Sea

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
FISH		

Scientific Name	Threatened Category	Presence Text
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
MAMMAL		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
REPTILE		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
SHARK		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata		
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sphyrna lewini		
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area

Scientific Name	Threatened Category	Presence Text
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalasseus bengalensis as Sterna bengalensis Lesser Crested Tern [66546]		Breeding known to occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Syngnathoides biaculeatus		
Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus		
Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris		
Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammal		
Dugong dugon		
Dugong [28]		Species or species habitat likely to occur within area
Reptile		
Acalyptophis peronii		
Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis		
Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii		
Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii		
Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus foliosquama		
Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus laevis		
Olive Seasnake [1120]		Species or species habitat may occur within area
Astrotia stokesii		
Stokes' Seasnake [1122]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Chitulia ornata as Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [87377]		Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area

Scientific Name	Threatened Category	Presence Text
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and Other Cetaceans

[Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima as Kogia simus Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Habitat Critical to the Survival of Marine Turtles

Scientific Name	Behaviour	Presence
Aug - Sep		
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
Dec - Jan		
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
Nov - May		
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur

Extra Information

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Ashburton Infrastructure Project	2021/9064	Controlled Action	Completed
Construct and operate LNG & domestic gas plant including onshore and offshore facilities - Wheatstone	2008/4469	Controlled Action	Post-Approval
Not controlled action			
HCA05X Macedon Experimental Survey	2004/1926	Not Controlled Action	Completed
Infill Production Well (Griffin-9)	2001/417	Not Controlled Action	Completed
Klammer 2D Seismic Survey	2002/868	Not Controlled Action	Completed
Subsea Gas Pipeline From Stybarrow Field to Griffin Venture Gas Export Pipeline	2005/2033	Not Controlled Action	Completed
Wanda Offshore Research Project, 80 km north-east of Exmouth, WA	2018/8293	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Kate' 3D marine seismic survey, exploration permits WA-320-P and WA-345-P, 60km	2005/2037	Not Controlled Action (Particular Manner)	Post-Approval
2D and 3D seismic surveys	2005/2151	Not Controlled Action (Particular Manner)	Post-Approval
Babylon 3D Marine Seismic Survey, Commonwealth Waters, nr Exmouth WA	2013/7081	Not Controlled Action (Particular Manner)	Post-Approval
Huzzas MC3D Marine Seismic Survey (HZ-13) Carnarvon Basin, offshore WA	2013/7003	Not Controlled Action (Particular Manner)	Post-Approval
Huzzas phase 2 marine seismic survey, Exmouth Plateau, Northern Carnarvon Basin, WA	2013/7093	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Munmorah 2D seismic survey within permits WA-308/9-P	2003/970	Not Controlled Action (Particular Manner)	Post-Approval
Ocean Bottom Cable Seismic Survey	2005/2017	Not Controlled Action (Particular Manner)	Post-Approval

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Ancient coastline at 125 m depth contour	North-west
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	North-west
Continental Slope Demersal Fish Communities	North-west

Biologically Important Areas

Scientific Name	Behaviour	Presence
Marine Turtles		
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting buffer	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Sternula nereis Fairy Tern [82949]	Breeding	Known to occur
Thalasseus bengalensis Lesser Crested Tern [66546]	Breeding	Known to occur
Sharks		
Rhincodon typus Whale Shark [66680]	Foraging	Known to occur
Whales		

Scientific Name	Behaviour	Presence
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 26-Nov-2021

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	49
Listed Migratory Species:	61

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	5
Commonwealth Heritage Places:	2
Listed Marine Species:	107
Whales and Other Cetaceans:	31
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	7
Habitat Critical to the Survival of Marine Turtles:	4

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	16
Regional Forest Agreements:	None
Nationally Important Wetlands:	3
EPBC Act Referrals:	170
Key Ecological Features (Marine):	6
Biologically Important Areas:	34
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Legal Status
The Ningaloo Coast	WA	Declared property

National Heritage Places [Resource Information]

Name	State	Legal Status
Natural		
The Ningaloo Coast	WA	Listed place

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
EEZ and Territorial Sea

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Malurus leucopterus edouardi White-winged Fairy-wren (Barrow Island), Barrow Island Black-and-white Fairy-wren [26194]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
CRUSTACEAN		
Kumonga exleyi		
Cape Range Remipede [86875]	Vulnerable	Species or species habitat known to occur within area
FISH		
Milyeringa veritas		
Blind Gudgeon [66676]	Vulnerable	Species or species habitat known to occur within area
Ophisternon candidum		
Blind Cave Eel [66678]	Vulnerable	Species or species habitat known to occur within area
Thunnus maccoyii		
Southern Bluefin Tuna [69402]	Conservation Dependent	Breeding known to occur within area
MAMMAL		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Bettongia lesueur Barrow and Boodie Islands subspecies		
Boodie, Burrowing Bettong (Barrow and Boodie Islands) [88021]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus hallucatus		
Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Isoodon auratus barrowensis		
Golden Bandicoot (Barrow Island) [66666]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes conspicillatus conspicillatus		
Spectacled Hare-wallaby (Barrow Island) [66661]	Vulnerable	Species or species habitat known to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Osphranter robustus isabellinus		
Barrow Island Wallaroo, Barrow Island Euro [89262]	Vulnerable	Species or species habitat likely to occur within area
Petrogale lateralis lateralis		
Black-flanked Rock-wallaby, Moororong, Black-footed Rock Wallaby [66647]	Endangered	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form)		
Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat known to occur within area
REPTILE		
Aipysurus apraefrontalis		
Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus foliosquama		
Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Ctenotus zastictus Hamelin Ctenotus [25570]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
SHARK		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Centrophorus zeehaani Southern Dogfish, Endeavour Dogfish, Little Gulper Shark [82679]	Conservation Dependent	Species or species habitat likely to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Scientific Name	Threatened Category	Presence Text
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat known to occur within area

Listed Migratory Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known to occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Dugong dugon Dugong [28]		Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Tursiops aduncus (Arafura/Timor Sea populations)		
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State
Defence	
Defence - EXMOUTH VLF TRANSMITTER STATION [50123]	WA
Defence - EXMOUTH VLF TRANSMITTER STATION [50122]	WA
Defence - LEARMONTH - AIR WEAPONS RANGE [50193]	WA
Defence - LEARMONTH RADAR SITE - VLAMING HEAD EXMOUTH [50001]	WA
Unknown	
Commonwealth Land - [52236]	WA

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		

Name	State	Status
Learmonth Air Weapons Range Facility	WA	Listed place
Ningaloo Marine Area - Commonwealth Waters	WA	Listed place

Listed Marine Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna pacifica as Puffinus pacificus Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Breeding known to occur within area
Onychoprion fuscatus as Sterna fuscata Sooty Tern [90682]		Breeding known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area
Sternula nereis as Sterna nereis Fairy Tern [82949]		Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Thalasseus bengalensis as Sterna bengalensis Lesser Crested Tern [66546]		Breeding known to occur within area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammal		
Dugong dugon Dugong [28]		Breeding known to occur within area
Reptile		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Chitulia ornata as Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [87377]		Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis macdowelli as Hydrophis mcdowelli Small-headed Seasnake [75601]		Species or species habitat may occur within area
Leioselasma czeblukovi as Hydrophis czeblukovi Fine-spined Seasnake, Geometrical Seasnake [87374]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Indopacetus pacificus Longman's Beaked Whale [72]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima as Kogia simus Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area

Current Scientific Name	Status	Type of Presence
[Stenella attenuata](#) Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
[Stenella coeruleoalba](#) Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
[Stenella longirostris](#) Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
[Steno bredanensis](#) Rough-toothed Dolphin [30]		Species or species habitat may occur within area
[Tursiops aduncus](#) Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
[Tursiops aduncus (Arafura/Timor Sea populations)](#) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
[Tursiops truncatus s. str.](#) Bottlenose Dolphin [68417]		Species or species habitat may occur within area
[Ziphius cavirostris](#) Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories
Gascoyne	Habitat Protection Zone (IUCN IV)
Gascoyne	Multiple Use Zone (IUCN VI)
Montebello	Multiple Use Zone (IUCN VI)
Shark Bay	Multiple Use Zone (IUCN VI)
Ningaloo	National Park Zone (IUCN II)

Park Name	Zone & IUCN Categories
Ningaloo	Recreational Use Zone (IUCN IV)
Ningaloo	Recreational Use Zone (IUCN IV)

Habitat Critical to the Survival of Marine Turtles

Scientific Name	Behaviour	Presence
Aug - Sep		
[Natator depressus](#) Flatback Turtle [59257]	Nesting	Known to occur
Dec - Jan		
[Chelonia mydas](#) Green Turtle [1765]	Nesting	Known to occur
Nov-Feb		
[Caretta caretta](#) Loggerhead Turtle [1763]	Nesting	Known to occur
Nov - May		
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Nesting	Known to occur

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State
Barrow Island	Nature Reserve	WA
Barrow Island	Marine Management Area	WA
Barrow Island	Marine Park	WA
Bessieres Island	Nature Reserve	WA
Cape Range	National Park	WA
Jurabi Coastal Park	5(1)(h) Reserve	WA
Montebello Islands	Conservation Park	WA
Montebello Islands	Marine Park	WA
Montebello Islands	Conservation Park	WA
Muiron Islands	Nature Reserve	WA

Protected Area Name	Reserve Type	State
Muiron Islands	Marine Management Area	WA
Ningaloo	Marine Park	WA
Round Island	Nature Reserve	WA
Serrurier Island	Nature Reserve	WA
Unnamed WA44665	5(1)(h) Reserve	WA
Victor Island	Nature Reserve	WA

Nationally Important Wetlands [Resource Information]

Wetland Name	State
Bundera Sinkhole	WA
Cape Range Subterranean Waterways	WA
Learmonth Air Weapons Range - Saline Coastal Flats	WA

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Action clearly unacceptable			
Highlands 3D Marine Seismic Survey	2012/6680	Action Clearly Unacceptable	Completed
Controlled action			
'Van Gogh' Petroleum Field Development	2007/3213	Controlled Action	Post-Approval
Ashburton Infrastructure Project	2021/9064	Controlled Action	Referral Decision
Browse to North West Shelf Development, Indian Ocean, WA	2018/8319	Controlled Action	Final PER or EIS
Construct and operate LNG & domestic gas plant including onshore and offshore facilities - Wheatstone	2008/4469	Controlled Action	Post-Approval
Develop Jansz-Io deepwater gas field in Permit Areas WA-18-R, WA-25-R and WA-26-	2005/2184	Controlled Action	Post-Approval
Development of Angel gas and condensate field, North West Shelf	2004/1805	Controlled Action	Post-Approval
Development of Browse Basin Gas Fields (Upstream)	2008/4111	Controlled Action	Completed
Development of Coniston/Novara fields within the Exmouth Sub-	2011/5995	Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
basin			
Development of Stybarrow petroleum field incl drilling and facility installation	2004/1469	Controlled Action	Post-Approval
Echo-Yodel Production Wells	2000/11	Controlled Action	Post-Approval
Enfield full field development	2001/257	Controlled Action	Post-Approval
Equus Gas Fields Development Project, Carnarvon Basin	2012/6301	Controlled Action	Completed
Gorgon Gas Development	2003/1294	Controlled Action	Post-Approval
Gorgon Gas Development 4th Train Proposal	2011/5942	Controlled Action	Post-Approval
Greater Enfield (Vincent) Development	2005/2110	Controlled Action	Post-Approval
Light Crude Oil Production	2001/365	Controlled Action	Post-Approval
Ningaloo Lighthouse Development, 17km north west Exmouth, Western Australia	2020/8693	Controlled Action	Assessment Approach
Pluto Gas Project	2005/2258	Controlled Action	Completed
Pluto Gas Project Including Site B	2006/2968	Controlled Action	Post-Approval
Pyrenees Oil Fields Development	2005/2034	Controlled Action	Post-Approval
The Scarborough Project - FLNG & assoc subsea infrastructure, Carnarvon Basin	2013/6811	Controlled Action	Post-Approval
Vincent Appraisal Well	2000/22	Controlled Action	Post-Approval
Yardie Creek Road Realignment Project	2021/8967	Controlled Action	Assessment Approach
Not controlled action			
'Goodwyn A' Low Pressure Train Project	2003/914	Not Controlled Action	Completed
'Van Gogh' Oil Appraisal Drilling Program, Exploration Permit Area WA-155-P(1)	2006/3148	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Bollinger 2D Seismic Survey 200km North of North West Cape WA	2004/1868	Not Controlled Action	Completed
Bultaco-2, Laverda-2, Laverda-3 and Montesa-2 Appraisal Wells	2000/103	Not Controlled Action	Completed
Carnarvon 3D Marine Seismic Survey	2004/1890	Not Controlled Action	Completed
Cazadores 2D seismic survey	2004/1720	Not Controlled Action	Completed
Construction and operation of an unmanned sea platform and connecting pipeline to Varanus Island for the extraction of natural gas	2004/1703	Not Controlled Action	Completed
Development of Halyard Field off the west coast of WA	2010/5611	Not Controlled Action	Completed
Development of Mutineer and Exeter petroleum fields for oil production, Permit	2003/1033	Not Controlled Action	Completed
Eagle-1 Exploration Drilling, North West Shelf, WA	2019/8578	Not Controlled Action	Completed
Echo A Development WA-23-L, WA-24-L	2005/2042	Not Controlled Action	Completed
Exploration drilling well WA-155-P(1)	2003/971	Not Controlled Action	Completed
Exploration of appraisal wells	2006/3065	Not Controlled Action	Completed
Exploration Well in Permit Area WA-155-P(1)	2002/759	Not Controlled Action	Completed
Exploratory drilling in permit area WA-225-P	2001/490	Not Controlled Action	Completed
HCA05X Macedon Experimental Survey	2004/1926	Not Controlled Action	Completed
Hess Exploration Drilling Programme	2007/3566	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
Infill Production Well (Griffin-9)	2001/417	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Jansz-2 and 3 Appraisal Wells	2002/754	Not Controlled Action	Completed
Klammer 2D Seismic Survey	2002/868	Not Controlled Action	Completed
Maia-Gaea Exploration wells	2000/17	Not Controlled Action	Completed
Montesa-1 and Bultaco-1 Exploration Wells	2000/102	Not Controlled Action	Completed
North Rankin B gas compression facility	2005/2500	Not Controlled Action	Completed
Pipeline System Modifications Project	2000/3	Not Controlled Action	Completed
Project Highclere Geophysical Survey	2021/9023	Not Controlled Action	Completed
Searipple gas and condensate field development	2000/89	Not Controlled Action	Completed
Spool Base Facility	2001/263	Not Controlled Action	Completed
Subsea Gas Pipeline From Stybarrow Field to Griffin Venture Gas Export Pipeline	2005/2033	Not Controlled Action	Completed
sub-sea tieback of Perseus field wells	2004/1326	Not Controlled Action	Completed
Telstra North Rankin Spur Fibre Optic Cable	2016/7836	Not Controlled Action	Completed
Thevenard Island Retirement Project	2015/7423	Not Controlled Action	Completed
To construct and operate an offshore submarine fibre optic cable, WA	2014/7373	Not Controlled Action	Completed
Wanda Offshore Research Project, 80 km north-east of Exmouth, WA	2018/8293	Not Controlled Action	Completed
Western Flank Gas Development	2005/2464	Not Controlled Action	Completed
Wheatstone 3D seismic survey, 70km north of Barrow Island	2004/1761	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Kate' 3D marine seismic survey, exploration permits WA-320-P and WA-345-P, 60km	2005/2037	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
'Tourmaline' 2D marine seismic survey, permit areas WA-323-P, WA-330-P and WA-32	2005/2282	Not Controlled Action (Particular Manner)	Post-Approval
"Leanne" offshore 3D seismic exploration, WA-356-P	2005/1938	Not Controlled Action (Particular Manner)	Post-Approval
2D and 3D seismic surveys	2005/2151	Not Controlled Action (Particular Manner)	Post-Approval
2D marine seismic survey	2012/6296	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey	2008/4493	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey Permit Area WA-352-P	2008/4628	Not Controlled Action (Particular Manner)	Post-Approval
3D marine seismic survey	2008/4281	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in Permit Areas WA-15-R, WA-18-R, WA-205-P, WA-253-P, WA-267-P and WA-268-P	2003/1271	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in WA 457-P & WA 458-P, North West Shelf, offshore WA	2013/6862	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Surveys - Contos CT-13 & Supertubes CT-13, offshore WA	2013/6901	Not Controlled Action (Particular Manner)	Post-Approval
3D seismic survey	2006/2715	Not Controlled Action (Particular Manner)	Post-Approval
3D Seismic Survey, WA	2008/4428	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
3D Seismic Survey in the Carnarvon Bsin on the North West Shelf	2002/778	Not Controlled Action (Particular Manner)	Post-Approval
3D sesmic survey	2006/2781	Not Controlled Action (Particular Manner)	Post-Approval
Acheron Non-Exclusive 2D Seismic Survey	2008/4565	Not Controlled Action (Particular Manner)	Post-Approval
Acheron Non-Exclusive 2D Seismic Survey	2009/4968	Not Controlled Action (Particular Manner)	Post-Approval
Apache Northwest Shelf Van Gogh Field Appraisal Drilling Program	2007/3495	Not Controlled Action (Particular Manner)	Post-Approval
Aperio 3D Marine Seismic Survey, WA	2012/6648	Not Controlled Action (Particular Manner)	Post-Approval
Artemis-1 Drilling Program (WA-360-P)	2010/5432	Not Controlled Action (Particular Manner)	Post-Approval
Australia to Singapore Fibre Optic Submarine Cable System	2011/6127	Not Controlled Action (Particular Manner)	Post-Approval
Babylon 3D Marine Seismic Survey, Commonwealth Waters, nr Exmouth WA	2013/7081	Not Controlled Action (Particular Manner)	Post-Approval
Balnaves Condensate Field Development	2011/6188	Not Controlled Action (Particular Manner)	Post-Approval
Bonaventure 3D seismic survey	2006/2514	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Cable Seismic Exploration Permit areas WA-323-P and WA-330-P	2008/4227	Not Controlled Action (Particular Manner)	Post-Approval
CGGVERITAS 2010 2D Seismic Survey	2010/5714	Not Controlled Action (Particular Manner)	Post-Approval
Charon 3D Marine Seismic Survey	2007/3477	Not Controlled Action (Particular Manner)	Post-Approval
Coverack Marine Seismic Survey	2001/399	Not Controlled Action (Particular Manner)	Post-Approval
Cue Seismic Survey within WA-359-P, WA-361-P and WA-360-P	2007/3647	Not Controlled Action (Particular Manner)	Post-Approval
CVG 3D Marine Seismic Survey	2012/6654	Not Controlled Action (Particular Manner)	Post-Approval
DAVROS MC 3D marine seismic survey northwaet of Dampier, WA	2013/7092	Not Controlled Action (Particular Manner)	Post-Approval
Decommissioning of the Legendre facilities	2010/5681	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Drilling Program	2010/5532	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Northwest Shelf 2D Seismic Survey	2007/3260	Not Controlled Action (Particular Manner)	Post-Approval
Demeter 3D Seismic Survey, off Dampier, WA	2002/900	Not Controlled Action (Particular Manner)	Post-Approval
Draeck 3D Marine Seismic Survey, WA-205-P	2006/3067	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Drilling 35-40 offshore exploration wells in deep water	2008/4461	Not Controlled Action (Particular Manner)	Post-Approval
Eendracht Multi-Client 3D Marine Seismic Survey	2009/4749	Not Controlled Action (Particular Manner)	Post-Approval
Enfield M3 & Vincent 4D Marine Seismic Surveys	2008/3981	Not Controlled Action (Particular Manner)	Completed
Enfield M3 4D, Vincent 4D & 4D Line Test Marine Seismic Surveys	2008/4122	Not Controlled Action (Particular Manner)	Post-Approval
Enfield M4 4D Marine Seismic Survey	2008/4558	Not Controlled Action (Particular Manner)	Post-Approval
Enfield oilfield 3D Seismic Survey	2006/3132	Not Controlled Action (Particular Manner)	Post-Approval
Exmouth West 2D Marine Seismic Survey	2008/4132	Not Controlled Action (Particular Manner)	Post-Approval
Exploration drilling of Zeus-1 well	2008/4351	Not Controlled Action (Particular Manner)	Post-Approval
Fletcher-Finucane Development, WA26-L and WA191-P	2011/6123	Not Controlled Action (Particular Manner)	Post-Approval
Foxhound 3D Non-Exclusive Marine Seismic Survey	2009/4703	Not Controlled Action (Particular Manner)	Post-Approval
Gazelle 3D Marine Seismic Survey in WA-399-P and WA-42-L	2010/5570	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Geco Eagle 3D Marine Seismic Survey	2008/3958	Not Controlled Action (Particular Manner)	Post-Approval
Glencoe 3D Marine Seismic Survey WA-390-P	2007/3684	Not Controlled Action (Particular Manner)	Post-Approval
Greater Western Flank Phase 1 gas Development	2011/5980	Not Controlled Action (Particular Manner)	Post-Approval
Grimalkin 3D Seismic Survey	2008/4523	Not Controlled Action (Particular Manner)	Post-Approval
Guacamole 2D Marine Seismic Survey	2008/4381	Not Controlled Action (Particular Manner)	Post-Approval
Harmony 3D Marine Seismic Survey	2012/6699	Not Controlled Action (Particular Manner)	Post-Approval
Harpy 1 exploration well	2001/183	Not Controlled Action (Particular Manner)	Post-Approval
Honeycombs MC3D Marine Seismic Survey	2012/6368	Not Controlled Action (Particular Manner)	Post-Approval
Huzzas MC3D Marine Seismic Survey (HZ-13) Carnarvon Basin, offshore WA	2013/7003	Not Controlled Action (Particular Manner)	Post-Approval
Huzzas phase 2 marine seismic survey, Exmouth Plateau, Northern Carnarvon Basin, WA	2013/7093	Not Controlled Action (Particular Manner)	Post-Approval
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval
John Ross & Rosella Off Bottom Cable Seismic Exploration Program	2008/3966	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Judo Marine 3D Seismic Survey within and adjacent to WA-412-P	2008/4630	Not Controlled Action (Particular Manner)	Post-Approval
Judo Marine 3D Seismic Survey within and adjacent to WA-412-P	2009/4801	Not Controlled Action (Particular Manner)	Post-Approval
Julimar Brunello Gas Development Project	2011/5936	Not Controlled Action (Particular Manner)	Post-Approval
Klimt 2D Marine Seismic Survey	2007/3856	Not Controlled Action (Particular Manner)	Post-Approval
Laverda 3D Marine Seismic Survey and Vincent M1 4D Marine Seismic Survey	2010/5415	Not Controlled Action (Particular Manner)	Post-Approval
Leopard 2D marine seismic survey	2005/2290	Not Controlled Action (Particular Manner)	Post-Approval
Lion 2D Marine Seismic Survey	2007/3777	Not Controlled Action (Particular Manner)	Post-Approval
Macedon Gas Field Development	2008/4605	Not Controlled Action (Particular Manner)	Post-Approval
Marine reconnaissance survey	2008/4466	Not Controlled Action (Particular Manner)	Post-Approval
Moosehead 2D seismic survey within permit WA-192-P	2005/2167	Not Controlled Action (Particular Manner)	Post-Approval
Munmorah 2D seismic survey within permits WA-308/9-P	2003/970	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Ocean Bottom Cable Seismic Program, WA-264-P	2007/3844	Not Controlled Action (Particular Manner)	Post-Approval
Ocean Bottom Cable Seismic Survey	2005/2017	Not Controlled Action (Particular Manner)	Post-Approval
Offshore Drilling Campaign	2011/5830	Not Controlled Action (Particular Manner)	Post-Approval
Orcus 3D Marine Seismic Survey in WA-450-P	2010/5723	Not Controlled Action (Particular Manner)	Post-Approval
Osprey and Dionysus Marine Seismic Survey	2011/6215	Not Controlled Action (Particular Manner)	Post-Approval
Palta-1 exploration well in Petroleum Permit Area WA-384-P	2011/5871	Not Controlled Action (Particular Manner)	Post-Approval
Pomodoro 3D Marine Seismic Survey in WA-426-P and WA-427-P	2010/5472	Not Controlled Action (Particular Manner)	Post-Approval
Pyrenees 4D Marine Seismic Monitor Survey, HCA12A	2012/6579	Not Controlled Action (Particular Manner)	Post-Approval
Pyrenees-Macedon 3D marine seismic survey	2005/2325	Not Controlled Action (Particular Manner)	Post-Approval
Quiberon 2D Seismic Survey, permit area WA-385P, offshore of Carnarvon	2009/5077	Not Controlled Action (Particular Manner)	Post-Approval
Reindeer gas reservior development, Devil Creek, Carnarvon Basin - WA	2007/3917	Not Controlled Action (Particular Manner)	Post-Approval
Rose 3D Seismic Program	2008/4239	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Rydal-1 Petroleum Exploration Well, WA	2012/6522	Not Controlled Action (Particular Manner)	Post-Approval
Salsa 3D Marine Seismic Survey	2010/5629	Not Controlled Action (Particular Manner)	Post-Approval
Santos Winchester three dimensional seismic survey - WA-323-P & WA-330-P	2011/6107	Not Controlled Action (Particular Manner)	Post-Approval
Skorpion Marine Seismic Survey WA	2001/416	Not Controlled Action (Particular Manner)	Post-Approval
Sovereign 3D Marine Seismic Survey	2011/5861	Not Controlled Action (Particular Manner)	Post-Approval
Stag 4D & Reindeer MAZ Marine Seismic Surveys, WA	2013/7080	Not Controlled Action (Particular Manner)	Post-Approval
Stybarrow 4D Marine Seismic Survey	2011/5810	Not Controlled Action (Particular Manner)	Post-Approval
Stybarrow Baseline 4D marine seismic survey	2008/4530	Not Controlled Action (Particular Manner)	Post-Approval
Tantabiddi Boat Ramp Sand Bypassing	2015/7411	Not Controlled Action (Particular Manner)	Post-Approval
Tidepole Maz 3D Seismic Survey Campaign	2007/3706	Not Controlled Action (Particular Manner)	Post-Approval
Tortilla 2D Seismic Survey, WA	2011/6110	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Triton 3D Marine Seismic Survey, WA-2-R and WA-3-R	2006/2609	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a three dimensional marine seismic survey	2010/5679	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a three dimensional marine seismic survey	2010/5715	Not Controlled Action (Particular Manner)	Post-Approval
Vincent M1 and Enfield M5 4D Marine Seismic Survey	2010/5720	Not Controlled Action (Particular Manner)	Post-Approval
Warramunga Non-Inclusive 3D Seismic Survey	2008/4553	Not Controlled Action (Particular Manner)	Post-Approval
West Anchor 3D Marine Seismic Survey	2008/4507	Not Controlled Action (Particular Manner)	Post-Approval
West Panaeus 3D seismic survey	2006/3141	Not Controlled Action (Particular Manner)	Post-Approval
Westralia SPAN Marine Seismic Survey, WA & NT	2012/6463	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone 3D MAZ Marine Seismic Survey	2011/6058	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2007/3941	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2008/4134	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
3D Seismic Survey	2008/4219	Referral Decision	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Referral decision			
Bianchi 3D Marine Seismic Survey, Carnavon Basin, WA	2013/7078	Referral Decision	Completed
CVG 3D Marine Seismic Survey	2012/6270	Referral Decision	Completed
Enfield 4D Marine Seismic Surveys, Production Permit WA-28-L	2005/2370	Referral Decision	Completed
Rose 3D Seismic acquisition survey	2008/4220	Referral Decision	Completed
Stybarrow Baseline 4D Marine Seismic Survey (Permit Areas WA-255-P, WA-32-L, WA-	2008/4165	Referral Decision	Completed

Key Ecological Features

[Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Ancient coastline at 125 m depth contour	North-west
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	North-west
Commonwealth waters adjacent to Ningaloo Reef	North-west
Continental Slope Demersal Fish Communities	North-west
Exmouth Plateau	North-west
Glomar Shoals	North-west

Biologically Important Areas

Scientific Name	Behaviour	Presence
Dugong		
Dugong dugon Dugong [28]	Breeding	Known to occur
Dugong dugon Dugong [28]	Calving	Known to occur
Dugong dugon Dugong [28]	Foraging (high density seagrass beds)	Known to occur

Scientific Name	Behaviour	Presence
Dugong dugon Dugong [28]	Nursing	Known to occur
Marine Turtles		
Caretta caretta Loggerhead Turtle [1763]	Internesting buffer	Known to occur
Caretta caretta Loggerhead Turtle [1763]	Nesting	Known to occur
Chelonia mydas Green Turtle [1765]	Aggregation	Known to occur
Chelonia mydas Green Turtle [1765]	Basking	Known to occur
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting buffer	Known to occur
Chelonia mydas Green Turtle [1765]	Mating	Known to occur
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Foraging	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting buffer	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Mating	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur

Scientific Name	Behaviour	Presence
Natator depressus Flatback Turtle [59257]	Aggregation	Known to occur
Natator depressus Flatback Turtle [59257]	Foraging	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur
Natator depressus Flatback Turtle [59257]	Mating	Known to occur
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur
Sternula nereis Fairy Tern [82949]	Breeding	Known to occur
Thalasseus bengalensis Lesser Crested Tern [66546]	Breeding	Known to occur
Sharks		
Rhincodon typus Whale Shark [66680]	Foraging	Known to occur
Rhincodon typus Whale Shark [66680]	Foraging (high density prey)	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur

Scientific Name	Behaviour	Presence
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Migration	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Resting	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix E

Oil Pollution Emergency Plan

GRIFFIN DECOMMISSIONING OIL POLLUTION EMERGENCY PLAN

Document No: GV-HSE-ER-0011

REVISION RECORD						
Rev	**Date**	**Description**	**Prepared by**	**Reviewed by**	**Checked by**	**Approved by**
1	17/03/2022	Updated in Response to NOPSEMA RFFWI	BlueSands Environmental / Advisian	Principal Project Engineer - Decommissioning	Regional HSE Lead Australia	Director Projects Australia

REVISION RECORD		
Rev	**Date**	**Description**
A	15/10/2021	Internal review
B	30/11/2021	Issued for BHP review
C	03/12/2021	Issued for BHP review
0	22/12/2021	Final – issued to NOPSEMA for assessment
1	17/03/2022	Updated in response to NOPSEMA RFFWI

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1 Introduction

1.1 Purpose

This Oil Pollution Emergency Plan (OPEP) has been developed to establish the processes and procedures within BHP to respond to and effectively manage incidents that may occur during Griffin Field decommissioning activities within Permit Area WA-10-L and WA-12-L, offshore Western Australia.

This OPEP is an appendix to the *Griffin Decommissioning and Field Management Environment Plan* (EP) (*GV-HSE-E-0014*) and is required under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations* (the OPGGS (Environment Regulations) for approval to perform petroleum activities in Commonwealth waters.

1.2 Scope

This OPEP applies to BHP activities associated with Griffin Field decommissioning.

This OPEP applies to oil spills resulting from activities associated with the Griffin Field decommissioning or operating under an instrument of the OPGGS Act.

Specifically in reference to oil spill preparedness, this OPEP contains:

- a summary description of the activity and locations (Section 1.4)
- a list of the spill scenarios that may occur during the petroleum activities (Section 2.1)
- an overview of the operational net environmental benefit analysis (NEBA) in relation to the spill scenarios (Section 4)
- details associated with each of the response strategies (Section 3)
- an outline of activities associated with the response to an oil spill (Section 3)
- the First Strike Response Plan (Appendix A).

The spill scenarios listed in Table 2-1 may impact on WA State waters, therefore this plan considers the Western Australia State Hazard Plan – Maritime Environmental Emergencies (SHP-MEE) (Government of WA, 2021) and Offshore Petroleum Industry Guidance Note (IGN) on Marine Oil Pollution: Response and Consultation Arrangements (Department of Transport (DoT), 2020). BHP acknowledges that as per the IGN, DoT will be the Controlling Agency in a State waters response (Refer to Section 1.5). BHP will provide all necessary resources, including personnel and equipment, to support DoT's Incident Management Team (IMT) and response, as agreed during consultations with DoT. BHP has access to staff for the Initial Personnel Requirements as outlined in Annexure 2 of the IGN. Refer to Appendix B of this plan for these requirements and the control and coordination/IMT structure that will be applied during a marine oil pollution response that impacts State waters.

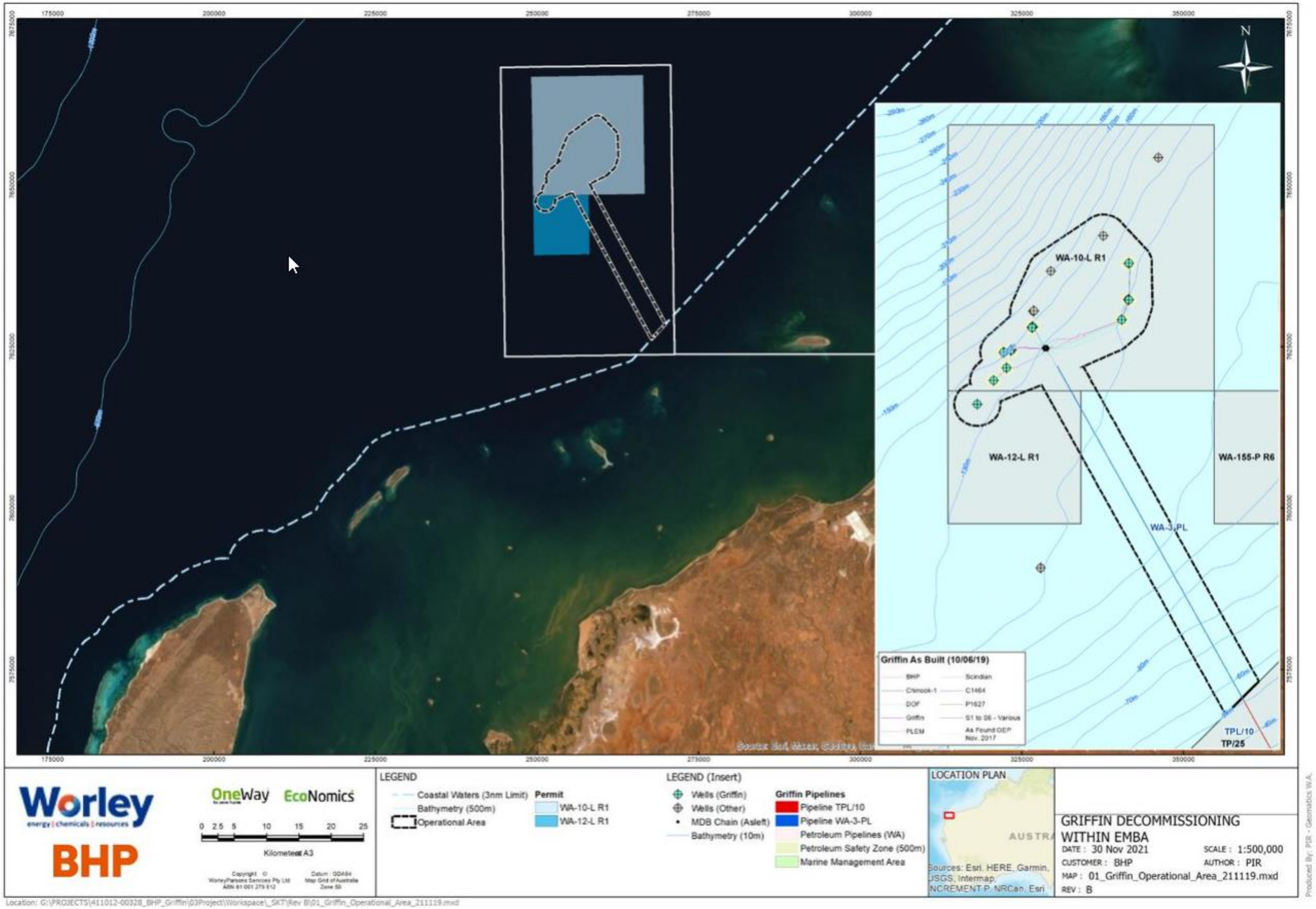
This plan is to be reviewed and implemented in conjunction with the BHP Griffin Decommissioning and Field Management EP (*GV-HSE-E-0014)* Activity Description and Location.

The activity covered by this OPEP involves removal of subsea infrastructure within the Griffin Field Permit Area WA-10-L, continued field management scopes on subsea infrastructure and removal of historic wellheads within Permit Areas WA-10-L and WA-12-L. The Griffin Field is in 130 m water depth around 70 km northwest of Onslow, WA (Figure 1-1). For a detailed description of the petroleum activities, refer to Section 3 of the EP.

1.3 Hydrocarbons and Their Sources

The petroleum activities will be performed using general support vessels, a heavy lift vessel, anchor handling tug vessels and a large construction support vessel, with further detail provided in Section 3.9 of the EP. The presence of such vessels in the operational area for the decommissioning activities presents a spill risk from a possible but unlikely vessel collision. A vessel collision has the potential to result in the rupture of a fuel tank and the release of marine diesel oil (MDO). The worst-case scenario is associated with the rupture of the largest fuel tank (1,000 m^3 of MDO) of one of the project vessels.

Properties of MDO are discussed in Section 8.1.1 of the EP.


WA-10-L R1
WA-12-L R1
WA-155-P R6
WA-3-PL
TPL/10
TP/25
Griffin As Built (10/06/19)
LEGEND
Coastal Waters (3nm Limit)
Bathymetry (500m)
Operational Area
Permit
WA-10-L R1
WA-12-L R1
LEGEND (Insert)
Wells (Griffin)
Wells (Other)
MDB Chain (Asleft)
Bathymetry (10m)
Griffin Pipelines
Pipeline TPL/10
Pipeline WA-3-PL
Petroleum Pipelines (WA)
Petroleum Safety Zone (500m)
Marine Management Area
LOCATION PLAN
Kilometers A3
GRIFFIN DECOMMISSIONING
WITHIN EMBA
DATE : 30 Nov 2021
SCALE : 1:500,000
CUSTOMER : BHP
AUTHOR : PIR
MAP : 01_Griffin_Operational_Area_211119.mxd
REV : B
Worley
BHP
OneWay
EcoNomics

1.4 Emergency Management and Oil Spill Response Documentation

Figure 1-2 shows the relationship of emergency management and oil spill documentation within BHP; Table 3-2 demonstrates the scope and content of tactical response plans developed by BHP. It excludes other tactical and industry plans, standard operating procedures and field guides prepared by DoT, Department Parks and Wildlife/ Department of Biodiversity, Conservation and Attractions, Australian Maritime Oil Spill Centre (AMOSC), Oil Spill Response Limited (OSRL), National Oceanic and Atmospheric Administration and IPIECA-International Association of Oil and Gas Producers available to BHP to support the marine recovery, oiled shoreline assessment, shoreline clean-up, oiled wildlife response and waste management.

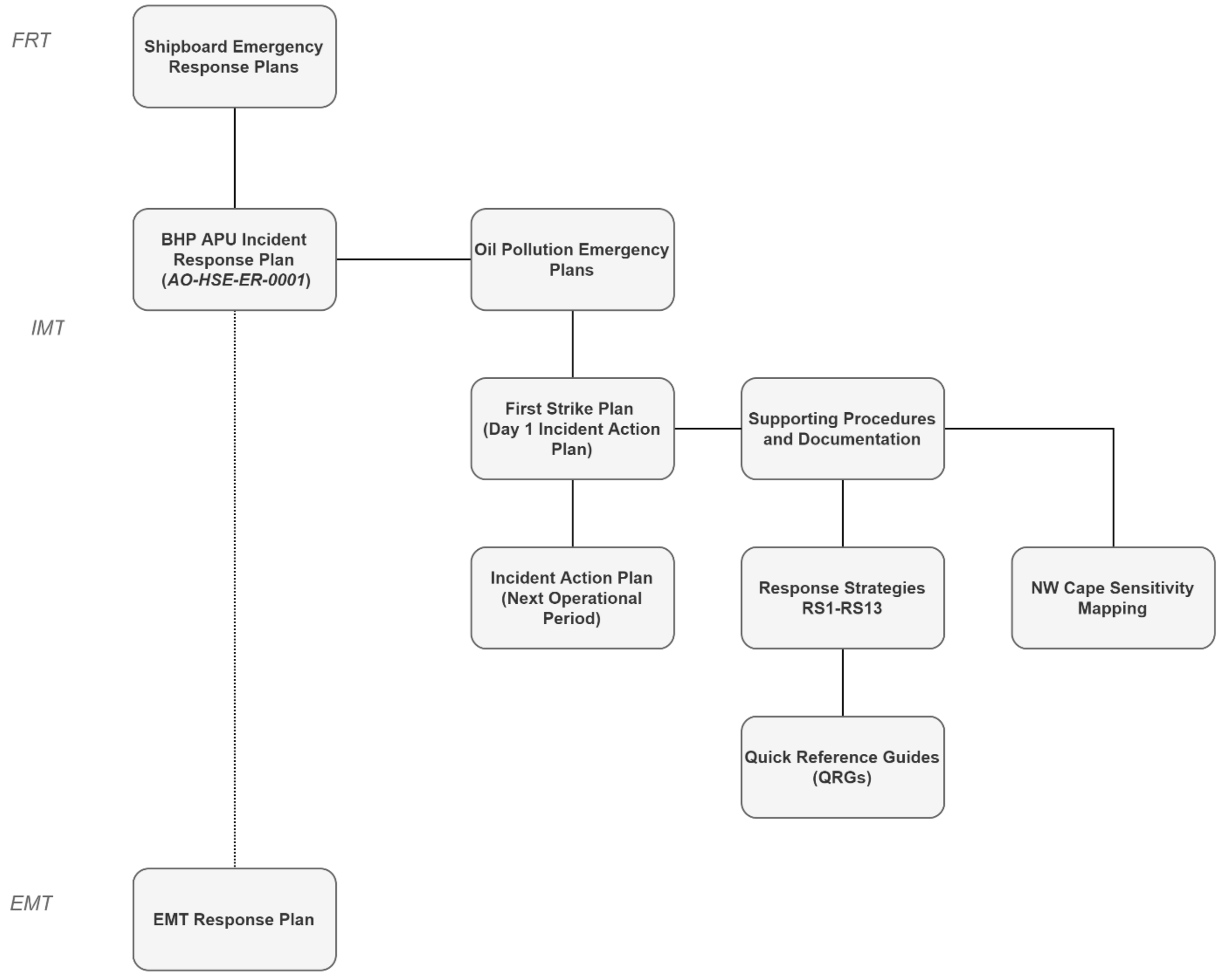


Figure 1-2: Relationship of Emergency Management and Oil Spill Response Documentation Within BHP

1.5 Oil Spill Response Control Agencies

During a spill response, there will be a 'Control Agency' and a 'Jurisdictional Authority' assigned to the incident for all spill response levels.

Definitions of a Control Agency and Jurisdictional Authority are as follows:

- Control Agency: the organisation assigned by legislation, administrative arrangements or within the relevant contingency plan, to control response activities to a maritime environmental emergency (AMSA, 2020). Control Agencies have the operational responsibility of response activities (AMSA, 2002) but may have arrangements in place with other parties to provide response assistance under their direction (AMSA, 2020).
- Jurisdictional Authority: the organisation which has responsibility to verify that an adequate spill response plan is prepared and, in the event of an incident, that a satisfactory response is implemented. The Jurisdictional Authority is also responsible for initiating prosecutions and the recovery of clean-up costs on behalf of all participating agencies.

The applicable Control Agency and Jurisdictional Authority is dependent on the location (Commonwealth vs State waters), type of activity (vessel based or petroleum activity) and the spill response level as shown in Table 1-1.

To aid in the determination of a vessel versus a facility spill, the following guidance is adopted:

- A vessel is a ship at sea to which the *Navigation Act 2012* applies.
- A facility is a petroleum facility as defined under the OPGGS Act, Volume 3, Schedule 3, Part 1, Clause 4 & Volume 2, Part 6.8, Section 640.

Table 1-1: Control Agencies and Jurisdictional Authorities for Oil Spill Response

Area	Spill Source	Jurisdictional Authority	Lead Control Agency	
			Level 1	Level 2
Commonwealth Waters (three to 200 nautical miles from territorial/state sea baseline)	Offshore Petroleum Activity[1]	NOPSEMA	BHP	BHP
	Vessels[2]	AMSA	AMSA	AMSA
State Waters (coastal waters within three nautical miles and some areas around offshore atolls and islands)	Offshore Petroleum Activity	DoT	BHP	DoT
	Vessels	DoT	DoT	DoT

[1] Includes a 'Facility', such as a fixed platform, FPSO/FSO, MODU, subsea infrastructure, or a construction, decommissioning and pipelaying vessel. As defined by Schedule 3, Part 1, Clause 4 of the OPGGS Act 2006.

[2] Vessels are defined by Australian Government Coordination Arrangements for Maritime Environmental Emergencies (AMSA, 2017) as a seismic vessel, supply or support vessel, or offtake tanker.

1.5.1 Petroleum Activity Spill in Commonwealth Waters

BHP holds the Control Agency role for its facility related spills within Commonwealth waters. Facility spills include vessels undertaking construction, decommissioning and pipelaying activities in BHP's operational area. This definition of a 'facility' is defined by Schedule 3, Part 1, Clause 4 of the OPGGS Act 2006.

1.5.2 Vessel Spills in WA State Waters

For WA State waters, the DoT Chief Executive Officer is prescribed as the Hazard Management Agency (HMA) for marine oil pollution as per the WA *Emergency Management Act 2005* and Emergency Management Regulations 2006. The DoT as the HMA has developed the State Hazard Plan: Maritime Environmental Emergencies (DoT, 2021). DoT has Control Agency responsibility for vessel spills within State waters.

1.5.3 Vessel Spills in Commonweath Waters

AMSA is the Control Agency for any shipping sourced spill in Australian Commonwealth waters (AMSA, 2020). AMSA is the national shipping and maritime industry regulator and was established under the *Australian Maritime Safety Authority Act 1990*. AMSA manages the National Plan for Maritime Environmental Emergencies (AMSA, 2020) on behalf of the Australian Government, working with State and the Northern Territory governments, emergency services and private industry to maximise Australia's marine pollution response capability.

1.5.4 Cross Jusridictional Spills

Cross Jusridictional Petroleum Activity Spills

If a Level 2 petroleum activity spill crosses jurisdictions between Commonwealth and State waters, the Jurisdictional Authority remains true to the source of the spill (i.e. NOPSEMA for Commonwealth waters; and DoT for State waters).

BHP will notify the DoT Maritime Environmental Emergency Response (MEER) unit as soon as reasonably practicable (within 2 hours of spill occurring) if an actual or impending spill may impact WA State waters. On notification, the HMA will activate their MEECC and the DoT IMT. BHP will work in partnership with DoT during such instances, as outlined within the DoT's Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (WA DoT, 2020).

BHP will conduct initial response actions in State waters as necessary in accordance with its OPEP and continue to manage those operations until formal handover of incident control is completed. Appendix 1 in DoT's Offshore Petroleum Industry Guidance Note (WA DoT, 2020) provides a checklist for formal handover.

For a cross-jurisdictional response, there will be a Lead IMT (DoT or BHP) for each spill response activity, with DoT's control resting primarily for State waters activities.

Appendix 2 in DoT's Offshore Petroleum Industry Guidance Note (WA DoT, 2020) provides guidance on the allocation of a Lead IMT to response activities for a cross-jurisdictional spill.

To facilitate effective coordination between the two Control Agencies and their respective IMT's, a Joint Strategic Coordination Committee (JSCC) will be established. The JSCC will be jointly chaired by the State Maritime Environmental Emergency Coordinator and BHP's nominated Crisis Management Team (CMT) Leader and will comprise of individuals deemed necessary by the chairs to ensure an effective coordinated response across both jurisdictions.

Cross Jurisdictional Vessel Spills

For a large vessel spill (e.g. Level 2 and above) that crosses jurisdictions between Commonwealth and State waters, two Jurisdictional Authorities will exist (AMSA for Commonwealth waters and DoT for State waters).

The Control Agency will remain with the original nominated agency or organisation unless otherwise appointed through agreement between the HMA / Jurisdictional Authority of both waters. AMSA may request that DoT manage a vessel incident in Australian Commonwealth waters (Government of WA ,2021).

BHP may be requested by the Control Agency to provide a first strike response and all necessary resources (including personnel and equipment) as a Supporting Agency.

1.6 Cost recovery

As required under Section 571(2) of the OPGGS Act 2006, BHP has financial assurances in place to cover any costs, expenses and liabilities arising from carrying out its petroleum activities, including major oil spills. This includes costs incurred by relevant control agencies (e.g. DoT) and third-party spill response service providers.

2 Identified Risks

2.1 Spill Scenarios for the Griffin Field Decommissioning Activities

The spill scenarios in which hydrocarbons may be released to the marine environment during the petroleum activities are provided in Table 2-1. The justification for selecting these spill scenarios is described in Section 8 of the EP.

Table 2-1: Hydrocarbon Spill Scenarios

Hydrocarbon	Activity	Scenarios	Average Frequency (per year)	Volume	Likelihood
MDO	Vessels required to perform petroleum activities	Vessel collision – which ruptures a MDO tank. One-time instantaneous release.	Not available	1,000 m^3	Highly Unlikely
MDO	Bunkering	Bunkering incident.	Not available	37.5 m^3	Highly Unlikely

Section 8 of the EP details the risk assessment and management for each of these scenarios respectively, which is not repeated in this document. This includes:

- description of the spill scenario
- spill frequency
- hydrocarbon properties
- environment that may be affected (EMBA)
- risk analysis conclusion and ranking
- objectives for spill prevention
- control measures.

2.2 Environment that May Be Affected

The EMBA for an MDO spill from Griffin Field decommissioning activities is described in the EP. In defining the EMBA, a range of factors detailed in National Offshore Petroleum Safety and Environmental Management Authority Oil Pollution Risk Management Guidance Note A382148 (NOPSEMA, 2021) have been considered. Specifically, the size of the EMBA has been based upon the quantity of oil, duration of discharge, concentration of hydrocarbons, film thickness of oil that can result in ecological impacts, zone of oil spill response activities and the environmental conditions that contribute to the largest distance travelled by the hydrocarbon. Figure 2-1 shows the EMBA's derived oil spill trajectory modelling commissioned by BHP for the worst-case MDO spill, defined using low hydrocarbon exposure values. Refer to Section 8.1.2 of the EP for more information about the hydrocarbon exposure values used for the oil spill modelling.

2.2.1 Diesel (Marine Diesel Oil)

The MDO spill scenario has a low contact probability of 3% for oil arriving at any shoreline at, or above, 10 g/m^2, including individual contact probabilities of 1% at Exmouth (summer) and Flat Island (summer), 2% at Peak Island (summer), and 3% at the Muiron Islands (winter). There was a 1% probability of shoreline contact at, or above, 100 g/m^2, at Exmouth (summer) and the Muiron Islands (winter) The maximum accumulated shoreline loading from any realisation was 15.9 m^3 at Exmouth (summer) (RPS, 2021).

The maximum distance of surface oil from the release location at the low (≥1 g/m^2), moderate (≥10 g/m^2) and high (≥50 g/m^2) thresholds were 123.8 km (north-northeast), 57.4 km (west-southwest) and 26.9 km (northeast), occurring during winter, transitional and summer conditions, respectively (RPS, 2021).

MDO is characterised by a high percentage of volatile components (95%), which will evaporate when on the sea surface (generally about 6% over the first 12 hours, a further 34.6% should evaporate in the first 24 hours, and an additional 54.4% should evaporate over several days). It also contains 5% persistent hydrocarbons, which will not evaporate, though will decay over time. Some heavy components contained in MDO have a strong tendency to physically entrain into the upper water column in the presence of moderate winds (i.e., >12 knots) and breaking waves but can re-float to the surface when the winds ease (RPS, 2021).

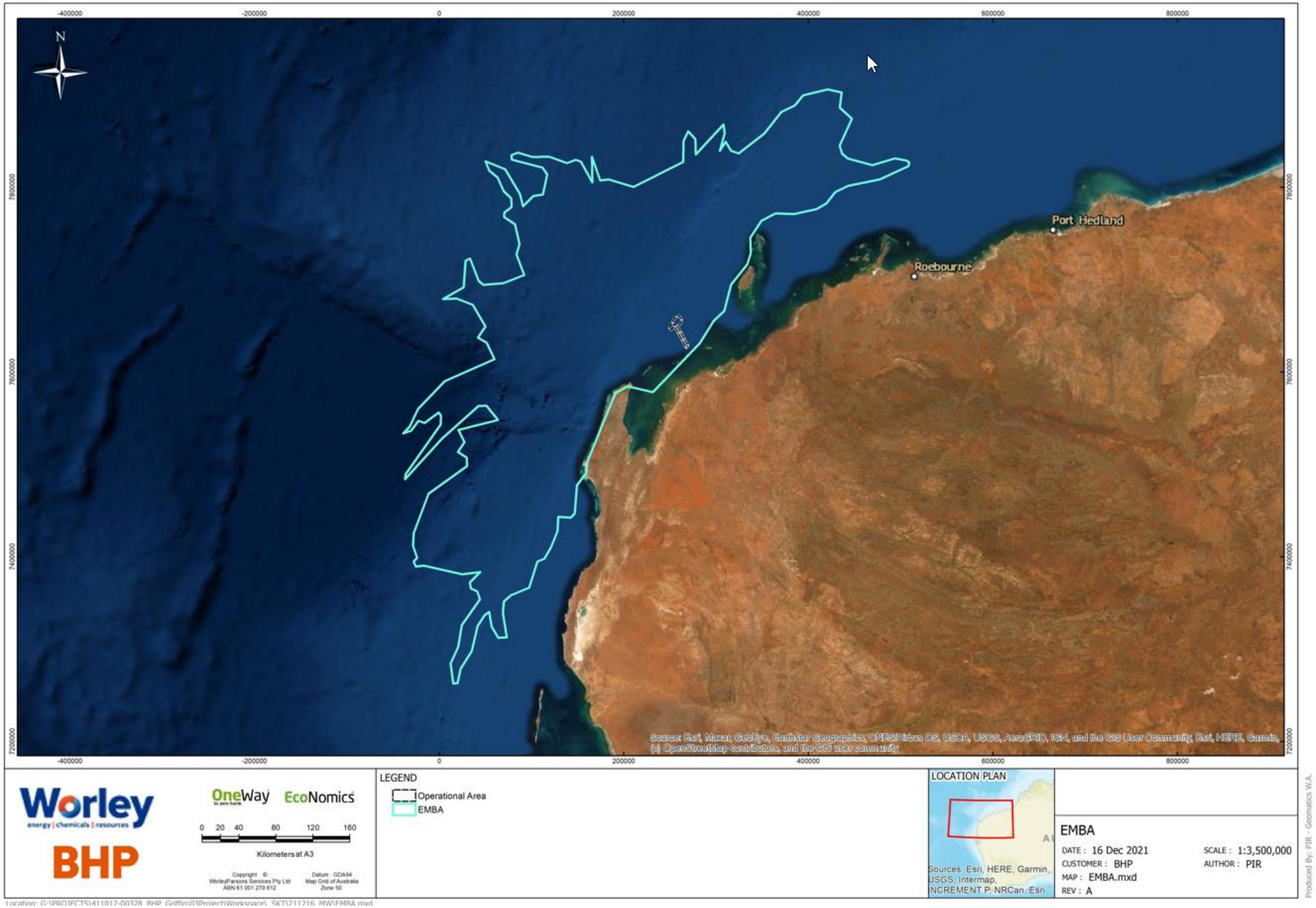


Figure 2-1: Griffin Field Environment that May Be Affected

2.3 Priority Areas

During an oil spill it is not always feasible to protect all receptors. Prioritising receptors helps to aid decision-making in the preliminary stages of a response, so initial resources are used for best effect. For the purposes of this OPEP, priority areas refer to those locations with significant receptors and values that require protection from the impacts of a spill.

Results from the hydrocarbon spill modelling were compared against the location of key sensitive receptors with high conservation-valued habitat or species or important socio-economic/heritage value within the EMBA. Relevant values and sensitivities of the environment are described in Section 4 of the EP. The ranking of these sensitivities (also referred to as receptors) are listed, which is consistent with the rankings in *Provisions of Western Australian Marine Oil Pollution Risk Assessment – Protection Priorities: Assessment for Zone 2: Pilbara* (DoT, 2017).

Using a combination of sensitivities and their associated rankings, together with the modelled maximum total volumes ashore and minimum time to contact, an initial response priority is provided in Table 2-2. Although Exmouth and the Muiron Islands are considered protection priority areas for this activity, the probability of shoreline contact at the low hydrocarbon exposure threshold (>10 g/m^2) for the worst-case spill scenario is very low at 3% for the Muiron Islands (winter) and 1% for Exmouth (summer) (RPS, 2021).

Table 2-2: Protection Priorities for Griffin Field Decommissioning Activities

Priority protection area	Location (in proximity to activity)	High value receptors	Seasonality or receptors	Ranking (floating oil)	Ranking (dissolved oil)	Minimum time to receptors (days at 100 g/m²)	Maximum accumulated volume (m³)	Protection and Response Priority
Exmouth (Shoreline cells 123 and 124 [DoT, 2017])	101 km	World Heritage Area	N/A	5	5	5	15.9	High
		Mangroves	N/A	3	3			High
		Turtles: loggerhead, green, hawksbill	Nesting and breeding Nov to Mar with peak in late Dec/early Jan	4	3			High
		Marine mammals: pygmy blue whales, humpback whales, dugongs	Pygmy blue whale migration: Apr to Aug Humpback whale migration: Jun to Oct	3	2			Medium
		Whale sharks and manta rays	Whale sharks – Mar to Jul	2	3			Medium
		Sea birds and shorebirds (including migratory species)	Nesting: Sep to Feb	5	4			High
		Coral	Coral spawning: Mar & Oct	3	4			High
		Tourism	Year-round	2	2			Medium
Muiron Islands (Shoreline cell 329 [DoT, 2017])	50 km	Turtle nesting – loggerhead (major site), green (major site), hawksbill (low density), flatback (occasional)	Turtle nesting and breeding Nov to Mar with peak in late Dec/early Jan	4	3	5.5	3.1	High
		Humpback whale	Jun to Oct	3	2			Medium
		Seabird nesting	Nesting: Sept-Feb	2	1			Low
		Coral	Coral spawning: Mar & Oct	3	4			Medium
		Fishing and tourism Exmouth gulf prawn fishery, recreational fishing and charter boat tourism	Prawn fishery – Apr to Nov Tourism and recreation: year-round	1	2			Low

At the time of a spill, the IMT has the following tools at its disposal to assess the oil spill scenario risk assessment, determine the environmental protection priorities and subsequent response needs for an emergency event related to the Griffin Field decommissioning activities.

NEBA

The NEBA response strategy evaluation process is a decision support tool used to help select the most appropriate response options that together make up the oil spill response strategies the IMT is to implement in a spill. Using the Strategic NEBA in the EP, the IMT has the foundation for preparing an Operational NEBA to inform response priorities.

Geographic Information System (GIS) – Petroleum Incident Management

This web-based GIS modelling platform takes Australian Production Unit (APU) Base map and overlays key sensitivities and other information in spatial format.

GIS – APU Oil Spill Response Plan

This web-based GIS modelling platform takes North West Cape-Sector Map, and allows a display of shore concentration by time and priority. For selected scenarios, it also provides data ‘graphs’ such as total shore volume by priority, oil load at each segment over time, protection priority and number of responders required by segment for selected OPEPs.

Oil Spill Response Atlas (OSRA)-Web Map Application (WMA)

WA OSRA is a spatial database of environmental, logistical and oil spill response data. Using a GIS platform, OSRA displays datasets collated from a range of custodians, allowing decision-makers to visualise environmental sensitivities and response considerations in a selected location. OSRA-WMA allows the layers found in OSRA to be viewed via a secure portal from the DoT website and provides basic functional tools.

North West Cape Sensitivities Mapping

The purpose of this shoreline sectorisation was to outline sensitive resources at risk, describe a baseline using the systematic cause analysis technique, and outline important segment access information. The document describes localised environmental type (shoreline, substrate) and accessibility of shorelines and required permissions.

3 Applicable Response Strategies

The strategies selected during the NEBA process for the worst-case MDO spill scenario are summarised in Table 3-1. Further description of each strategy includes a risk assessment on performing it, the control options and a conclusion as to how the strategy demonstrates as low as reasonably practicable (ALARP) criteria and BHP acceptability criteria.

Table 3-1: Summarised Response Strategies for the Griffin Field Decommissioning Spill Scenarios

Response Strategy	1,000 m³ MDO Loss from Vessel Storage Tank (Level 2)
Response Strategy 1: Source Control – Vessel Control	Primary
Response Strategy 2: Monitor and Evaluate	Primary
Response Strategy 3: Dispersant – Surface Application	×
Response Strategy 4: Marine Recovery	×
Response Strategy 5: Shoreline Protection	Secondary*
Response Strategy 6: Mechanical Dispersion	×
Response Strategy 7: In-Situ Burning	×
Response Strategy 8: Shoreline Clean-Up	Secondary*
Response Strategy 9: Natural Recovery	Primary
Response Strategy 10: Environmental Monitoring	Primary
Response Strategy 11: Oiled Wildlife Response	Primary*
Response Strategy 12: Forward Command Post	Secondary
Response Strategy 13: Waste Management	Secondary

* Potentially activated depending on reports and observations of Response Strategy 2: Monitor and Evaluate.

Each option has advantages and disadvantages with regard to effectiveness, operational constraints and environmental impacts. Consequently, spill response strategies need to be assessed for each case, taking into account the nature of the spill, oil spill trajectory modelling, the weather conditions, and the advantages and disadvantages of each response strategy.

Table 3-2: Summary of Response Plans

Response Strategy	Documentation	Purpose	Doc Number	Location
RS1: Source Control – Vessel Control	Shipboard OPEP	Provide guidance to the Vessel Master with respect to the steps to be taken when a pollution incident has occurred or is likely to occur when the vessel is under the command of the Vessel Master. For contracted vessel – applicable to all vessel activities when operating.	Specific for project vessels	Vessel bridge
RS2: Monitor and Evaluate	Oil Spill Response Strategy- RS2 - Monitor & Evaluate Response Strategy	Describe the operational monitoring activities used to gain and maintain near real-time situational awareness and to inform the ongoing need for response, efficacy of response and ongoing environmental effects assessment. RS2 Monitor & Evaluate Response Strategy provides a quick reference guide for use of: • aerial observation – aircraft (rotary and/or fixed wing) and potentially unmanned aerial vehicles • oil spill trajectory modelling • satellite imagery through service providers • oil spill tracking buoys	AOHSE-ER-0053	AU/HSE Network APU Operations Management System IMT Room EMQnet
	APU Operational Response Guideline 3 – Oil Spill Trajectory Modelling. Initiation, Data Collection and Progression	Describe capability that is maintained to conduct trajectory modelling. Outline the process for trajectory modelling to inform response planning and situation awareness; (validating oil spill releases to the marine environment).	AOHSE-ER-0044	AU/HSE Network APU OMS IMT Room EMQnet
	APU Operational Response Guideline 4: Oil Spill Tracking Buoy – Deployment/Tracking	Describe capability that is maintained to prepare, deploy and track oil spill tracking buoys. Outlines the steps to perform spill monitoring to: • determine the size, quantity and location of the spill • determine the movement of the oil; and to forecast which marine and coastal resources or areas are under threat.	AOHSE-ER-0033	AU/HSE Network APU OMS IMT Room EMQnet
	APU Operational Response Guideline 1 – Aerial Surveillance, Confirmation, Quantification and Monitoring of Oil Spills	Describe capability to conduct aerial surveillance and quantification of spills to prepare, conduct, record, and report on aerial surveillance to inform response planning.	AOHSE-ER-0041	AU/HSE Network APU OMS IMT Room EMQnet

Response Strategy	Documentation	Purpose	Doc Number	Location
RS5: Shoreline Protection	Jurabi to Lighthouse Beaches Oil Spill Tactical Response Plan (Reference – Sensitivity Mapping Report NWC-01-H to NWC-01-N)	The Tactical Response Plans identify the tactical objectives of a response and the resources required to meet those objectives, including personnel and equipment. This pre-identification of the response requirements enables a quicker mobilisation in the event the identified resources are threatened by an incident. Describe the arrangements in place for shoreline protection and clean-up for key sensitivities at risk. Provide a template for other locations. Provide the number of personnel and equipment and actions to be followed for pre-impact and post-impact shoreline cleaning.	AOHSE-ER-0064	EMQnet APU OMS AU/HSE Network IMT Room
	Muiron Islands Oil Spill Tactical Response Plan (Reference – Sensitivity Mapping Report – No reference)		AOHSE-ER-0066	
	Turquoise Bay Oil Spill Tactical Response Plan (Reference – Sensitivity Mapping Report NWC-02-AF and NWC-02-AG)		AOHSE-ER-0067	
	Yardie Creek Oil Spill Tactical Response Plan (Reference – Sensitivity Mapping Report NWC-03-AC)		AOHSE-ER-0068	
	Mangrove Bay Oil Spill Tactical Response Plan (Reference – Sensitivity Mapping Report NWC-02-E & K)		AOHSE-ER-0065	
RS8: Shoreline Clean-Up	Oil Spill Response Strategy – RS8 Shoreline Clean-Up	Describe requirements for Shoreline Group Supervisor, Incident Commander and IMT Planning Section to establish and maintain a waste management capability. Define practices to be performed to ensure BHP can establish and maintain a waste management capability to prevent environmental impacts to sensitive environmental receptors.	AOHSE-ER-0058	
RS10: Environmental Monitoring	Oil Spill Response Strategy – RS10: Environmental Monitoring	Describe capability that is maintained to monitor spill impacts to extreme and highly sensitive environmental receptors throughout emergency response activities. Define practices to be performed to ensure BHP can monitor effects of an oil spill on the marine environment and inform the effectiveness of response strategies associated with any oil spill event.	AOHSE-ER-0060	AU/HSE Network IMT Room EMQnet

Response Strategy	Documentation	Purpose	Doc Number	Location
		Monitor oil hydrocarbons in marine waters, sediments, and effects on benthic infauna.	AOHSE-ER-0037	
		Monitor effects of an oil spill on birds.	AOHSE-ER-0038	
		Monitor effects of an oil spill on marine mammals and megafauna.	AOHSE-ER-0039	
		Monitor effects of an oil spill on benthic habitats and benthic primary producers (including mangroves).	AOHSE-ER-0040	
		Monitor effects of an oil spill on marine reptiles.	AOHSE-ER-0043	
		Monitor effects of an oil spill on commercial and recreational fish species.	AOHSE-ER-0048	
		Monitor effects of an oil spill on fishes.	AOHSE-ER-0051	
RS12: Forward Command Post	APU Response Strategy 12 – Forward Command Post	Define practices to be performed to ensure BHP can establish and maintain a Forward Command Post to prevent environmental impacts to sensitive environmental receptors.	AOHSE-ER-0062	AU/HSE Network APU OMS IMT Room EMQnet
	ICS204 Forward Command Post	Draft procedure to provide a local command post to enable effective coordination of on-ground resources and in-field activities with response organisations and other stakeholders with the Perth IMT.	N/A – assigned in event of a spill and used by IMT	
RS13: Waste Management	APU Response Strategy 13 – Waste Management	Provide guidance to ensure there is a systematic and documented approach to managing waste generated during an oil spill. This plan contains details of the practices and principles to effectively manage oiled waste and minimise the environmental impact of an incident.	AOHSE-ER-0063	AU/HSE Network APU OMS IMT Room EMQnet
	APU Waste Management Plan – Oil Spill		AOHSE-E-0014-001	As above

4 Net Environmental Benefit Analysis and Decision-Making Criteria for Response Strategy Selection

For oil spill response, the Incident Action Plan (IAP) response strategies are identified through a process that involves reviewing key decision-making criteria, the outcomes of which are used as inputs to the Operational NEBA, as outlined in Figure 4-1. This ensures the most effective response strategies with the least detrimental impacts can be selected and implemented.

The IMT must first gain situational awareness by obtaining answers to the following key questions, which are fundamental to any oil spill response:

- What type of oil has been released?
- What is the expected behaviour of the oil that has been released?
- What volume has been released?
- Is the source under control?
- Where is the oil going?
- What environmental receptors and sensitivities are in the path of the predicted oil trajectory?
- Can the oil be approached or are there safety concerns?
- Can the oil be contained?
- Can the oil be dispersed?
- Will shoreline impact occur, and clean-up be required?

To answer these questions, the Incident Commander must review key information such as engineering advice about the volume and characteristics of the oil released, oil spill trajectory modelling, oil spill tracker buoys, the weather forecast, Automatic Identification System (AIS) vessel feed, aircraft data feeds, operational reports from field teams and operational and environmental monitoring teams to determine presence and/or extent of environmental receptors, advice from the State Government Environmental Scientific Coordinator, any other external advice, the window of ecological sensitivity (Section 4.5 of EP), oil spill reference documents (as detailed in each response strategy within the EP) and any other Daily Field Reports.

The outcome of this data review step is then used to update the Operational NEBA, which assesses the impacts and risks of response strategy options on environmental sensitivities. The spill response risk assessment applies predefined assessment classifications (3P to 3N), as shown in Table 4-1, to assess the potential ‘impact, for the receptor sensitivities for each response option. To aid interpretation where both positive and negative impacts have been indicated for a spill response in Table 4-2, cross-referencing potential impacts with the receptor’s protection priority can be used to weight benefits and risks to receptors. Those with higher protection priorities can be weighted as of greater importance than risks to lower priorities for determining net environmental benefit.

Where a response has ‘zero’ scores for all receptors and sensitivities, this may still be assessed as being of net environmental benefit (or carried forward to ALARP assessment) based on potential for indirect (rather than direct) reduction in risk. For example, Response Strategy 2: Monitor and Evaluate has no direct impact on the spill due to implementation of this strategy, but the situational awareness gained from the response allows proactive and effective application of other response strategies, thereby contributing to reducing risk to ALARP.

The NEBA Matrix (Table 4-2) prioritises environmental sensitivities and assesses the individual net effect each response option may have on it, allowing informed decisions to be made. If there are conflicting outcomes for a particular response option, the sensitivity with the higher priority becomes the preferred response option. A NEBA is a decision-making process and will ultimately result in a trade-off of priorities and response strategies. It is possible for a response strategy to be used for one sensitivity, even if it has been identified that this response option may not benefit one or several other sensitivities. The final outcome of the response, however, should result in an overall net environment benefit. Spill response options identified by BHP are outlined in Section 3. An evaluation of the impacts and risks of the spill response options is provided in Section 7 of the EP.

The IMT will apply the Operational NEBA process to identify the response options that are preferred for the situation, oil type and behaviour, environmental conditions, direction of plume and protection priority of sensitive receptors.

The steps in the Operational NEBA aim to identify:

- key ecological values, environmental, socio-economic and cultural heritage receptors (Table 2-2 herein and Section 4 of the EP) within the plume path and predicted EMBA, based on operational monitoring arrangements in Response Strategy 2 (Monitor and Evaluate)
- protection priorities of either High, Medium or Low in line with the rankings in *Provisions of Western Australian Marine Oil Pollution Risk Assessment – Protection Priorities: Assessment for Zone 2: Pilbara* (DoT, 2017)
- receptors within the window of ecological sensitivity (Table 2-2) for the period of the oil spill
- response strategies to be included in the IAP work instruction
- new situational awareness information that becomes available from the range of operational monitoring arrangements in Response Strategy 2 (Monitor and Evaluate) such as updated spill trajectory models, observations of oil on the water and shorelines, locations of sensitive receptors, effectiveness of implemented response strategies, Daily Field Reports, any updated advice from the Environmental Scientific Coordinator (nominated officer from the Department of Biodiversity Conservation and Attractions) and other external sources (such as consideration of recommendations from the WA Hazard Management Agency) for inclusion in daily updates of the Operational NEBA to optimise the IAP. Some sensitive receptors are mobile (such as fish, mammals, birds) and may move in and out of the predicted oil path on numerous occasions throughout the response, requiring frequent review of the NEBA table and selection of response techniques documented in IAPs by the IMT.

The Planning Section Chief will supervise the development of the IAP with the IMT. The Incident Commander authorises the IAP before releasing it to the Operations Section.

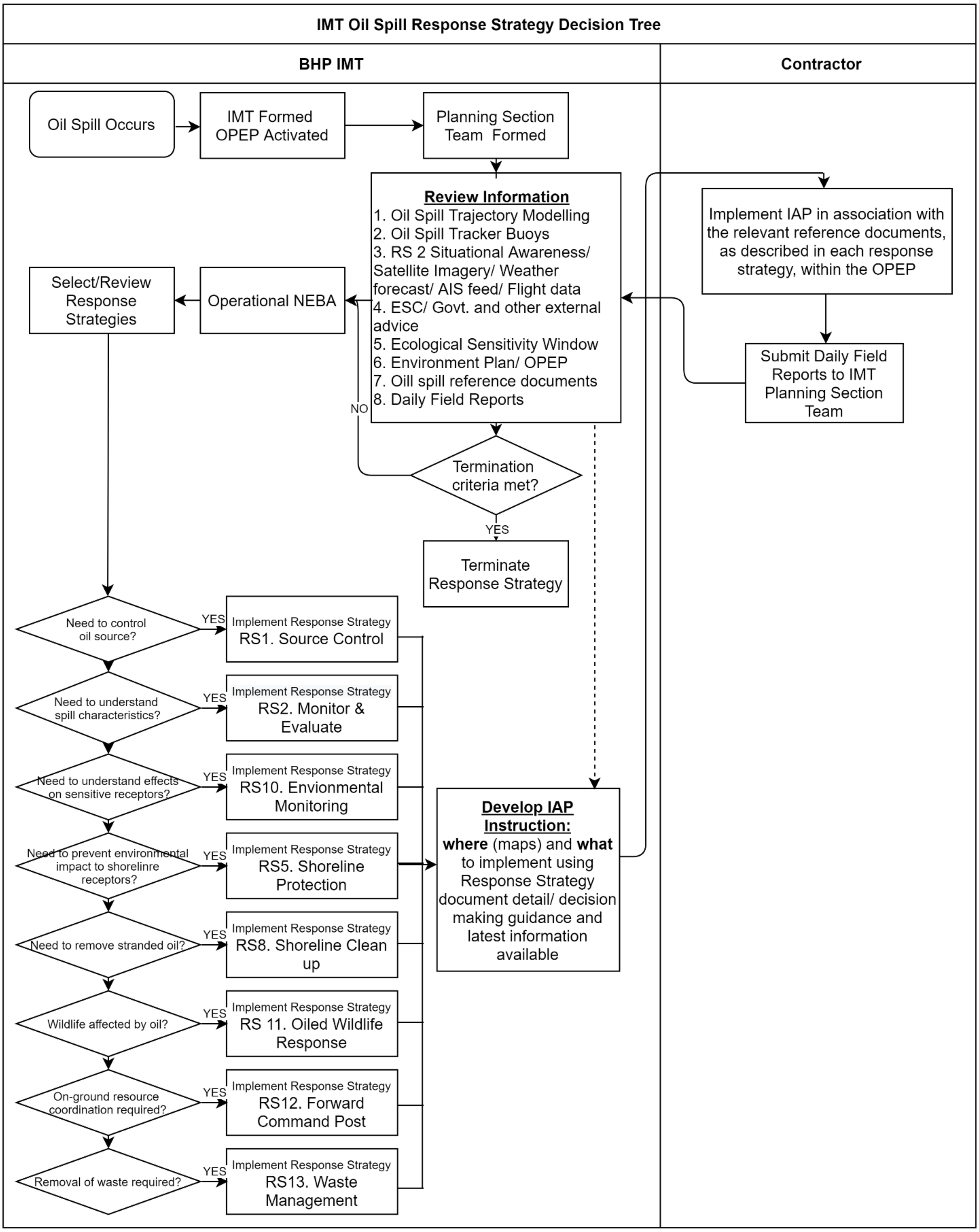


Figure 4-1: Incident Management Team Oil Spill Response Strategy Decision Tree

Table 4-1: Net Environmental Benefit Analysis Impact Categories Identifying Potential Change in Impact Due to Response Strategies, Relative to the Impact of the Spill

NEBA Categories			Degree of Impact	Potential Duration of Impact	Equivalent BHP Severity Risk Matrix Consequence Level
Positive	3P	Major	Likely to prevent: • behavioural impact to biological receptors • behavioural impact to socio-economic receptors, such as changes daily business operations, public opinion/behaviours (for example, avoidance of amenities such as beaches), or regulatory designations.	Decrease in duration of impact by more than five years	N/A.
	2P	Moderate	Likely to prevent: • significant impact single phase of reproductive cycle for biological receptors, or • detectable financial impact, either directly (such as loss of income) or indirect (such as via public perception), for socio-economic receptors. This level of negative impact is recoverable and unlikely to result in closure of business/industry in the region.	Decrease in duration of impact by one to five years	N/A.
	1P	Minor	Likely to prevent impact to: • significant proportion of population or breeding stages, for biological receptors, or • significant impact to the sensitivity of protective designation for socio-economic receptors; or significant long-term impact to business/industry.	Decrease in duration of impact by several seasons (less than one year)	N/A.
	0	Non-mitigated spill impact	No detectable difference to unmitigated spill difference		
Negative	1N	Minor	Likely to result in: • behavioural impact for biological receptors • behavioural impact for socio-economic receptors, such as changes to daily business operations, public opinion/behaviours (such as avoidance of amenities such as beaches), or regulatory designations. [Note 1]	Decrease in duration of impact by several seasons (less than one year)	Measurable but limited impacts to the environment, where recovery of ecosystems function takes less than one year. BHP Petroleum Risk Matrix Severity Level 2, Non-Material Risk.
	2N	Moderate	Likely to result in: • significant impact single phase of reproductive cycle for biological receptors, or • detectable financial impact, either directly (such as loss of income) or indirect (such as via public perception), for socio-economic receptors. This level of negative impact is recoverable and unlikely to result in closure of business/industry in the region.	Increase in duration of impact (one year to less than three years)	Substantial impacts to the environment, where recovery of ecosystem function takes between one to three years. BHP Petroleum Risk Matrix Severity Level 3, Non-Material Risk.
	3N	Major	Likely to result in impact to: • significant proportion of population or breeding stages, for biological receptors, or • significant impact to the sensitivity of protective designation for socio-economic receptors, or • significant long-term impact to business/industry for socio-economic receptors.	Increase in duration of impact (three years to more than ten years or unrecoverable)	Serious or severe impacts to the environment and where recovery of ecosystem function takes three years or more. BHP Petroleum Risk Matrix Severity Level ≥4, Material Risk.

Note 1: Behavioural impacts tend to be short-term and limited in their impact (even on a regional scale). The maximum likely should be considered if a response strategy directly impacts behaviour that results in an impact to reproduction and/or the breeding population, such as failure of fish spawning aggregations, then score should be a 2 or 3 rather than 1.

Table 4-2: Operational Net Environmental Benefit Analysis – Response Strategy Selection

Sensitivity	Protection Priority*	Seasonal presence on NWS												Response Strategy							
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	RS1 Source Control	RS2 Monitor and Evaluate	RS5 Shoreline Protection	RS8 Shoreline Clean-Up	RS9 Natural Recovery	RS10 Environmental Monitoring	RS11 Oiled Wildlife Response	RS 13 Waste Management
Ecological																					
Whales	High (T, M)	N	N	N	N	N	N	Y	Y	Y	Y	N	N	2P	0	0	0	0	0	0	0
Dugongs	High (M)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	0	0	0	0	0	0
Dolphins	High (M)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	0	0	0	0	0	0
Whale sharks	High (T, M)	N	N	Y	Y	Y	Y	N	N	N	N	N	N	2P	0	0	0	0	0	0	0
Fishes (resident, demersal, pelagic)	High	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	0	0	0	0	0	0
Turtles (foraging, interesting, nesting)	High (T, M)	Y	Y	Y	N	N	N	N	N	Y	Y	Y	Y	2P	0	1P	1P	0	0	2P	0
Migratory birds	Extreme (T, M)	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	2P	0	1P	1P	0	0	2P	0
Seabirds	Medium	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	0	0	0	2P	0
Shorebirds	Medium	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	1P	0	0	2P	0
Ecosystem																					
Coral spawning	Medium	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	2P	0	0	0	0	0	0	0
Mangroves	Extreme	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	2N	0	0	0	0
Coral reef	Medium	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	0	0	0	0	0	0
Seagrasses	Medium	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	0	0	0	0	0	0
Sandy beaches	Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	1P	0	0	0	1P
Rocky shores	Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	0	0	0	0	0
Open waters	Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	0	0	0	0	0	0
Socio-economic																					
Tourism	Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	1P	0	0	0	1P
Fisheries	Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	0	0	0	0	0	0
Cultural Heritage	High	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	2P	0	1P	1P	0	0	0	1P
Response strategy provides net environmental benefit?														Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Response strategy feasible?														Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is response strategy recommended (and ALARP assessment required)?														Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

***Protection priority**: This ranking is based on a combination of factors, including the likelihood of impact (time of year) and severity of impact (type of exposure to the sensitivity, ranking of the sensitivity (DoT, 2017) and recovery time after exposure to hydrocarbons).

Shoreline response: Where shoreline clean-up has been given a negative score, this indicates use of equipment, machinery and personnel in that environment is likely to have negative effect, potentially causing more damage and prolonging the recovery and environmental benefit to that sensitivity.

5 Response

5.1 Incident Management Team Briefing Documents and Task Checklists

The purpose of the IMT is to gain control of an incident or event and bring it to a safe resolution while minimising the impact on personnel, the environment, assets and reputation. The key to controlling an incident is successful transition from an initial reactive mode to a proactive planning mode. This is achieved through a series of iterative stages that create and refine an IAP, as summarised in Figure 5-1.

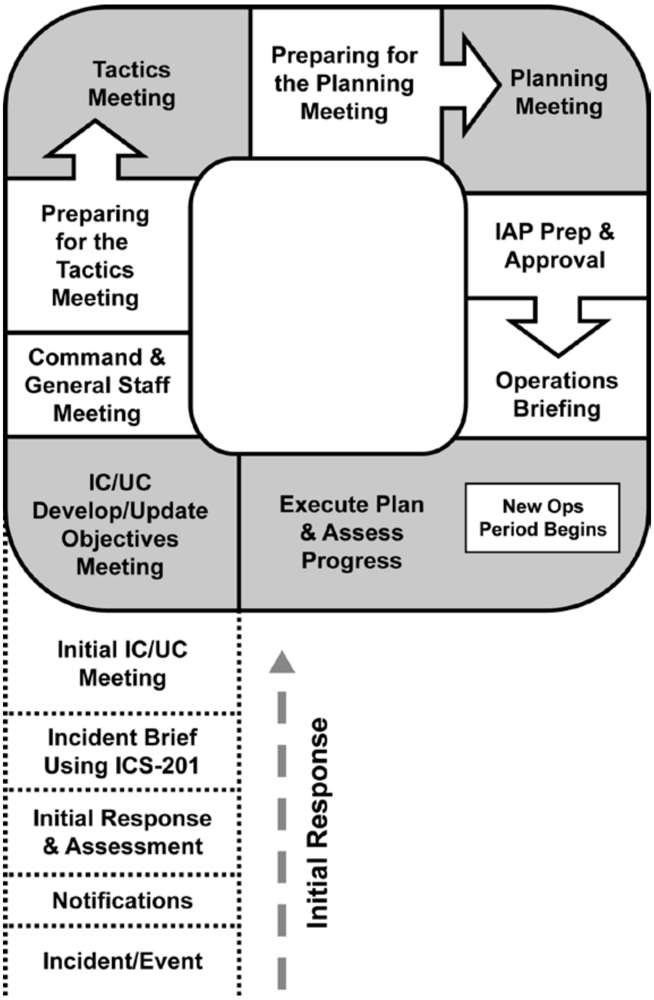


Figure 5-1: Planning Cycle Used by BHP Incident Management Team

The Griffin Field Decommissioning – First Strike Plan is listed in Appendix A of this document.

The First Strike Plan provides guidance to the BHP IMT in the first 24 hours of the spill to respond to a loss of hydrocarbons. Operational phases are listed in 2-, 8-, 16- and 24-hour periods after mobilising the IMT. In some cases, there may be no specific actions described for an activity period.

After 24 hours, the BHP IMT will further develop Incident Action Plans (Incident Command System Form based) and Operational NEBAs, which is described further in Section 3.2.

The First Strike Plan acts as the IAP for the initial response (in other words, within the first 24 hours of the incident) and is used and updated until Planning prepares the first IAP that is approved by the Incident Commander. This checklist also acts as a permanent record of the initial response to the incident.

The BHP APU Incident Management Plan (AOHSE-ER-0001) provides the IMT structure and guidance on systems, processes and procedures to establish the IMT during the first hours of the response. During the response, IMT members will use the BHP Petroleum Incident Management Handbook.

5.2 First Strike Plan Summary

The time-steps provided in the First Strike Plan for each response strategy that follow are consistent with achieving the environmental performance outcomes and the performance standards listed in Section 10 of the EP.

Table 5-1: Incident Management Team Actions in First 24 Hours of a Spill

Response Strategy	Response Activity	Level 2
		1,000 m³ spill
Notification & Establish Response Organisation	Incident Management Team	Activate*
	Emergency Management Team	Notify*
	Regulatory Agency	Notify*
	Technical Support	Notify*
Determine Potential Impacts	Monitor and Evaluate – Oil Spill Trajectory Modelling	Activate
	Monitor and Evaluate – Aerial Surveillance	Activate
	Monitor and Evaluate – Vessel Surveillance	Activate
	Monitor and Evaluate – Satellite Imagery	Optional
	Operational Net Environmental Benefit Analysis	Undertake
Offshore Response	Dispersant Application	×
	Marine Recovery	×
	Mechanical Dispersion	×
	Natural Recovery	Applicable
Shoreline Response	Forward Command Post (Exmouth)	Activate
	Shoreline Protection	Standby
	Shoreline Clean-Up	Standby
	Environmental Monitoring Procedures	Activate
	Oiled Wildlife Response	Standby
	Waste Management Plan	Standby

* Process described in detail in the BHP Incident Management Plan

A working copy of the First Strike Plan in Spreadsheet format allows the IMT and Functional groups to execute the plan within the IMT. The First Strike Plan covers the first 24-72 hours of activity during the initial response phase.

A copy of the editable spreadsheet is available in the APU IMT Fast Facts section of EMQnet.

6 Response Equipment

6.1 Equipment

Oil spill response equipment from AMOSC, OSRL, Australian Maritime Safety Authority (AMSA) National Plan and WA DoT can be called upon if required. The National Plan equipment, stored in regional stockpiles around Australia, is sufficient to deal with spills of up to 20,000 tonnes. The major WA stockpile is in Fremantle, with a smaller stockpile located at Dampier and a regional stockpile in Exmouth.

6.1.1 Oil Spill Response Atlas Spill Response Equipment

Oil spill response equipment maintained by AMOSC (Exmouth, Fremantle and Geelong) and OSRL is available to BHP during a spill response as part of contractual arrangements in place with these agencies. A complete list of equipment maintained by BHP's OSRA, including stockpiles in Exmouth and Dampier from the MOSES database (DoT; equipment owners include AMSA, DoT and other titleholders) is provided in Appendix C.

6.1.2 Vessel Support

The marine response strategies outlined in this plan can be performed independently or concurrently. In a Level 2 spill response, marine strategies are expected to be performed concurrently. Table 6-1 outlines the multiple expected vessel requirements for the response strategies. During a response, the IMT may determine additional vessels are either required or are available to be used and therefore can supplement the expected arrangements. BHP can, through supplier contracts or through vessels of opportunity available on local charter market in Exmouth or Onslow, scale up (or down) the response to meet the needs of the response. Table 6-1 provides an indication of expected vessel usage across the spill response strategies.

Table 6-1: Response strategy vessel requirements

Response Strategy	Vessel Type	Number	Location	How accessed	Comment	Earliest need
Shoreline protection	Small recreational craft	2	Local/ regional	Vessel of opportunity	DoT has boats in Exmouth	As identified
Oiled wildlife	Small recreational craft	2	Local/ regional	Vessel of opportunity	Exmouth/Onslow/Dampier based	As identified
	Small utility vessels	2	Local/ regional	Vessel of opportunity	Cray boats suitable	As identified
Operational & scientific monitoring	Small utility vessels	1 to 2	Local/ regional	Vessel of opportunity	One initially, ramping to two as spill develops for water quality	Day 2
	Commercial fishing vessel	2	Local/ regional	Charter	Benthic habitats trap/line/ trawl fishing vessels Fish monitoring	As identified
	Small recreational craft	3	Local/ regional	Vessel of opportunity	Marine mammals	As identified
Shoreline clean-up	Landing craft	2	Local/ regional	Vessel of opportunity	For island clean-up operations	As identified
	Crew transfer vessel	2	Local/ regional	Vessel of opportunity	Crew transfer to vessels or offshore islands	As identified
Waste recovery	Platform supply vessel	2	Regional	Vessel of opportunity	Waste transfer from vessels/marine recovery	As identified
Support	Barge	1 to 2	Regional	Vessel of opportunity	To support remote island shoreline protection and clean-up	As identified
	Tug	1	Regional	Vessel of opportunity	Support/towing of barges	As identified

BHP oversees monthly availability of larger vessels that would be required to perform a response through subscribing to live vessel feeds on the MarineBase capability. While vessel availability and locations depend on levels of activity, BHP has sufficient confidence in the ability to source these vessels in the timeframes expected for the oil spill response and outlined in the EP, based on current tracking of vessel utilisation and locations.

Port facilities at Exmouth and/or Onslow will be used throughout the response. BHP has access to a supply base in Dampier, which is immediately available to support response operations. A logistics plan will be developed by the IMT with a “look ahead” to replace or supplement vessels during the response operations to maintain the operational capability.

There may be circumstances where additional support vessels may be required to assist with spill response; requests for offshore vessel support can be made by AMSA.

7 References

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Department of Transport (DoT). (2020). Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements. Accessed 12 October 2021 at https://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_Westplan_MOP_OffshorePetroleumIndGuidance.pdf

Government of Western Australia. (2021). State Hazard Plan – Marine Environmental Emergencies. Department of Transport, Perth, Western Australia. Accessed 12 October 2021- https://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_StateHazardPlanMaritimeEnviroEmergMEE.pdf

NOPSEMA (2021). Oil Pollution Risk Management Guidance Note, Document No. N-04750-GN1488 A382148.

RPS (2021). BHP Griffin Facilities Decommissioning Oil Spill Modelling report, MAQ1059J Rev 0

Appendix A

First Strike Plan

Griffin Field Decommissioning - Oil Spill Emergency Plan - First Strike Plan

Version - 30/11/2021

Response	Subtitle	MDO Spill	External Stakeholder	Action	Timing	Responsible	Sub team/Role	Reference Documentation
Notifications	Internal	Yes	BHP Duty Incident Commander	Notify Duty Incident Controller of release.	Immediately	Vessel Master	N/A	Vessel SOPEP / Griffin OPEP
Notifications	External	Yes	AMSA – Rescue Coordination Centre (RCC)	If Spill from Vessel (Marine Diesel Oil), verbally notify AMSA RCC of the hydrocarbon spill. Follow-up with a written Marine Pollution Report (POLREP) as soon as practicable after verbal notification. RCC 1800 641 792	As soon as practicable	Incident Commander (or delegate)	N/A	Vessel SOPEP / Griffin OPEP
Notifications	External	Yes	NOPSEMA	Notify NOPSEMA verbally. Record notification using Initial Verbal Notification Form or equivalent and send to NOPSEMA as soon as practicable (cc to NOPTA and DMIRS). (08) 6461 7090	Within 2 hours	BHP Incident Commander (or delegate)	N/A	NOPSEMA online notification form API IMT Emergency Contact Directory
Notifications	External	Yes	NOPSEMA, NOPTA, DMIRS	Provide a written NOPSEMA Incident Report Form as soon as practicable (no later than 3 days after notification) (cc to NOPTA and DMIRS). NOPSEMA: submissions@nopsema.gov.au NOPTA: resources@nopta.gov.au DMIRS: petreps@dmirs.wa.gov.au	Within 3 days	Incident Commander (or delegate)	N/A	NOPSEMA online notification form API IMT Emergency Contact Directory
Notifications	External	Yes	Parks Australia (24-hour Marine Compliance Duty Officer)	Notify Director of National Parks in the event of oil pollution within a marine park, or where an oil spill response action must be taken within a marine park, so far as reasonably practicable, before response action being taken. Information should be provided about: - titleholder's details - time and location of the incident (including name of marine park likely to be affected) - proposed response arrangements as per the OPEP - confirmation of providing access to relevant monitoring and evaluation reports when available - details of the relevant contact person in the IMT.	As soon as practicable	Incident Commander (or delegate)	N/A	API IMT Emergency Contact Directory
Notifications	External	Yes	Australian Maritime Oil Spill Centre (AMOSC) *	Notify AMOSC Duty Manager that a spill has occurred and follow-up with an email from the Incident Commander, to formally activate AMOSC. Determine what resources are required, consistent with the AMOS Plan, and detail in a Service Contract. Note, it will be sent to BHP from AMOSC upon activation. The Contract Note must be signed by an authorised member of staff and returned to AMOSC. 03 5272 1555 or 0438 379 328 Email: amosc@amosc.com.au	As soon as practicable	Incident Commander (or delegate)	N/A	AMOS PLAN
Notifications	External	N/A	Oil Spill Response Limited (OSRL) *	Contact OSRL Duty Manager and request assistance from technical advisor in Perth. Follow up phone call with the OSRL Notification Form and signed Mobilisation Authorisation Form, which are to be sent to OSRL once signed by an authorised member of staff. Singapore Office +65 6266 1566 Perth Office 08 6557 8551 Email: dutymanagers@oilspillresponse.com	As soon as practicable	Incident Commander (or delegate)	N/A	OSRL Agreement Form Incident Commander / IMT Leader / EMT Leader / Power of Attorney (POA) Execution Authority / Senior Drilling and Completions Manager

Notifications	External	N/A	WA Department of Transport (DoT)	Marine Duty Manager to verbally notify DoT Maritime Environmental Emergency Response (MEER) Unit as soon as reasonably practicable (within 2 hours of becoming aware of the incident) if an actual or impending Marine Oil Pollution (MOP) incident occurs within or may impact WA State waters. Emergency Management Regulations 2006 (WA) define MOP as an actual or impending spillage, release or escape of oil or an oily mixture that is capable of causing loss of life, injury to a person or damage to the health of a person, property or the environment. Request DoT to provide Liaison to BHP IMT. Follow up with a written POLREP as soon as practicable after verbal notification. POLREP Form - https://www.transport.wa.gov.au/mediaFiles/marine/MAC-F-PollutionReport.pdf Phone: (08) 9480 9924 Email: marine.pollution@transport.wa.gov.au	As soon as practicable	Incident Commander (or delegate)	N/A	API IMT Emergency Contact Directory
Notifications	External	N/A	WA Department of Biodiversity, Conservation and Attractions (DBCA)	Notify Duty Officer if there is potential for oiled wildlife or the spill is expected to contact land or waters managed by WA DBCA (08) 9219 9108 Notification also to Pilbara Regional Office - (08) 9182 2000	As soon as practicable	Incident Commander (or delegate)	N/A	API IMT Emergency Contact Directory
IMT Activation	IMT	Yes	Houston ECC	Initiate IMT Callout - consider additional resources to support Event Emergency Response and Oil Spill Response requirements.	First 30 minutes	Incident Commander	N/A	Incident Management Manual Incident Management Handbook
IMT Activation	Forward Operating Base	N/A	-	Identify Forward Operating Base Manager.	Within 2 hours	Operations Section Chief/Logistics Section Chief	N/A	AOHSE-ER-0062 RS12 Forward Operating Base
IMT Activation	Forward Operating Base	N/A	Dept. Defence Harold E Holt	Inform Harold E Holt of intention to setup Forward Operating Base (FOB) at designated building. Logistics Section to determine what BHP resources can be mobilised to Learmonth.	Within 2 hours	Logistics Section	N/A	API IMT Emergency Contact Directory – Department of Defence Harold E Holt
IMT Activation	Forward Operating Base	N/A	-	Deploy Forward Operating Base Manager with Grab bag.	Within 4 hours	Logistics Section	N/A	AOHSE-ER-0062 RS12 Forward Operating Base
IMT Activation	Forward Operating Base	N/A	Dept. Defence Harold E Holt	Fully Activate FOB Response Strategy.	FOB to be in place and set up within 24 hours	Logistics Section	N/A	AOHSE-ER-0062 RS12 Forward Operating Base
IMT Activation	Forward Operating Base	N/A	Dept. Defence Harold E Holt	Identify and establish staging areas for Shoreline, Marine and Aviation Branches.	Staging Areas to be identified by 24 hours	Operations Section	N/A	AOHSE-ER-0062 RS12 Forward Operating Base
IMT Activation	Forward Operating Base	N/A	Dept. Defence Harold E Holt	Identify and establish staging areas for Shoreline Response Teams.	Staging Areas to be identified by 24 hours	Operations Section	N/A	AOHSE-ER-0062 RS12 Forward Operating Base
Monitor and Evaluate	Aerial Surveillance	Yes	CHC Helicopters, AMOSC	Notify CHC Helicopters and provide spill location; options also include mobilising from Karratha or Barrow Island.	Within 2 hours	Operations Section	Deputy Operations Section Chief (Aviation)	AOHSE-ER-0053-Oil Spill Response Strategy - RS2 Monitor & Evaluate
Monitor and Evaluate	Aerial Surveillance	Yes	AMOSC	Inform Learmonth (Exmouth shire and RAAF) of additional aircraft movements.	Within 2 hours	Operations Section	Deputy Operations Section Chief (Aviation)	API IMT Emergency Contact Directory
Monitor and Evaluate	Aerial Surveillance	Yes	CHC Helicopters	Complete observation flights and return data to IMT Planning Team.	Within 8 hours	Operations Section	Deputy Operations Section Chief (Aviation)	-
Monitor and Evaluate	Aerial Surveillance	Yes	Helo Provider/AMOSC	Develop and confirm schedule of observation flights for next 24 hours.	Within 16 hours	Operations Section	Deputy Operations Section Chief (Aviation) AMOSC	AOHSE-ER-0041 APU Operational Response Guideline 1 - Aerial Surveillance. Confirmation, Quantification and Monitoring of Oil Spills
Monitor and Evaluate	Aerial Surveillance	Yes	CHC/ Helo Provider	Establish long-term aerial observation plans with additional aircraft and trained observers from BHP, AMOSC or OSRL.	Within 24 hours	Operations Section	Deputy Operations Section Chief (Aviation) AMOSC	AOHSE-ER-0041 APU Operational Response Guideline 1 - Aerial Surveillance. Confirmation, Quantification and Monitoring of Oil Spills
Monitor and Evaluate	Aerial Surveillance	Yes		Fully activate Response Strategy 2 - Monitor and Evaluate - Aerial Surveillance.	Within 24 hours	Planning Section	N/A	AOHSE-ER-0053-Oil Spill Response Strategy - RS2 Monitor & Evaluate
Monitor and Evaluate	Vessel Surveillance	Yes	Vessels of opportunity	Source vessels of opportunity	Within 2 hours	Operations Section	Deputy Operations Section Chief (Marine)	
Monitor and Evaluate	Vessel Surveillance	Yes	Vessels of opportunity	Mobilse vessels of opportunity	Within 12 hours	Operations Section	Deputy Operations Section Chief (Marine)	

Monitor and Evaluate	Vessel Surveillance	Yes	Vessels of opportunity	Advise surveillance vessel of spill location and any safety precautions necessary.	Within 12 hours	Operations Section	Deputy Operations Section Chief (Marine)	-
Monitor and Evaluate	Vessel Surveillance	Yes	Vessels of opportunity	Complete vessel surveillance and provide information to IMT Planning Team.	Within 24 hours	Operations Section	Deputy Operations Section Chief (Marine)	-
Monitor and Evaluate	Vessel Surveillance	Yes	-	Fully activate Response Strategy 2 - Monitor and Evaluate - Vessel Surveillance.	Within 24 hours	Planning Section	Deputy Operations Section Chief (Marine)	AOHSE-ER-0053-Oil Spill Response Strategy - RS2 Monitor & Evaluate
Monitor and Evaluate	Tracking buoy	Yes	AMOSC	Request oil spill tracking buoy from AMOSC	As soon as practicable	Planning Section	Deputy Operations Section Chief (Marine)	
Monitor and Evaluate	Tracking buoy	Yes	Vessels of opportunity	Deploy oil spill tracking buoy.	Within 12-18 hours	Planning Section	Deputy Operations Section Chief (Marine)	AOHSE-ER-0033 Operational Response Guideline 4: Oil Spill Tracking - Buoy Deployment /Tracking
Monitor and Evaluate	Oil Spill Trajectory Modelling	Yes	-	Collect all data on the location, type, volume and other necessary data for oil spill tracking modelling.	As soon as practicable	Planning Section	GIS Specialist	AOHSE-ER-0033 Operational Response Guideline 4: Oil Spill Tracking - Buoy Deployment /Tracking
Monitor and Evaluate	Oil Spill Trajectory Modelling	Yes	RPS	Contact AMOSC, activate Oil Spill Trajectory Modelling standby contract. Communicate all necessary data to enable modelling to commence.	As soon as practicable	Planning Section	Planning Section Chief	API IMT Emergency Contact Directory
Monitor and Evaluate	Oil Spill Trajectory Modelling	Yes	AMOSC /APASA	Receive oil spill trajectory modelling and update Common Operating Picture.	Within 4 hours	Planning Section	GIS Specialist	-
Monitor and Evaluate	Oil Spill Trajectory Modelling	Yes	AMOSC /APASA	Provide operational surveillance data (e.g. aerial surveillance, tracking buoy data) to modelling provider to verify and adjust spill modelling outputs.	Within 4 hours of receiving data	Planning Section	GIS Specialist	-
Monitor and Evaluate	Oil Spill Trajectory Modelling	Yes	Neighbouring facilities/ externally affected company operations	Communicate modelling results with all relevant operators that may be affected/impacted. Liaise with appropriate organisational IMTs.	Within 4 hours	Planning Section	Planning Section Chief	API IMT Emergency Contact Directory
Monitor and Evaluate	Oil Spill Trajectory Modelling	Yes	-	Provide trajectory model results to operations section for aerial surveillance planning.	Within 8 hours	Planning Section	Deputy Operations Section Chief (Aviation) /AMOSC	-
Monitor and Evaluate	Oil Spill Trajectory Modelling	Yes	-	Confirm EMBA and determine areas for 'post-spill / pre-impact' monitoring.	Within 8 hours	Planning Section	Environmental Unit Leader	Griffin Decommissioning and Field Management Environment Plan (GV-HSE-E-0014)
Monitor and Evaluate	Oil Spill Trajectory Modelling	Yes	AMOSC	Determine need and, if required, frequency of additional tracker buoy deployments.	Within 24 hours	Planning Section	Planning Section Chief	API IMT Emergency Contact Directory
Monitor and Evaluate	Oil Spill Trajectory Modelling	Yes	-	Complete daily safety analysis for the next 24-hour period.	Within 24 hours	Command Section	Safety Officer	-
Monitor and Evaluate	Oil Spill Trajectory Modelling	Yes	-	Complete modelling requirements as per IAP.	Within 24 hours	Planning Section	Planning Section Chief	-
Monitor and Evaluate	Oil Spill Trajectory Modelling	Yes	-	Ensure complete activation of Response Strategy 2 - Monitor and Evaluate - Oil Spill Trajectory.	Within 24 hours	Planning Section	Planning Section Chief	AOHSE-ER-0053-Oil Spill Response Strategy - RS2 Monitor & Evaluate
Monitor and Evaluate	Satellite Imagery	N/A	AMOSC/KSAT	Activate satellite imagery acquisition via contract with OSRL.	Within 2 hours	Planning Section	Planning Section Chief	-
Monitor and Evaluate	Satellite Imagery	N/A	AMOSC/KSAT	Determine Area of Interest coordinates, image frequency and details of receiving imagery. Include in OSRL Notification.	Within 2 hours	Planning Section	GIS Specialist	-
Monitor and Evaluate	Satellite Imagery	N/A	AMOSC/KSAT	Receive satellite imagery and incorporate into Common Operating Picture.	Within 24 hours	Planning Section	GIS Specialist	-
Monitor and Evaluate	Satellite Imagery	N/A	-	Ensure complete activation of Response Strategy 2 - Monitor and Evaluate - Satellite Imagery.	Within 24 hours	Planning Section	Planning Section Chief	AOHSE-ER-0053-Oil Spill Response Strategy - RS2 Monitor & Evaluate
Monitor and Evaluate	Operational NEBA	Yes	-	Complete the daily operational NEBA.	Within 4 hours	Planning Section	Environmental Unit Leader	Griffin Decommissioning and Field Management Environment Plan (GV-HSE-E-0014)

Environmental Monitoring	Environmental Monitoring Plan	Yes	-	Activate Response Strategy 10 - Environmental Monitoring.	Within 2 hours	Planning Section	Environmental Unit Leader	AOHSE-ER-0060 RS10 Environmental Monitoring
Environmental Monitoring	Environmental Monitoring Plan	Yes	Vendors for provision of environmental monitoring services	Consider the premobilisation of Environmental Monitoring Contractors.	Within 2 hours	Planning Section	Environmental Unit Leader	APU IMT Contact Directory
Environmental Monitoring	Environmental Monitoring Plan	Yes	Vendors for provision of environmental monitoring services	Begin Operational NEBA and determine appropriate Environmental Response Strategies.	Within 4 hours	Planning Section	Environmental Unit Leader	AOHSE-ER-0036 Sensitivity Mapping Exmouth AOHSE-ER-0037 Monitoring of oil in Marine Waters AOHSE-ER-0038 Monitoring Effects on Birds AOHSE-ER-0039 Monitoring Effects on Marine Mammals AOHSE-ER-0040 Monitoring Effects on Benthic Habitats AOHSE-ER-0043 Monitoring Effects on Marine Reptiles AOHSE-ER-0048 Monitoring Effects on Commercial and Recreational Fish Species AOHSE-ER-0051 Monitoring Effects on Fishes
Environmental Monitoring	Environmental Monitoring Plan	Yes	Vendors for provision of environmental monitoring services	Monitoring contractors to specify logistics requirements for sampling plan to Logistics Section. Confirm ETA of monitoring contractor to site with IMT Planning Section Chief.	Within 8 hours	Planning Section	Environmental Unit Leader	APU IMT Contact Directory
Environmental Monitoring	Environmental Monitoring Plan	Yes	Vendors for provision of environmental monitoring services	Develop logistics plan for accommodation and transport for Contract Environmental Monitoring organisations.	Within 8 hours	Logistics Section	Environmental Unit Leader	-
Environmental Monitoring	Environmental Monitoring Plan	Yes	Vendors for provision of environmental monitoring services	Planning Section to confirm sampling locations.	Within 16 hours	Planning Section	Environmental Unit Leader	-
Environmental Monitoring	Environmental Monitoring Plan	Yes	Vendors for provision of environmental monitoring services	Deploy initial Environmental Monitoring Team members to Exmouth.	Within 48-72 hours	Logistics Section	Environmental Unit Leader	AOHSE-ER-0060 RS10 Environmental Monitoring
Environmental Monitoring	Environmental Monitoring Plan	Yes	-	Complete Risk Assessment for Monitoring Teams included in IAP for next operating period.	Within 48-72 hours	Command Section	Safety Officer	-
Environmental Monitoring	Environmental Monitoring Plan	Yes	Vendors for provision of environmental monitoring services	Complete initial Sampling Plan, ready for inclusion within IAP for future Operating Period.	Within 48-72 hours	Planning Team	Environmental Unit Leader	AOHSE-ER-0060 RS10 Environmental Monitoring
Environmental Monitoring	Environmental Monitoring Plan	Yes	-	Complete Activation of Response Strategy 10 - Environmental Monitoring.	Within 48-72 hours	Planning Section	Environmental Unit Leader	AOHSE-ER-0060 RS10 Environmental Monitoring
Shoreline Protection	Mobilisation	Yes	-	Activate Response Strategy 5 - Shoreline Protection (secondary response - only if needed and practical).	Within 2 hours	Planning Section	Planning Section Chief	AOHSE-ER-0057 - RS5 Shoreline Protection
Shoreline Protection	Mobilisation	Yes	-	From initial oil spill monitoring data, identify likely impacted sensitive receptors.	Within 4 hours	Planning Section	Environmental Unit Leader	Griffin Decommissioning and Field Management Environment Plan (GV-HSE-E-0014) AOHSE-ER-0066 - Oil Spill Tactical Response Plan – Muiron Islands

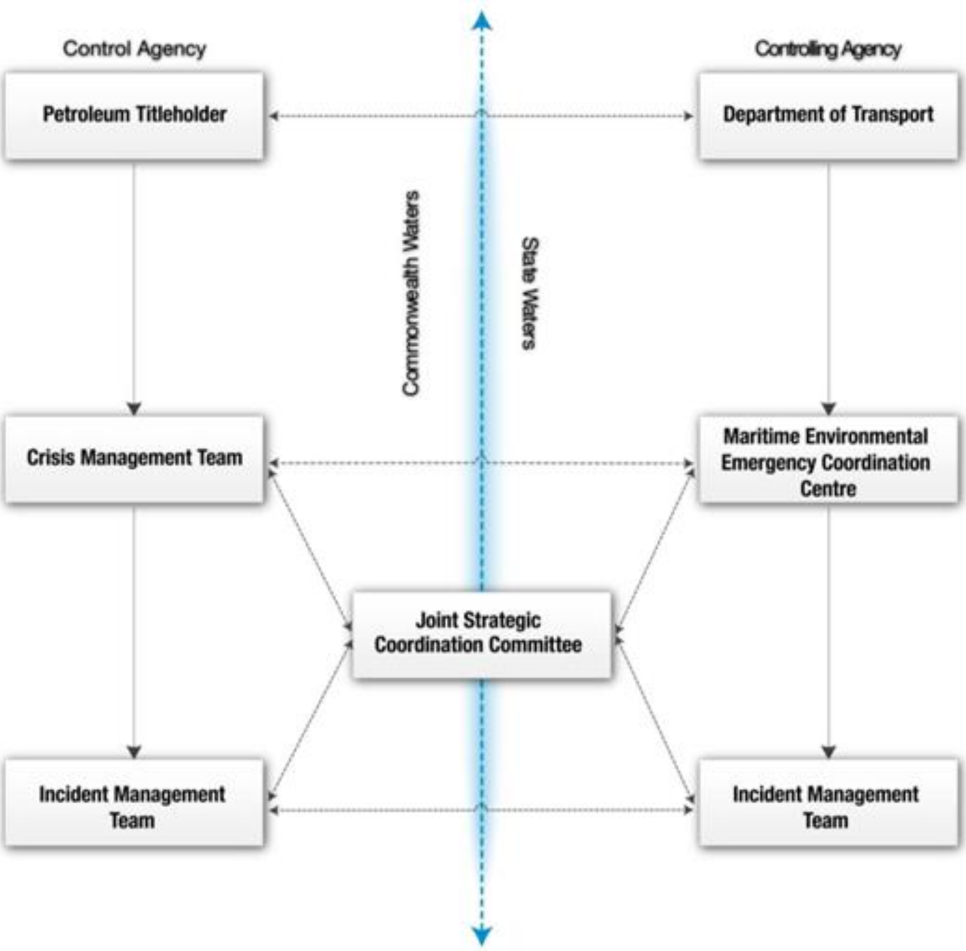
Shoreline Protection	Mobilisation	Yes	AMOSC	Determine what resources are required, consistent with the AMOS Plan, and detail in a Service Contract that will be sent to BHP from AMOSC. Arrange for AMOSC to mobilise the Exmouth stockpile.	Within 4 hours	Planning Section	Environmental Unit Leader	Northwest Cape Sensitivity Mapping (AOHSE-ER-0036) Tactical Response Plans
Shoreline Protection	Mobilisation	Yes	DoT	Advise DoT of potential shoreline contact and intention to deploy protective boom to identified sensitive resources based on OSTM.	Within 4 hours	Planning Section	Planning Section Chief	As per the WA DoT IGN, DoT will become the controlling agency in a State waters response, utilising BHP resources and plans to achieve the best outcome for the oil pollution response
Shoreline Protection	Mobilisation	Yes	-	Nominate a Shoreline Group Supervisor. Finalise the organisation chart and deployment plan for the Shoreline Group.	Within 8 hours	Operations Section	Shoreline Group Supervisor	-
Shoreline Protection	Mobilisation	Yes	-	Develop logistics plan for accommodation and transport for Contract Shoreline Protection organisations.	Within 8 hours	Logistics Section	Logistics Section Chief	APU IMT Contact Directory
Shoreline Protection	Mobilisation	Yes	AMOSC / Dept. Defence Harold E Hold Naval Base	AMOSC arrange for access to Harold E Holt base to mobilise boom equipment.	Within 24 hours	Logistics Section	Logistics Section Chief	APU IMT Contact Directory
Shoreline Protection	Mobilisation	Yes	-	Deploy initial Shoreline Group personnel for initial SCAT teams to Exmouth.	Within 24-48 hours	Operations Section	Shoreline Group Supervisor	-
Shoreline Protection	Mobilisation	Yes	-	Mobilise boom equipment from Harold E Holt base to selected location.	Within 72 hours	Logistics Section	Logistics Section Chief	-
Shoreline Protection	Mobilisation	Yes	-	Complete Risk Assessment for Shoreline Protection and SCAT teams included in IAP for next operating period.	Within 24-48 hours	Command Section	Safety Officer	-
Shoreline Protection	Mobilisation	Yes	-	Complete Assignment lists for SCAT teams and Shoreline Protection Teams and include in the IAP for the next operating period.	Within 24-48 hours	Operations Section	Shoreline Group Supervisor	-
Shoreline Protection	Mobilisation	Yes	-	Complete activation of appropriate Response Strategy 5 - Shoreline Protection.	Within 24-48 hours	Planning Section	Planning Section Chief	AOHSE-ER-0057 - RS5 Shoreline Protection
Shoreline Clean-up	Mobilisation	Yes	-	Activate Response Strategy 8 - Shoreline Clean-Up (secondary response - only if needed and practical).	Within 2 hours	Planning Section	Planning Section Chief	AOHSE-ER-0058 - RS8 Shoreline Clean-up
Shoreline Clean-up	Mobilisation	Yes	AMOSC/OSRL/DoT	Advise AMOSC/OSRL and DoT that SCAT Teams and trained shoreline responders are to be placed on standby for mobilisation to Exmouth.	Within 2 hours	Planning Section	Planning Section Chief	APU IMT Contact Directory
Shoreline Clean-up	Mobilisation	Yes	-	Use initial oil spill modelling and oil fate modelling to determine size of shoreline impacts and unskilled workforce required.	Within 4 hours	Planning Section	Environmental Unit Leader	-
Shoreline Clean-up	Mobilisation	Yes	DoT	SCAT Team Coordinator to work with Shire/DoT to access predicted impacted shorelines.	Within 12 hours	Planning Section	Planning Section Chief	APU IMT Contact Directory
Shoreline Clean-up	Mobilisation	Yes	-	SCAT Team Coordinator to update IMT with predicted scale and scope of oiling and any pre-emptive shoreline clean-up.	Within 24 hours	Planning Section	Planning Section Chief	-
Shoreline Clean-up	Mobilisation	Yes	DPLH	All necessary regulatory approvals in place before implementing waste management activities; and consult with (and authority where necessary) the WA Department of Planning, Lands and Heritage regarding potential locations of cultural heritage sensitivities.	Within 2 hours	Planning Section	Planning Section Chief	APU IMT Contact Directory
Shoreline Clean-up	Mobilisation	Yes	-	Confirm shoreline protection priorities and begin mobilising priority equipment.	Within 24-48 hours	Planning Section	Environmental Unit Leader	-
Shoreline Clean-up	Mobilisation	Yes	DoT/DBCA	Depending on OSTM and potential impacts to priority sensitivities, begin mobilising SCAT Teams and trained shoreline responders to Exmouth.	Within 24-48 hours	Operations Section	Operations Section Chief	-
Shoreline Clean-up	Mobilisation	Yes	-	Complete activation of appropriate Response Strategy 8 - Shoreline Clean-up.	Within 24-48 hours	Planning Section	Planning Section Chief	AOHSE-ER-0058 - RS8 Shoreline Clean-up
Wildlife Response	Wildlife Response	Yes	-	Initiate Response Strategy 11 - Oiled Wildlife.	Within 2 hours	Planning Section	Environmental Unit Leader	AOHSE-ER-0061 Oil Spill Response Strategy - RS11 Oiled Wildlife
Wildlife Response	Wildlife Response	Yes	AMOSC	Advise AMOSC of potential for wildlife recovery equipment and team mobilisation.	As soon as practicable	Planning Section	Environmental Unit Leader	APU IMT Contact Directory

Wildlife Response	Wildlife Response	Yes	DoT/DBCA	Advise DoT/DBCA of the potential need for oiled wildlife response, and ETA of equipment and personnel.	Within 8 hours	Planning Section	Environmental Unit Leader	APU IMT Contact Directory
Wildlife Response	Wildlife Response	Yes	-	Develop logistics plan for accommodation and transport for Contract Environmental Monitoring organisations.	Within 8 hours	Logistics Section	Logistics Section Chief	-
Wildlife Response	Wildlife Response	Yes	-	Implement wildlife response as per IAP under advisement of wildlife response experts.	Within 48-72 hours	Planning Section	Environmental Unit Leader	-
Wildlife Response	Wildlife Response	Yes	-	Complete risk assessment and safety analysis for oil wildlife response teams and include in the IAP for the next operating period.	Within 48-72 hours	Command Section	Safety Officer	-
Wildlife Response	Wildlife Response	Yes	-	Confirm activation of appropriate components of Initial Response Strategy 11 - Oiled Wildlife.	Within 48-72 hours	Planning Section	Environmental Unit Leader	AOHSE-ER-0061 Oil Spill Response Strategy - RS11 Oiled Wildlife
Waste Management	Mobilisation	Yes	-	Initiate Response Strategy 13 - Waste Management (secondary response - only if needed and practical)	Within 2 hours	Planning Section	Planning Section Chief	AOHSE-ER-0063 Oil Spill Response Strategy - RS13 Waste Management AOHSE-E-0014-001 - Waste Management Plan - Oil Spill
Waste Management	Mobilisation	Yes	DPLH	All necessary regulatory approvals in place before implementing waste management activities; and consult with (and authority where necessary) the WA Department of Planning, Lands and Heritage regarding potential locations of cultural heritage sensitivities.	Within 2 hours	Planning Section	Planning Section Chief	APU IMT Contact Directory
Waste Management	Mobilisation	Yes	Veola/Northwest Waste Alliance	Activate waste management contracts and other third-party agreements for providing equipment / supplies and resources.	Within 4 hours	Logistics Section	Logistics Section Chief	APU IMT Contact Directory
Waste Management	Mobilisation	Yes	WA Department of Transport	Notify WA DoT that waste management contractors have been activated and mobilising to Exmouth. Request regulatory agency liaison for waste management sites.	Within 4 hours	Logistics Section	Logistics Section Chief	APU IMT Contact Directory
Waste Management	Mobilisation	Yes	-	Identify priority locations for temporary waste storage suitable for volumes predicted by SCAT teams and information gathered as part of Response Strategy 2 - Monitor and Evaluate.	Within 6 hours	Logistics Section	Logistics Section Chief/Waste Management Contractor	AOHSE-ER-0063 Oil Spill Response Strategy - RS13 Waste Management AOHSE-E-0014-001 - Waste Management Plan - Oil Spill
Waste Management	Mobilisation	Yes	Veola/Northwest Waste Alliance	Begin development of logistics plan.	Within 12 hours	Logistics Section	Logistics Section Chief/Waste Management Contractor	AOHSE-ER-0063 Oil Spill Response Strategy - RS13 Waste Management AOHSE-E-0014-001 - Waste Management Plan - Oil Spill
Waste Management	Mobilisation	Yes	Veola/Northwest Waste Alliance	Complete Waste Management Logistics Plan.	Within 24 hours	Logistics Section	Logistics Section Chief/Waste Management Contractor	AOHSE-ER-0063 Oil Spill Response Strategy - RS13 Waste Management AOHSE-E-0014-001 - Waste Management Plan - Oil Spill
Waste Management	Mobilisation	Yes	-	Complete activation of Response Strategy 13 - Waste Management.	Within 24 hours	Planning Section	Planning Section Chief	AOHSE-ER-0063 Oil Spill Response Strategy - RS13 Waste Management AOHSE-E-0014-001 - Waste Management Plan - Oil Spill

Appendix B

Western Australia Department of Transport Incident Management Team Coordination

Control and Coordination IMT Structure with WA DoT



Note: DoT IMT contains an appropriate number of appropriately qualified persons from the Petroleum Titleholder in key areas commensurate with their level of introduced risk.

Appendix C

Oil Spill Equipment

Industry Mutual Aid Equipment Register Updated 10/08/2021

Company	Equipment	Type	Units	Location
BHP BILLITON as 13/08/2021				
BHP Billiton	Dispersant, Spray Systems	Auspray Dispersant system ASDS	1	Pyrenees FPSO
BHP Billiton	Dispersant, Spray Systems	Auspray Dispersant system ASDS	1	Dampier
BHP Billiton	Dispersant	Corexit 9527	1.2 m3	Pyrenees FPSO
Ampol as of 11/08/2021				
Ampol	Absorbent, Boom	Rubberiser Boom	200 m	Lytton Refinery
Ampol	Boom, Nearshore	GP 800 Fence Boom	180 m	Lytton Refinery
Ampol	Shoreline Cleanup equipment	Oil Spill shed	1 unit	Lytton Refinery
Ampol	Vessel	4.75 mtr Aluminium Runner about "Jabiru"	1 unit	Lytton Refinery
Ampol	Vessel	5.7 litre multicruiser "Mimi"	1 unit	Lytton Refinery
Ampol	Vessel	135hp Honda "Ocean Cruiser"	1 unit	Lytton Refinery
Ampol	Skimmer, Multi Head	Versatech Multi Skimmer, Brush, drum, disc with all hydraulic hoses, oil transfer hose and diesel Hydraulic power pack deliver FIS	1 Unit	Lytton Refinery
Ampol	Boom, Nearshore	Zoom Boom	150m	Lytton Refinery
Ampol	Vessel	Seamac (Punt)	1 units	Lytton Refinery
Ampol	Boom, OnShore	Beach guardian	7 units	Lytton Refinery
Ampol	Boom, OnShore	Anchor Kits	15 units	Lytton Refinery
CHEVRON as of 23/08/2021				
Chevron	Boom, OnShore	AirBlower	2	BWI
Chevron	Temporary Storage	Canflex Open Top, Floating Collar Tank	1	BWI
Chevron	Boom, Nearshore	Current Buster 2 (plus air blower)	1	BWI
Chevron	Boom, Nearshore	Current buster 6 with boom vane (plus 2 x air blowers)	1	BWI
Chevron	Power Pack	Desmi Skimmer Power Pack/ Skimmer Hose Reel	3	BWI
Chevron	Shoreline Cleanup equipment	Diesel Powered Water pump for low pressure flushing system	2	BWI
Chevron	Boom, OnShore	Ex WA Oil Shore Guardian	3	BWI
Chevron	Boom, Nearshore	Ex WA Oil Zoom boom	2	BWI
Chevron	Temporary Storage	Fastank 2000	4	BWI
Chevron	Tracking Buoys	iSphere tracking buoy	1	BWI
Chevron	Skimmer, Weir	Mini-Max Weir Skimmer Set	2	BWI
Chevron	Boom, Nearshore	NOFI Solid Floatation Boom Bags 350 EP	2	BWI
Chevron	Boom, Nearshore	NOFI towable boom bag	2	BWI
Chevron	Boom, Nearshore	Self Inflating Zooom Boom	8	BWI
Chevron	Boom, Nearshore	Self Inflating Zooom Boom	10	BWI
Chevron	Power Pack	Spate pump	2	BWI
Chevron	Skimmer, Brush	Terminator Skimmer	3	BWI
Chevron	Boom, Nearshore	Tidal Boom 500 (Shore sealing boom)	9	BWI
Chevron	Temporary Storage	Towable bladder canflex	2	BWI
Chevron	Dispersant, Spray Systems	AFEDO nozzles spray system	1	Ashbuton North
Chevron	Dispersant	Slickgone EW dispersant	5	Ashbuton North

Chevron	Power Pack	Spate pump	2	Ashbuton North
Chevron	Tracking Buoys	iSphere tracking buoy	1	Ashbuton North
Chevron	Temporary Storage	Towable bladder (Canflex Series 1 'Sea Slug')	1	Ashbuton North
Chevron	Temporary Storage	Fastank 2000	1	Ashbuton North
Chevron	Boom, Nearshore	Self Inflating Zooom Boom	6	Ashbuton North
Chevron	Boom, Nearshore	Current Buster 2 in 10ft container	1	Ashbuton North
Chevron	Skimmer, Brush	Terminator in 10ft container	1	Ashbuton North
Chevron	Skimmer, Vacumm	Manta Ray skimmer	2	Ashbuton North
Chevron	Temporary Storage	Fastank 2000	15	Ashbuton North
Chevron	Boom, Nearshore	NOFI Boom Bag 350EP	1	Ashbuton North
Chevron	Boom, Nearshore	Self Inflating Boom in container (Canadyne)	2	Ashbuton North
Chevron	Temporary Storage	Fastank 10000	4	Ashbuton North
Chevron	Skimmer, Brush	Terminator	125tph	Karratha
Chevron	Boom, Offshore	Norlense NO-1000-R	300	BWI
Chevron	Boom, Offshore	Norlense NO-1000-R	300	BWI
Chevron	Dispersant, Spray Systems	AFEDO nozzles spray system	1	Karratha
Chevron	Dispersant	Slickgone EW dispersant	5	Karratha
Chevron	Boom, Nearshore	Current buster 4 with boom vane	1	Karratha
ESSO as of 02/06/2021				
Esso	Temporary Storage	Aluminium Skips (3m x 2m x 600mm High)	12 unit	LIP
Esso	Vessel	Sperm Whale for nearshore response. (F.Y.I. to transport this vessel a tilt tray or Semi would be required & is potentially oversized load due to width of vessel and cradle)	1	BBMT
Esso	Dispersant	AFEDO dispersant spray systems	2	BBMT
Esso	Dispersant	Corexit 9500	30 m3	BBMT
Esso	Boom, Nearshore	Expandi 3000 Harbour Boom	300m	BBMT
Esso	Boom, Nearshore	Sea Sentinel (Can be used Offshore, ASTM connectors)	2000m	LIP
Esso	Trailer	Beach/shoreline cleanup trailers	x4	LIP x 2, BBMT x 1, Sale x 1
Esso	Trailer	Decontamination Trailer	x1	LIP
Esso	Dispersant, Spray Systems	Vikospray Dispersant System, Boat Spray Booms (pressure wands) & pump	X1	LIP
Esso	Boom, Nearshore	Shoreboom	750m	LIP
Inpex as of 10/08/2021				
INPEX	Boom, Nearshore	400m zoom-boom in deployment trailer, plus ancillaries, (towing bridles, ship hull magnets, 6 x anchor kits etc)	1	Bhagwan Darwin Marine Logistics Base – East Arm (Darwin Harbour)
INPEX	Skimmer, Weir	Desmi Termite Weir Skimmer (with brush skimmer adaptor)	1	ASCO Marine Supply Base – East Arm (Darwin Harbour)
INPEX	Skimmer, Weir	(Skimmer) Action Hydraulics Power Pack and ancillaries (hydraulic hoses etc)	1	ASCO Marine Supply Base – East Arm (Darwin Harbour)
INPEX	Temporary Storage	25m3 towable oil storage bladder	2	ASCO Marine Supply Base – East Arm (Darwin Harbour)
INPEX	Oil Transfer Equipment	Desmi DOP 200 Offloading Pump	1	ASCO Marine Supply Base – East Arm (Darwin Harbour)

INPEX	Oil Transfer Equipment	20m oil transfer hoses on reel	1	ASCO Marine Supply Base – East Arm (Darwin Harbour)
INPEX	Dispersant	IsoTank 8000Lt Dasic Slick Gone NS Dispersant (MSDS attached)	2	Ichthys Venturer FPSO – Ichthys Field
INPEX	Dispersant, Spray Systems	AFEDO Spray System	1	Ichthys Venturer FPSO – Ichthys Field
INPEX	Tracking Buoys	RPS MetOcean Drifter (ARGOS satellite system)	10	Darwin (INPEX Offshore Logistics Base) Broome (INPEX Drilling Logistics Base) Ichthys Field (CPF, FPSO and various vessels)
Jadestone current as of 11/08/2021				
Jadestone	Boom, Offshore	Offshore Boom	2	Darwin
Jadestone	Skimmer, Brush	Brush Skimmer	2	Darwin
Jadestone	Temporary Storage	11 Te. Collapsible Storage Tank	4	Darwin
Jadestone	Temporary Storage	50 Te. Deck Tank	2	Darwin
Jadestone	Dispersant	Dasic Slickgone NS Dispersant (1000lt IBC)	8	Darwin
Jadestone	Dispersant, Spray System	AFEDO 100D Dispersant Spray System	1	Darwin
Jadestone	Tracking Buoy	iSphere Tracking Buoy	1	Darwin
Jadestone	Dispersant, Spray System	Dispersant Spray System (Type)	2	Darwin
Jadestone	Skimmer, Wier	Lamor LWS500 Wier Skimmer	1	Darwin
Jadestone	Dispersant, Transfer Pump	Dispersant Transfer Pump Spate 75c	1	Darwin
Jadestone	Dispersant	Dasic Slickgone NS Dispersant (1000lt IBC)	5	Darwin
SANTOS WA 23/08/2021				
Santos WA	Absorbent, Boom	Boom, 3metre x 180mm	120 metres	WA, Exmouth
Santos WA	Absorbent, Boom	Boom, 3metre x 180mm	144 metres	WA, Varanus Island
Santos WA	Absorbent, Roll	Roll,40mx1.1m	280 metres	WA, Varanus Island
Santos WA	Boom, Nearshore	Zoom Boom	400 metre	WA, Varanus Island
Santos WA	Boom, Nearshore	Harbo T-Fence Boom	200 metre	WA, Varanus Island
Santos WA	Boom, Offshore	Expandi self-inflating boom – 2 x 200 m vertical bundles	400 metre	WA, Dampier
Santos WA	Boom, Offshore	Power pack for Expandi Self-inflating Boom	1 unit	WA, Dampier
Santos WA	Boom, Offshore	Roto Cassette Retrieval Reel for Expandi Self-inflating Boom	1 unit	WA, Dampier
Santos WA	Boom, Offshore	Power Pack for Expandi Sea Curtain Boom	Out of Service	WA, Exmouth
Santos WA	Boom, Offshore	Expandi self-inflating boom – 4 x 200 m vertical bundles	800 metre	WA, Varanus Island
Santos WA	Boom, Offshore	Roto Cassette Retrieval Reel for Expandi Self-inflating Bo	1 Unit	WA, Varanus Island
Santos WA	Boom, OnShore	Beach Guardian Boom	200 metre	WA, Varanus Island
Santos WA	Boom, OnShore	Beach Guardian, Deployment Kit	2 unit	WA, Varanus Island
Santos WA	Dispersant, Spray Systems	Double AFEDO Head Spray System	1 unit	WA, Dampier
Santos WA	Dispersant, Spray Systems	Double Arm Spray System	1 unit	WA, Dampier
Santos WA	Dispersant, Spray Systems	Single Arm Spray System	1 unit	WA, Exmouth
Santos WA	Dispersant, Spray Systems	4 x Lance Head Spray System	1 unit	WA, Exmouth
Santos WA	Dispersant, Spray Systems	Double Arm Spray System	1 unit	WA, Exmouth
Santos WA	Shoreline Clean-up Container	40ft Container (W/barrows,Shovels,Brooms,Squeegy, sorl	1 unit	WA, Varanus Island
Santos WA	Skimmer, Oleophilic/Brush	Skimmer, Disc and brush, Desmi DBD 16, incl. hoses and	1 unit	WA, Dampier
Santos WA	Skimmer, Oleophilic/Brush	Skimmer, Disc and brush, Desmi DBD 16, incl. hoses and	1 unit	WA, Varanus Island
Santos WA	Temporary Storage	CORT Bladder Tank	3 unit	WA, Varanus Island
Santos WA	Tracking Buoys	Fastwave	6 unit	WA, Dampier
Santos WA	Tracking Buoys	i-Sphere	2 unit	WA, Exmouth

Santos WA	Tracking Buoys	Fastwave	2 unit	WA, Ningaloo Vision
Santos WA	Tracking Buoys	Pathfinder Tracking Buoy	2 unit	FSO
Santos WA	Tracking Buoys	Fastwave	4 unit	WA, Varanus Island
Santos WA	Vessel	28'Aluminium Response Vessel "Monte Belle"	1 unit	WA, Varanus Island
SANTOS East as at - 23/08/2021				
Santos East	Vessel	8 mtr Shark Cat "TREGALANA" with spray equipment	1 unit	Currently awaiting survey and repair to anti-fouling paint on hull. In progress.
Santos East	Vessel	6 Mtr Stabi Craft with 135 HP Outboard	1 unit	In the Water Ready to Go
Santos East	Vessel	4.08 Mtr Alocraft Sprint, Aluminium Open Boat 20hp Outboard	1 unit	Parked in the Oil Spill Shed and ready to Go.
Santos East	Dispersant	Slickgone NS	1x 1m3	
Santos East	Dispersant	Corexit 9527	5m3	
VIVA as at 25/08/2021				
Viva	Boom, OnShore	Beach Guardian, 25 metre	150m	Victoria, Geelong
Viva	Boom, Nearshore	Zoom Boom, 25 metre	200m	Victoria, Geelong
Viva	Boom, Nearshore	Fence Boom, 500mm, 20 metre	Nil	Victoria, Geelong
Viva	Boom, Nearshore	Fence Boom, 600mm, 20 metre	160m	Victoria, Geelong
Viva	Temporary Storage	10,000 Fastank	2 units	Victoria, Geelong
Viva	Skimmer, Oleophilic	Disc, 12k Komara	1 unit	Victoria, Geelong
Viva	Skimmer, Vacumm	Manta Ray Head	1 unit	Victoria, Geelong
Viva	Boom, OnShore	Beach Guardian, Deployment Kit	1 unit	Victoria, Geelong
WOODSIDE as 10/08/2021				
Woodside	Boom, Onshore	Fence Boom	150m	WA, Dampier
Woodside	Boom, Onshore	Lamor Shore Seal	200m	WA, Dampier
Woodside	Boom, Onshore	Shore Guardian, 20 metre	160m	WA, Dampier
Woodside	Boom, (Curtin on reel)	Curtain Boom, 30 metre lengths	300m	WA, Dampier
Woodside	Boom, Nearshore	Zoom Boom, 25 metre	175m	WA, Dampier
Woodside	Boom, Nearshore	Zoom Boom, 50 metre	200m	WA, Dampier
Woodside	Boom, Nearshore	Lamor inflatable Boom	250m	WA, Dampier
Woodside	Boom, Offshore	Offshore Boom on reel 200m per reel	400m	WA, Dampier
Woodside	Skimmer, Vacuum	Delta Ray Head	2 units	WA, Dampier
Woodside	Skimmer, Weir	Dragon Fly Weir Skimmer	1 unit	WA, Dampier
Woodside	Skimmer, Weir	Global 30m3/hr Weir Skimmer	1 unit	WA, Dampier
Woodside	Skimmer	Lamor 12 - Multi Skimmer	1 unit	WA, Dampier
Woodside	Boom, Nearshore	Anchoring Systems	21 units	WA, Dampier
Woodside	Shoreline Clean-up	Spades, Rakes, Some PPE etc.	multiple units	WA, Dampier
Woodside	Shoreline Clean-up	Decontamination Kit	2 unit	WA, Dampier
Woodside	Temporary Storage	Lamor storage tanks (like fast tanks) 7000L	2 units	WA, Dampier
Woodside	Dispersant	Slickgone NS	1 m3 on each vessel (2x OSV's)	WA, Dampier/ Exmouth, Supply Vessels
Woodside	Dispersant	Slickgone NS	5 m3	WA, Dampier
Woodside	Dispersant, Spray Systems	AFEDO Set	1 unit	WA, Exmouth
Woodside	Dispersant, Spray Systems	AFEDO Set	1 unit	WA, Dampier
Woodside	Gas monitors	Auto Rea	x6	KBSF

Product Totals by Location Report

Wednesday, 3 November 2021
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Quantity	Available	Length	Product#	Product Name	Product Category	Bay Location
Broome						
2	2		G-033	Dispersant Spray-Afedo System 200-TS	Dispersant Spray Equipment	Supply Base 3
1	1		G-041	Power Pack-Lamor Hydraulic LPP 14	Power Packs, Pumps & Accessories	Supply Base 3
1	1		G-052	Skimmer-Minimax 12-Brush	Skimmer	Supply Base 3
2	2	400	G-092	Boom-Lamor HDB 1300 (200m)on Reel	Boom	Supply Base 3
4	4	100	G-110	Boom-Beach Guardian Shoreseal (20m)	Boom	Supply Base 3
8	8	200	G-111	Boom-Zoom Boom (25m)	Boom	Supply Base 3
1	1		G-130	Boom Accessories-Beach Guardian Deployment Kit	Boom Accessories	Supply Base 3
4	4		G-133	Boom Accessories-Zoom Boom Anchor Kit	Boom Accessories	Supply Base 3
1	1		G-141	Waste (Land)-Vikotank (13000Ltr)	Waste Storage	Supply Base 3
12	12		G-150	Sorbent-Boom	Sorbents	Supply Base 3
3	3		G-151	Sorbent-Squares	Sorbents	Supply Base 3
3	3		G-184	Shipping Container	General	Supply Base 3
1	1		G-330	Wildlife-Oiled fauna kit	Decontamination	Supply Base 3
1	1		G-331	Decontamination-Kit (PPE)	Decontamination	Supply Base 3
1	1		G-400	Boom Cage	Misc	Supply Base 3
1	1		G-401	Boom Cage	Misc	Supply Base 3
1	1		G-500	Response tool box	General	Supply Base 3
14	14		G-607	Dispersant-Ardrox 6120	Dispersant	DG Shed
Exmouth						
1	1		G-030	Dispersant Spray-Viko Spray	Dispersant Spray Equipment	Harold Holt
1	1		G-031	Dispersant Spray-Helibucket (Simplex)	Dispersant Spray Equipment	Harold Holt
1	1		G-032	Dispersant Spray-Transfer Pump	Dispersant Spray Equipment	Harold Holt
1	1		G-033	Dispersant Spray-Afedo Ecospray 80W	Dispersant Spray Equipment	Harold Holt
1	1		G-040	Power Pack-Desmi Ro-Boom	Power Packs, Pumps & Accessories	Harold Holt
1	1		G-051	Skimmer-Komara 12K-Disc	Skimmer	Harold Holt
1	1		G-052	Skimmer-Minimax 12-Brush	Skimmer	Harold Holt
1	1		G-054	Skimmer-Passive-Weir	Skimmer	Harold Holt
1	1		G-070	Skimmer-Ro-Vac-Vacuum	Skimmer	Harold Holt
1	1		G-079	Skimmer-Desmi GT 185-Brush/Weir	Skimmer	Harold Holt

Quantity	Available	Length	Product#	Product Name	Product Category	Bay Location
2	2		G-090	Hydraulic Powered reel Winder- Roboom	Boom Accessories	Harold Holt
2	2	400	G-091	Boom-Desmi Ro-Boom 1500 (200m)	Boom	Harold Holt
20	20	500	G-110	Boom-Beach Guardian Shoreseal (20m)	Boom	Harold Holt
20	20	500	G-111	Boom-Zoom Boom (25m)	Boom	Harold Holt
3	3		G-130	Boom Accessories-Beach Guardian Deployment Kit	Boom Accessories	Harold Holt
1	1		G-132	Boom Accessories-Shoreline Boom Anchoring kit	Boom Accessories	Harold Holt
10	10		G-133	Boom Accessories-Zoom Boom Anchor Kit	Boom Accessories	Harold Holt
2	2		G-140	Waste (Land)-Fastank Temporary Storage (9000Ltr)	Waste Storage	Harold Holt
1	1		G-160	Skimmer-Desmi Ro Mop 240-Oil Mop	Skimmer	Harold Holt
1	1		G-181	Trailer-General Support	Trailer	Harold Holt
2	2		G-184	Shipping Container	General	Harold Holt
10	10		G-186	Shoreline Accessories-Wheelbarrow	General	Harold Holt
1	1		G-260	Genarator-Hatz 15kva (12kw)	Trailer	Harold Holt
1	1		G-330	Wildlife-Oiled fauna kit	Decontamination	Harold Holt
1	1		G-335	Decontamination-Kit (PPE)	Decontamination	Harold Holt
1	1		G-336	Decontamination-Kit Locker	Decontamination	Harold Holt
1	1		G-337	Shoreline Accessories-Hand Tool Accessories Cage	General	Harold Holt
3	3		G-400	Boom Cage	Misc	Harold Holt
5	5		G-401	Boom Cage	Misc	Harold Holt
30	30		G-604	Dispersant-Slickgone NS	Dispersant	Harold Holt
45	45		G-605	Dispersant-Slickgone NS	Dispersant	Harold Holt
1	1		G-610	Dispersant-Agitator	General	Harold Holt
1	1		G-888	Miscellaneous Items	General	Harold Holt

Fremantle

Quantity	Available	Length	Product#	Product Name	Product Category	Bay Location
1	1		G-029	Dispersant Spray-Boom Vane (Containerised)	Dispersant Spray Equipment	Outside Warehouse
1	1		G-030	Dispersant Spray-Viko Spray	Dispersant Spray Equipment	
5	5		G-033	Dispersant Spray-Afedo System 100-TS	Dispersant Spray Equipment	Outside Warehouse
1	0		G-034	Dispersant Spray-Global Boat Spray	Dispersant Spray Equipment	Outside Warehouse
1	1		G-035	Pump-Lamor GTA 30 Oil Transfer	Power Packs, Pumps & Accessories	2D
4	4		G-037	Pump-Honda GX-160 Water (2")	Power Packs, Pumps & Accessories	Outside Warehouse
9	9		G-039	Boom Accessories-Air Blower-2 Stroke	General	Outside Warehouse
1	1		G-040	Power Pack-Desmi Ro-Boom	Power Packs, Pumps & Accessories	4B
3	3		G-042	Power Pack-Lamor Hydraulic LPP 36	Power Packs, Pumps & Accessories	12, 13, 14

Quantity	Available	Length	Product#	Product Name	Product Category	Bay Location
1	1		G-043	Power Pack-Lamor Hydraulic LPP 7	Power Packs, Pumps & Accessories	
1	1		G-044	Boom Accessories-Lamor Control Stand for LPP36	Power Packs, Pumps & Accessories	2A
3	3		G-045	Boom Accessories-Lamor Air Blower-Hydraulic	General	12, 13, 14
1	1		G-051	Skimmer-Komara 12K-Disc	Skimmer	3B, 3E
2	2		G-052	Skimmer-Minimax 12-Brush	Skimmer	2C, 2F, 2B, 2E
1	1		G-053	Skimmer-Komara 20K-Disc	Skimmer	3C, 3F
1	1		G-054	Skimmer-Passive-Weir	Skimmer	4C, 4F
2	2		G-060	Skimmer-Lamor Rock Cleaner-Brush	General	1C, 1F, 1B, 1E
3	3		G-081	Skimmer-Lamor LWS500-Brush/Weir	Skimmer	12, 13, 14
6	6		G-090	Hydraulic Powered reel Winder- Roboom	Boom Accessories	14, 13, 12
6	6	1200	G-091	Boom-Desmi Ro-Boom 1500 (200m)	Boom	14, 13, 12
23	18	575	G-110	Boom-Beach Guardian Shoreseal (20m)	Boom	Outside Warehouse
30	30	750	G-111	Boom-Zoom Boom (25m)	Boom	4 A/D, Outside Warehouse
18	18	540	G-112	Boom-Lamor SFB-18 GP Solid Floatation (30m)	Boom	Outside Warehouse
1	1		G-113	Boom System- NOFI Current Buster 2	Boom	
2	2		G-130	Boom Accessories-Beach Guardian Deployment Kit	Boom Accessories	4E
3	3		G-131	Boom Accessories-Ro-Boom Anchoring System	Boom Accessories	12, 13, 14
28	28		G-133	Boom Accessories-Zoom Boom Anchor Kit	Boom Accessories	Outside Warehouse
2	2		G-140	Waste (Land)-Fastank Temporary Storage (3000Ltr)	Waste Storage	Outside Warehouse
2	2		G-142	Waste (On-Water)-Lancer Storage Barge (25000Ltr)	Waste Storage	Outside Warehouse
3	3		G-143	Waste (On-Water)-Deck Bladder Storage (25000Ltr)	Waste Storage	Outside Warehouse
4	4		G-144	Waste (Land)-Lamor TemporaryStorage (11400Ltr)	Waste Storage	Outside Warehouse
1	1		G-161	Skimmer-Desmi Ro Mop 260-Oil Mop	Skimmer	Warehouse 2
1	0		G-172	Forklift-Heli 7 Tonne	Vehicle	Warehouse
1	1		G-180	Trailer-Mobile Workshop	Trailer	Warehouse 3
2	2		G-181	Trailer-Tandem (Galvanised)	Trailer	Outside Warehouse
5	5		G-183	Aluminium Container	General	Outside Warehouse
8	8		G-184	Shipping Container	General	Outside Warehouse
4	4		G-188	Monitoring/Surveillance-I SPHERE Drift Buoys	Communications	1A
1	1		G-199	Wildlife-Bird Scarer	Wildlife Support	1D
1	1		G-200	Vessel-Zodiac Pro 500 (4.7Mtr)	Vessel	Warehouse
1	1		G-251	PPE- Inflatable PFD Set of 24	General	12 C/F
2	2		G-259	Generator-Portable (6KW)	General	Warehouse, Wildlife Container

Quantity	Available	Length	Product#	Product Name	Product Category	Bay Location
1	1		G-262	Decontamination-Vehicle Washdown Trailer	Trailer	Warehouse 2
1	1		G-325	Wildlife-Fauna Hazing & Exclusion Kit	Wildlife Support	
3	3		G-326	Wildlife-Fauna Hazing & Exclusion Kit	Wildlife Support	Warehouse
1	1		G-332	Wildlife-Washdown Container	Wildlife Support	Outside Warehouse
1	1		G-333	Shoreline-Support Kit	General	3A
1	1		G-334	Shoreline-Flushing Kit (3")	Power Packs, Pumps & Accessories	3D
1	1		G-336	Decontamination-Kit Locker	Decontamination	7 C/F
1	1		G-339	PPE-PPE Response Container (SCFU 1114735)	General	Outside Warehouse
1	1		G-400	Boom Cage	Misc	4 A/D
8	8		G-605	Dispersant-Slickgone NS	Dispersant	Outside Warehouse, Dispersant Area
27	27		G-606	Dispersant-Corexit 9500	Dispersant	Outside Warehouse, Dispersant Area
1	1		G-610	Dispersant-Agitator	General	Warehouse
1	1		G-700	Monitoring/Surveillance-Phantom 4 Drone	General	Head Office
1	1		G-750	Monitoring/Surveillance-Aerial Surveillance Kit	General	Head Office
2	2		G-808	Monitoring/Surveillance-4-1 Personnal Gas Monitor	General	Head Office
1	1		G-809	Monitoring/Surveillance-Air Quality Monitoring Kit	Misc	Head Office
4	4		G-850	Ancilliaries box 1	General	Outside Warehouse
4	4		G-851	Ancilliaries Box 2	General	Outside Warehouse
2	2		G-889	Oil sampling kit	General	Outside Warehouse
3	3		G-890	Sorbent-Boom	Sorbents	Outside Warehouse
3	3		G-891	Sorbent-Squares	Sorbents	Outside Warehouse
1	1		G-950	AMOSC Vehicles	Vehicle	Warehouse
1	1		G-960	Vehicle-ATV- CF Moto u550 (1GQM058)	Vehicle	Warehouse
Nth Geelong						
1	1		G-029	Dispersant Spray-Boom Vane (Containerised)	Dispersant Spray Equipment	Outside Warehouse
2	2		G-030	Dispersant Spray-Viko Spray	Dispersant Spray Equipment	Bay D
1	1		G-031	Dispersant Spray-Helibucket (Simplex)	Dispersant Spray Equipment	Bay D
1	1		G-032	Dispersant Spray-Transfer Pump	Dispersant Spray Equipment	Bay P
4	4		G-033	Dispersant Spray-Afedo System 100-TS	Dispersant Spray Equipment	Outside Warehouse, Bay D
1	1		G-035	Pump-Lamor GTA 30 Oil Transfer	Power Packs, Pumps & Accessories	Bay P
2	2		G-039	Boom Accessories-Air Blower-2 Stroke	General	Warehouse
1	1		G-040	Power Pack-Desmi Ro-Boom	Power Packs, Pumps & Accessories	Bay A
3	3		G-042	Power Pack-Lamor Hydraulic LPP 36	Power Packs, Pumps & Accessories	Bay A

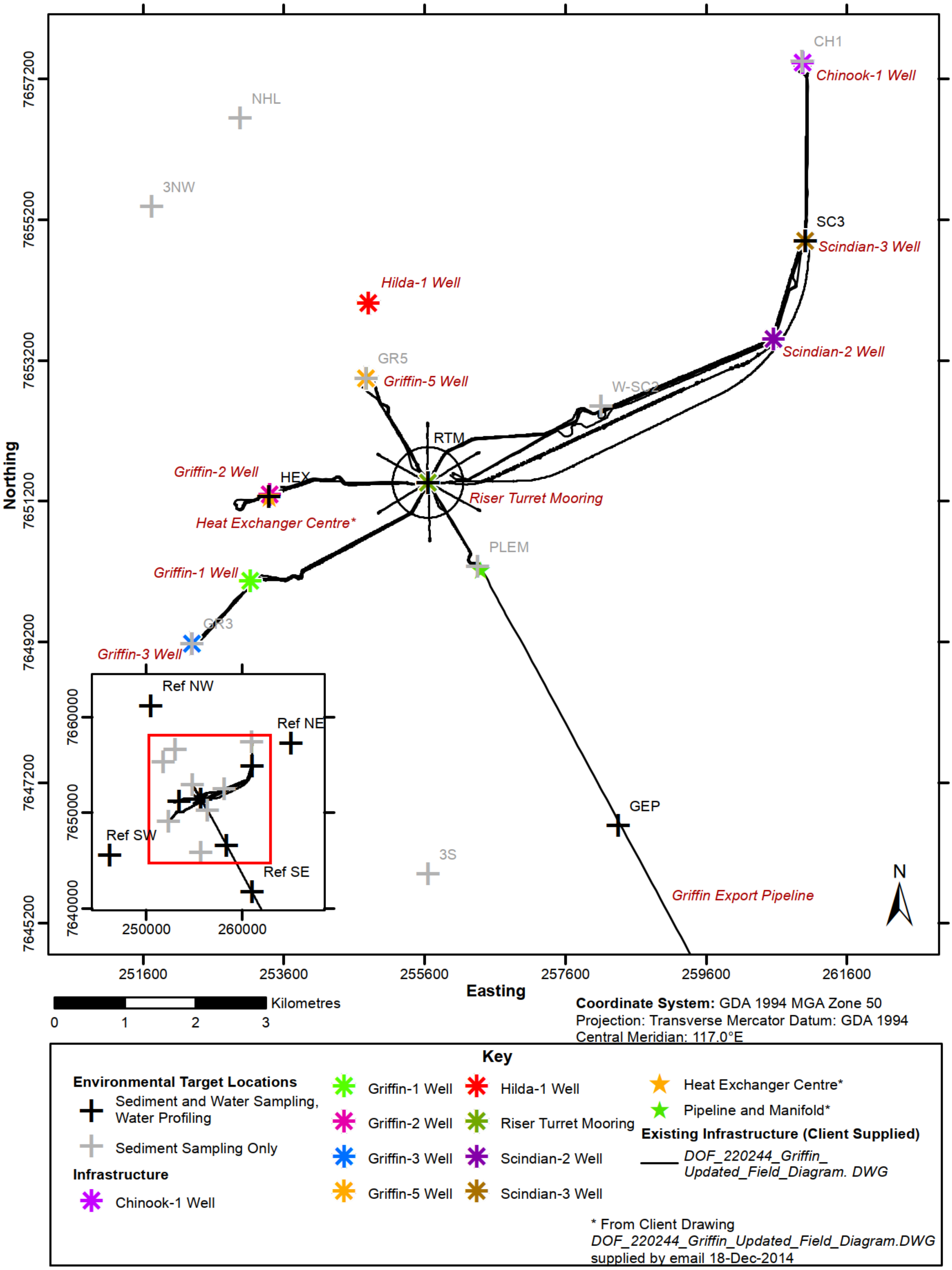
Quantity	Available	Length	Product#	Product Name	Product Category	Bay Location
1	1		G-044	Boom Accessories-Lamor Control Stand for LPP36	Power Packs, Pumps & Accessories	Bay K
3	3		G-045	Boom Accessories-Lamor Air Blower-Hydraulic	General	Bay A
2	2		G-050	Skimmer-Komara 30K-Disc	Skimmer	Bay J
2	2		G-051	Skimmer-Komara 12K-Disc	Skimmer	Bay J
1	1		G-052	Skimmer-Minimax 12-Brush	Skimmer	Bay K
1	1		G-054	Skimmer-Passive-Weir	Skimmer	Bay K
2	2		G-060	Skimmer-Lamor Rock Cleaner-Brush	General	Bay O
3	3		G-070	Skimmer-Ro-Vac-Vacuum	Skimmer	Bay P
1	1		G-079	Skimmer-Desmi GT 185-Brush/Weir	Skimmer	Bay C
1	1		G-080	Skimmer-Desmi 250-Weir	Skimmer	Outside Warehouse
3	3		G-081	Skimmer- Lamor LWS500-Brush/Weir	Skimmer	Bay A
2	2		G-082	Skimmer-Ro-Skim Boom System-Weir	Skimmer	Outside Warehouse
1	1		G-083	Skimmer-Canadyne Multi Head-Brush/Disc/Drum	Skimmer	Bay K
1	1		G-084	Skimmer-Versatech Multi Head-Brush/Disc/Drum	Skimmer	Bay C
10	10		G-090	Hydraulic Powered reel Winder- Roboom	Boom Accessories	Bay A
9	9	1800	G-091	Boom-Desmi Ro-Boom 1500 (200m)	Boom	Bay A
1	1	36	G-093	Boom-Desmi Ro-Boom 1500 (36m)	Boom	Bay A
51	51	1275	G-110	Boom-Beach Guardian Shoreseal (20m)	Boom	Bay L, Training Trailer
135	135	3375	G-111	Boom-Zoom Boom (25m)	Boom	Bay L, Training Trailer, Outside Warehouse
40	40	1200	G-112	Boom-Lamor SFB-18 GP Solid Floatation (30m)	Boom	Outside Warehouse, Bay L, Training Trailer
1	1		G-114	Boom System-Desmi Speed Sweep	Boom	Bay E
3	3		G-120	Pump-General Purpose Diaphragm (3")	Power Packs, Pumps & Accessories	Bay P
1	1		G-121	Pump-Desmi DOP 250 Transfer	Power Packs, Pumps & Accessories	Bay P
8	8		G-130	Boom Accessories-Beach Guardian Deployment Kit	Boom Accessories	Training Trailer, Bay M
3	3		G-131	Boom Accessories-Ro-Boom Anchoring System	Boom Accessories	Bay A
4	4		G-132	Boom Accessories-Shoreline Boom Anchoring kit	Boom Accessories	Bay M
30	30		G-133	Boom Accessories-Zoom Boom Anchor Kit	Boom Accessories	Training Trailer, Bay K
2	2		G-135	Boom Accessories-Dual Hull magnet (1000Kg)	Boom Accessories	Charging Station Area
4	4		G-140	Waste (Land)-Fastank Temporary Storage (3000Ltr)	Waste Storage	Training Trailer, Bay M
1	1		G-141	Waste (Land)-Vikotank (13000Ltr)	Waste Storage	Bay M
2	2		G-142	Waste (On-Water)-Lancer Storage Barge (25000Ltr)	Waste Storage	Bay F
3	3		G-143	Waste (On-Water)-Deck Bladder Storage (25000Ltr)	Waste Storage	Bay G
65	65		G-150	Sorbent-Boom	Sorbents	Bay N

Quantity	Available	Length	Product#	Product Name	Product Category	Bay Location
40	40		G-151	Sorbent-Squares	Sorbents	Bay N
96	96		G-152	Sorbent-Viscous Oil Snares	Sorbents	Bay N
11	11		G-153	Sorbent-Roll	Sorbents	Bay N
1	1		G-160	Skimmer-Desmi Ro Mop 240-Oil Mop	Skimmer	Trailer Bay
1	1		G-161	Skimmer-Desmi Ro Mop 260-Oil Mop	Skimmer	Trailer Bay
1	1		G-162	Vessel-Egmopol Barge w/t Brush Skimmer-AMOSC 1	Skimmer	Warehouse
2	2		G-172	Forklift-Hyster 2 Tonne	Vehicle	Warehouse
1	1		G-180	Decontamination-Decon Support Trailer	Trailer	Trailer Bay
3	3		G-181	Trailer-General Support	Trailer	Trailer Bay
1	1		G-182	Trailer-Egmopol	Trailer	Warehouse
1	1		G-183	Aluminium Container	General	
10	10		G-184	Shipping Container	Misc	Outside Warehouse, Dispersant Area
13	13		G-185	Waste (Land/Onwater)-IBC	Waste Storage	North Wall
2	2		G-188	Monitoring/Surveillance-I SPHERE Drift Buoys	Communications	
1	1		G-201	Vessel-Aluminium Catamaran (9Mtr)AMOSC 3	Vessel	Warehouse
1	1		G-251	PPE- Inflatable PFD Set of 32	General	Warehouse
3	3		G-259	Generator-Portable (6KW)	General	Bay, Wildlife Container
1	1		G-260	Cleaning-Generator/Karcher Pressure Washer Unit	Trailer	Trailer Bay
1	1		G-261	Shoreline-Flushing Kit (4")	General	Bay O
1	1		G-262	Decontamination-Vehicle Washdown Trailer	Trailer	Trailer Bay
2	2		G-263	Cleaning-Diesel Pressure Washer	Power Packs, Pumps & Accessories	Bay O
1	1		G-325	Wildlife-Fauna Hazing & Exclusion Kit	Wildlife Support	
2	2		G-330	Wildlife-Oiled fauna kit	Decontamination	Bay H
1	1		G-332	Wildlife-Washdown Container	Wildlife Support	Outside Warehouse
1	1		G-334	Shoreline-Flushing Kit (3")	Power Packs, Pumps & Accessories	Bay O
1	1		G-335	Decontamination-PPE Kit (First Strike Support)	Decontamination	Bay I
1	1		G-336	Decontamination-Kit Locker	Decontamination	Bay I
1	1		G-338	Shoreline-Impact Lance Kit	Power Packs, Pumps & Accessories	Bay O
1	1		G-339	PPE-PPE Response Container (TCIU 1962281)	General	Outside Warehouse
24	24		G-400	Boom Cage	Misc	Bay 12, Bay L
13	13		G-401	Boom Cage	Misc	Bay L, Bay K
1	1		G-500	Response tool box	General	Warehouse Store
8	8		G-604	Dispersant-Slickgone NS	Dispersant	Bay 0

Quantity	Available	Length	Product#	Product Name	Product Category	Bay Location
67	67		G-605	Dispersant-Slickgone NS	Dispersant	Bay 0
62	62		G-606	Dispersant-Corexit 9500	Dispersant	Bay 0, Outside Warehouse
1	1		G-610	Dispersant-Agitator	General	Dispersant
2	2		G-700	Monitoring/Surveillance-DJI Spark	General	Head Office
1	1		G-750	Monitoring/Surveillance-Aerial Surveillance Kit	General	Head Office
1	1		G-760	Dispersant-Effectiveness Field Test Kit	Dispersant	Head Office
1	1		G-770	Monitoring/Surveillance-Shoreline Surveillance Kit	Misc	Head Office
6	6		G-808	Monitoring/Surveillance-4-1 Personnal Gas Monitor	General	Head Office
1	1		G-889	Oil sampling kit	General	Outside warehouse
2	2		G-890	Sorbent-Boom	Sorbents	Outside warehouse
2	2		G-891	Sorbent-Squares	Sorbents	Outside warehouse
3	3		G-950	AMOSC Vehicles	Vehicle	Warehouse, Head Office
1	1		G-960	Vehicle-ATV- CF Moto u550	Vehicle	Warehouse

Appendix F

Griffin Field Infrastructure Layout and Environmental Target Locations


CH1
Chinook-1 Well
NHL
3NW
SC3
Scindian-3 Well
Hilda-1 Well
Scindian-2 Well
GR5
Griffin-5 Well
W-SC2
RTM
Griffin-2 Well
HEX
Riser Turret Mooring
Heat Exchanger Centre*
PLEM
Griffin-1 Well
GR3
Griffin-3 Well
Ref NW
Ref NE
Ref SW
Ref SE
GEP
3S
Griffin Export Pipeline
N
Northing
7657200
7655200
7653200
7651200
7649200
7647200
7645200
7660000
7650000
7640000
250000
260000
251600
253600
255600
257600
259600
261600
Easting
Kilometres
0
1
2
3
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator Datum: GDA 1994
Central Meridian: 117.0°E
Key
Environmental Target Locations
Sediment and Water Sampling, Water Profiling
Sediment Sampling Only
Infrastructure
Chinook-1 Well
Griffin-1 Well
Griffin-2 Well
Griffin-3 Well
Griffin-5 Well
Hilda-1 Well
Riser Turret Mooring
Scindian-2 Well
Scindian-3 Well
Heat Exchanger Centre*
Pipeline and Manifold*
Existing Infrastructure (Client Supplied)
DOF_220244_Griffin_ Updated_Field_Diagram. DWG
* From Client Drawing
DOF_220244_Griffin_Updated_Field_Diagram.DWG
supplied by email 18-Dec-2014

Appendix G

ALARP Assessment for Resourcing for Oil Spill Response Strategies

1 Source Control

Table 1: RS1 Source Control Response Strategy risk assessment including evaluation of effectiveness of controls, environmental benefit gained compared with practicability and ALARP summary

Risk Assessment				ALARP Assessment												Performance Standard
Function	Risk	Control Measure	Rationale	Response Capacity (Volume of Oil Treated)	Units	Timing (Days)	Cost	Effectiveness (High / Low): Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
Eliminate	Negative environmental impact from the execution of this response strategy.	No source control.	Do nothing option.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No environment benefit would be gained from this option. Halting the release of hydrocarbons and spill clean-up activities are essential.	The do nothing option is not considered acceptable.	**Reject:** Source control is a recognised strategy for the mitigation of oil spill impacts.	-
Administrate	Ad hoc response with no plan for source control immediately following surface release.	Dependent on nature and scale of spill, spill response executed in accordance activity-specific OPEP *(Griffin Decommissioning OPEP (GV-HSE-ER-0011)* or vessels' MARPOL-compliant SOPEP.	Control is based on legislative requirements – OPGGS (Environment) Regulations and MARPOL Annex I (Prevention of Pollution by Oil).	Medium	1	0-2 hours	Minor	H	H	H	H	H	Implements response plan to quickly and efficiently deal with unplanned hydrocarbon spills in order to reduce impacts to the marine environment.	Controls have high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications for the operation.	**Accept**: Controls based on legislative requirements must be accepted. Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	**PS RS1.4**
	Response activities not considered in preparedness planning therefore not allowing for input into the NEBA.	Operational NEBA to include evaluation of requirement for implementation of source control.	Source control activated and supported by Operational NEBA to provide a net environmental benefit to prevent environmental impacts to sensitive environmental receptors.	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational NEBA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority	Strategic NEBA is included in the OPEP and the Operational NEBA must be undertaken to gain understanding of net environmental benefit of implementation of response strategies.	**Accept**: Controls are practicable and the cost is covered under the primary contract and is proportionate to the environmental benefit gained. Source Control is accepted as the best option for any hydrocarbon release.	**PS RS1.1**

Risk Assessment				ALARP Assessment													Performance Standard
Function	Risk	Control Measure	Rationale	Response Capacity (Volume of Oil Treated)	Units	Timing (Days)	Cost	Effectiveness (High / Low): Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary		
													locations and sensitive receptors. Shoreline protection and/or clean-up will be activated if the Operational NEBA indicates a benefit would be gained in protecting any shoreline sensitivities that may come into contact with the released diesel.				
	Source control equipment not available on vessel	Pumps for transferring hydrocarbons to different tanks are regularly tested. Magnetic patches available on vessel to potentially control small holes/damage to vessel hull	Control is based on legislative requirements – OPGGS (Environment) Regulations and MARPOL Annex I (Prevention of Pollution by Oil).	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Implements response plan to quickly and efficiently deal with unplanned hydrocarbon spills in order to reduce impacts to the marine environment.				PS RS1.5
	Deck leaks enter the environment via drainage channels.	Scupper plugs or equivalent deck drainage control measures available on vessel where hazardous chemicals and hydrocarbons stored and frequently handled.	Control is based on legislative requirements – MARPOL Annex I (Prevention of Pollution by Oil).	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Implements response plan to quickly and efficiently deal with unplanned hydrocarbon spills in order to reduce impacts to the marine environment.				PS RS1.6
	Predictive spill trajectory unknown when undertaking Operational NEBA.	Modelling predictions of spill trajectory to be undertaken to support the Operational NEBA.	Used as tool to gain situational awareness through real-time spill trajectory modelling to enable evaluation of which sensitive receptors require priority protection.	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Positive environmental benefit gained as oil spill trajectory modelling will assist in the effectiveness of response strategies and will enable real-time evaluation of which sensitive receptors require priority protection.				PS RS1.2
	Response continues with no end point or is removed early.	Response strategy activities continued until termination criteria met.	Ensures that the source control – vessel control response strategy continues until the performance	N/A	N/A	Immediately and on-going	Minor	H	H	H	H	H	Positive environmental benefit gained from ensuring that the source control – vessel control response strategy continues				PS RS1.3

Risk Assessment				ALARP Assessment													Performance Standard
Function	Risk	Control Measure	Rationale	Response Capacity (Volume of Oil Treated)	Units	Timing (Days)	Cost	Effectiveness (High / Low): Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary		
			outcome has been achieved.										until the performance outcome has been achieved.				

2 Monitor and Evaluate

Table 2: RS2 Monitor and Evaluate Response Strategy risk assessment including evaluation of effectiveness of controls, environmental benefit gained compared with practicability and ALARP summary

Risk Assessment				ALARP Assessment												Performance Standard
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (Days)	Cost	Effectiveness (High / Low) Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
Eliminate	Negative environmental impact from the execution of this response strategy.	No situational awareness.	Do nothing option	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No environment benefit would be gained from this option. Developing a monitoring and evaluate response strategy is a necessary contingency to have in place prior to and during operations and cannot be eliminated. Monitoring and evaluation is integral to the management and verification of spill response strategies for all spill scenarios.	The do nothing option is not considered acceptable.	Reject: The monitor and evaluate strategy is a mandatory response strategy to have in place and cannot be eliminated.	-
Administrate	Response strategy executed adhoc with no real planning.	Monitor and evaluate operations to be reviewed and managed by IMT through Incident Action Plan (IAP) process.	Within the first 24 hours, BHP IMT will enact the first strike plan in conjunction with development of an IAP.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective monitor and evaluate response activities to track the spill trajectory and to feed into real-time decision-making for further strategies for responding to and managing spill event. The review/evaluation of monitor and evaluate options will be implemented immediately for all levels of spills.	Controls have high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications for the operation.	Accept: Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	PS RS2.1
	Spill trajectory not known in early stages of the response.	Spill fate modelling initiated within 2 hours of incident notification to support Operational NEBA.	Used as tool to gain situational awareness through real-time spill trajectory modelling to enable evaluation of which sensitive receptors require priority protection.	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Positive environmental benefit gained as oil spill trajectory modelling will enable real-time evaluation of which sensitive receptors require priority protection.			PS RS2.2

Risk Assessment				ALARP Assessment												Performance Standard
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (Days)	Cost	Effectiveness (High / Low) Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
	Response activities not considered in preparedness planning therefore not allowing for input into the NEBA.	Operational NEBA to include evaluation of requirement for various monitoring and evaluation activities to be employed i.e. aerial/vessel surveillance; autonomous underwater vehicles; oil spill tracker buoys (OSTBs); and satellite imagery.	Various techniques for tracking, monitoring and evaluating the spill. The methods employed will be dependent on the volume of the spill, sea state/ weather conditions and health/safety considerations.	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective monitor and evaluate response strategy to track the spill dependent on sea state and weather conditions, spill volume and health/safety considerations. The Operational NEBA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors. Information received from the various monitor and evaluate activities implemented will be crucial in decision-making for the activation of other response strategies. For example, considerations include the time of year of the spill to take account of environmental sensitivities i.e. peak turtle nesting season; coral spawning events; whale and whale shark migration; and seabird nesting periods.			**PS RS2.3, and PS RS2.10**
Current Capability																
Administrate	Aerial surveillance resources not available.	Contract in place with CHC helicopters and backup by Babcock helicopters.	BHP contract in place for the provision of aerial surveillance mobilising from Karratha (or alternatively from Barrow Island) in the event of a hydrocarbon spill.	N/A	2	0-2 hours	Minor	H	H	H	H	H	Positive environmental benefit gained from having aircraft/ vessels already on contract or readily obtained through MOU's for spill surveillance activities. Dependent on the size of the spill, vessel/ aerial surveillance would be initiated immediately.	The response capacity is small but the effectiveness is generally high (vessel operations are only possible during daylight hours). The cost of using all available BHP marine vessels, those available through Mutual Aid and on the local spot-charter market in Exmouth / Dampier / Broome has minor cost implications. Cost during activation would be moderate.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS2.4**

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (Days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
	Marine-based resources (vessels) not available to respond when required.	Access to support vessels (BHP, mutual aid, local charter).	BHP Marine Fleet (Contracted OSV), Mutual aid MOU's (Santos / Woodside) and vessels of opportunity available on the local spot charter market in Exmouth, Onslow and Dampier. Vessels already on contract or readily obtained through MOU's, no additional standby cost.	N/A	1-4	Within 12 hours	Moderate	H	H	H	H	H				
	Spill modelling resources not available.	Contract in place with AMOSC who maintains call-off contract with RPS* to provide spill modelling in the event of a hydrocarbon spill.	Real-time monitoring and evaluation of the spill is a mandatory primary response strategy implemented for Level 1 – 2 spills required for real-time decision-making during a spill event. BHP has agreements and contracts in place to expedite implementation of monitor and evaluate activities.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained from implementation of this control measure. Oil spill trajectory modelling will be conducted to predict the extent of impacts to offshore habitat, for any physical disturbance that may impact shoreline, nearshore areas, or areas protected for the purpose of conservation. The IMT will engage RPS * via a call-off contract maintained by AMOSC to start modelling the spill, and correlate it with real data received from aerial surveillance and/or OSTB.	Control has high effectiveness; it is available, functional and reliable and in general it is reliable and compatible with other control measures. Control has minor cost implications for operations.		**PS RS2.5**
	Spill modelling not available within the needed timeframe and to the expected standard.	Ensure spill modelling capability meets and exceeds the industry standards for oil spill modelling.											From these sources, RPS will develop an oil spill trajectory model for the next 5 days, which will allow the IMT to direct resources for the next phase of the response. Alternative oil spill modelling agencies may be selected dependent on operational requirements.	Control has high effectiveness; it is available, functional and reliable and in general it is reliable and compatible with other control measures. Control has minor cost implications for operations.		**PS RS2.5,**

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (Days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
	Tracker buoys not immediately available for deployment.	Access to OSTB's from AMOSC and Mutual Aid.	BHP has agreements in place to expedite resourcing additional OSTB's through AMOSC in the event of a spill.	N/A	2	Within 12-18 hours	Moderate	H	H	H	H	H	Positive environment benefit gained from implementation of this control measure BHP has agreements in place to expedite resourcing OSTB's through AMOSC in the event of a spill.	The response capacity is small but the control effectiveness is generally high. The cost of using resources/ equipment already in place is minor.		PS RS2.4
	Real time monitoring arrangements not in place as part of response preparedness.	BHP has agreement in place with OSRL/ third-party for the provision of satellite imagery.	Real-time monitoring and evaluation of the spill is a mandatory primary response strategy implemented for Level 1 – 2 spills required for real-time decision-making during a spill event. BHP has agreements in place to expedite acquisition of satellite imagery in the event of a spill.	N/A	N/A	< 24 hours for acquisition of first satellite image.	H	H	H	H	H	H	Positive environmental benefit by having access to monitor and evaluate resources obtained via contractual arrangements and service agreements with OSRL and other third-party vendors ensures activation of response strategy activities are expedited in the event of a spill.	The response capacity is minor but the control effectiveness is generally high The cost of having agreements/contracts in place is minor. Cost during activation would be moderate.		PS RS2.6
	Aerial surveillance personnel not available.	Access to aerial surveillance and trained observers from AMOSC Core Group.	BHP has agreements in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill.	N/A	~16	24-48 hours	Moderate	H	H	H	H	H	Positive environment benefit gained from implementation of this control measure BHP has agreements in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill.	The cost of maintaining membership with AMOSC		PS RS2.4
Scalable																
Administrate	Marine-based resources (vessels) not available to respond when required.	Support vessels (Australia).	Acquisition of charter vessels on the spot-market from around Australia.	Medium	As required	3-8	Minor	H	H	H	H	H	Positive environmental benefit by implementation of this control measure. The ongoing charter of more support vessels will continue on an 'as required' basis during the spill response.	The response capacity is small for vessel operations but the control effectiveness is generally high (vessel operations are only possible during daylight hours) and the cost of using marine vessels available as required through the spot-charter market around Australia has minor cost implications. Cost during activation would be moderate.	Accept: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	PS RS2.4

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (Days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
	Tracker buoys not immediately available for deployment.	Access to additional OSTB's from the Pyrenees Facility .	Access to OSTB's located on the Pyrenees Facility	N/A	2	2-5	Minor	H	H	H	H	H	Positive environment benefit gained from implementation of this control measure.	The response capacity is small but the control effectiveness is generally high. The cost of using resources/ equipment already in place is minor.		
	Aerial surveillance personnel not available.	Access to aerial surveillance and trained observers from OSRL.	BHP has agreements in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill.	N/A	18	14	Moderate	H	H	H	H	H	Positive environment benefit gained from implementation of this control measure BHP has agreements in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill.	The cost of maintaining membership with OSRL.		**PS RS2.4**
	Aerial surveillance personnel not available.	Access to aerial surveillance and trained observers via mutual aid.	BHP has mutual aid MoU's in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill.	N/A		24-48 hours	Moderate	H	H	H	H	H	Positive environment benefit gained from implementation of this control measure BHP has mutual aid MoU's in place to expedite resourcing additional aerial surveillance and trained observers in the event of a spill.	The cost of maintaining membership with AMOSC and OSRL.		**PS RS2.4**
	Marine-based resources (vessels) not available to respond when required.	Dedicated OSR vessel on standby at Exmouth, Naval Base.	On standby 24/7 during operations to expedite initiation of vessel surveillance. Requests for offshore vessel support can be made by AMSA.	N/A	1	0-1	Moderate $35K/day x ~ 295 days = ~$10.3M	H	H	L	L	H	Positive environment benefit gained by having dedicated aircraft/ vessels on standby to immediately monitor the spill.	Dedicated standby vessels and aircraft have substantial costs that do not provide a measurable advantage.	**Reject**: This control has high costs that are disproportionate to any environmental benefit that might be gained. This takes into consideration additional fuel required for having vessels on standby at site, additional collision risk, and interference with other sea users.	-
	Marine-based resources (vessels) not available to respond when required.	Dedicated OSR vessel on standby at Dampier Supply Base.	On standby 24/7 during operations to expedite initiation of vessel surveillance. Requests for offshore vessel support can be made by AMSA.	N/A	1	0-1	Moderate $35K/day x ~ 295 days = ~$10.3M	H	H	L	L	H				-

3 Shoreline Protection

Table 3: RS5 Shoreline Protection Response Strategy risk assessment including evaluation of effectiveness of controls, environmental benefit gained compared with practicability and ALARP summary

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
Eliminate	Negative environmental impact from the execution of this response strategy.	No shoreline response.	Do nothing option.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No environment benefit would be gained from this option; experience from past oil spills suggests that environmental sensitivities can be protected effectively when shoreline protection operations are activated.	There may be occasions when shoreline protection is not implemented, e.g. during poor weather, or when operations are temporarily ceased such as, for example, due to the presence of migratory EPBC listed species occurring within the area of operations, but in general, the 'do nothing' option is not considered within the external context (e.g. stakeholder views) to be a viable option.	**Reject:** Shoreline protection using booms is a recognised strategy for the mitigation of oil spill impacts.	-
Separate	Response executed when EPBC Act listed migratory are in the area.	Operational control to prevent impacts on EPBC Act Listed migratory species.	If EPBC Act Listed migratory species such as humpback whales or whale sharks are observed in the immediate vicinity of shoreline protection operations as determined from situational awareness reports from the 'monitor and evaluate' response strategy and/or from the vessels, shoreline protection operations would cease until the animal has moved out of the area and has not been sighted for 30 minutes.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environment benefit gained by reducing the potential impacts, e.g. entrapment, entanglement, associated with implementing shoreline protection operations in areas where EPBC Act Listed threatened/migratory species have been observed, as determined from situational awareness reports. Operations would cease until the animal has moved out of the area and has not been sighted for	Controls have high effectiveness; are available, functional and reliable and in general are survivable and compatible with other control measures. Controls have minor cost implications for operations.	**Accept**: Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	**PS RS5.11**

Risk Assessment				ALARP Assessment													
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Effectiveness (High / Low): Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
													30 minutes to reduce the potential of interaction with booms.			
	Response use during periods of important windows of ecological sensitivity, e.g. coral spawning; turtle nesting season; migratory shorebirds arriving /departing the region and during migrations of EPBC Act Listed species.	Temporal / seasonal windows of ecological sensitivity to be considered in Operational NEBA.	Shoreline protection is a key response strategy to facilitate the protection of sensitive shorelines and adjacent shallow water habitats particularly those occurring within the NMP. However, shoreline protection during periods of important windows of ecological sensitivity, e.g. coral spawning; turtle nesting season; and during migrations of EPBC Act Listed species such as whales and whale sharks (as described in Section 4); will be a key component of the Operational NEBA and will be subject to operational constraints.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environment benefit gained by reducing the potential impacts associated with shoreline protection operations during windows of important ecological sensitivity, as described in Section 4. For example, shoreline protection operations would not be applied in areas with visible coral spawning slicks.			**PS RS5.12**
	Response strategy not executed effectively through planning or fast enough to prevent impact highly sensitive areas impacted.	Pre-deployment of shoreline protection boom at identified priority locations along the Ningaloo Coast during operations.	Pre-deployment of shoreline protection boom at identified priority locations along the Ningaloo Coast would reduce the time to deployment following the loss of hydrocarbons thereby increasing the potential for protection of environmental sensitivities.	N/A	N/A	N/A	Major; 2 people $1,000 / day x ~ 295 days = $590K	H	H	H	Low	H	Positive environment benefit gained by pre-deploying shoreline protection boom such as beach guardian at identified priority locations along the Ningaloo Coast, and Muiron Islands during project activities.	This control would have low survivability and major costs associated with standby rates for the field crew to monitor the condition of the boom.	**Reject**: Pre-deployment of shoreline boom has high costs that are disproportionate to the potential environmental benefit that might be gained particularly taking into consideration that sufficient booms are located in Exmouth and mobilisation timeframes are considered to be acceptable for rapid deployment.	-

Risk Assessment				ALARP Assessment													
								Effectiveness (High / Low)									
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
Administrate	Response strategy not executed effectively through planning or fast enough to prevent impact highly sensitive areas impacted.	Shoreline protection operations to be reviewed and managed by IMT through Incident Action Plan (IAP) process.	Within the first 24 hours, the BHP IMT will develop IAPs.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of shoreline protection operations will take place almost immediately in the event of a Level 2 spill. The shoreline protection operations would be adapted based on real-time information regarding the spill incident: determine if sea state and weather conditions are conducive to operations and applicability with other response strategies.	Controls have high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications for operations.	**Accept**: Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	**PS RS5.1**
	Response activities not considered in preparedness planning therefore not allowing for input into the NEBA.	Operational NEBA to include evaluation of requirement for implementation of shoreline protection operations.	The shoreline protection response strategy will be activated if Operational NEBA indicates the implementation would provide a net environmental benefit to prevent environmental impacts to sensitive environmental receptors.	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational NEBA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors. Shoreline protection will be activated if the Operational NEBA indicates the potential harm of implementation is less than leaving the oil untreated on the surface; and if the implementation of the			**PS RS5.2, PS RS5.6 and PS RS5.12**

Risk Assessment				ALARP Assessment												
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
													response strategy would provide a net environmental benefit to prevent/minimise environmental impacts to sensitive shorelines and shoreline receptors.			
	Predictive spill trajectory unknown when undertaking NEBA.	Oil spill modelling contract in place to provide predictions of oil trajectory to be undertaken to support the Operational NEBA and activated within 2 hours of notification.	Used as tool to gain situational awareness through real-time spill trajectory modelling to enable direction of daily shoreline protection operations.	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Positive environmental benefit gained as oil spill trajectory modelling will assist in the effective deployment of shoreline protection boom to areas where sensitive receptors require priority protection.			PS RS5.8
	Incompetent personnel utilised during response operations.	Trained operators to supervise boom deployment and shoreline protection operations.	Use of skilled personnel to supervise boom deployment and shoreline protection operations will increase efficiency of oil spill protection efforts.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by using skilled personnel to supervise boom deployment and shoreline protection operations to increase efficiency of response efforts, increases the potential that impacts to sensitive receptors will be prevented and reduces the possibility that mistakes are made that magnify the severity of the situation.			PS RS5.9
	Shoreline response delayed due to poor understanding of impact area and specific operational response.	Deployment of boom and any laydown areas will follow pre-designated plans for establishing a works area, as described in North West Cape Sensitivity Mapping (AOHSE-ER-0036), to protect environmental sensitivities and including areas of cultural sensitivity.	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental and cultural sensitivity.	N/A	N/A	N/A	Minor	H	H	H	H	H				PS RS5.4
	Vessel selection limits the ability to deploy boom.	Vessels used to deploy boom will be flat-bottomed (where safe and practicable) and no anchoring of vessels or booms will occur on emergent reefs or other fragile /	Increases the potential that impacts to sensitive receptors will be prevented by using plant and equipment that is fit-for-purpose.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by using small marine craft that are fit for purpose in working in shallow water and not anchoring on emergent coral reefs or other sensitive benthic habitats.			PS RS5.2 and PS RS5.7

Risk Assessment				ALARP Assessment													
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Effectiveness (High / Low): Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
		sensitive benthic habitats.														
	Response impact (positive or negative) is not known or measured.	Environmental monitoring	Environmental monitoring to evaluate the concentration of hydrocarbons; the effectiveness of shoreline protection; and the impact of hydrocarbons on marine and shoreline habitats.	N/A	N/A	Within 2 hours	Minor	H	H	H	H	H	Positive environmental benefit gained from adopting this control measure. Allows evaluation of the effectiveness of shoreline protection techniques.			**PS RS5.10**
	Response continues with no end point or is removed early.	Response strategy activities continued until termination criteria met.	Ensures that the shoreline response strategy continues until the performance outcome has been achieved.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained from ensuring that the shoreline protection response strategy continues until the performance outcome has been achieved.			**PS RS5.13**
Current Capability																
Administrate	Response resources not available.	Access to shoreline protection equipment, e.g. beach guardian, fence boom, deployment kits, owned by AMOSC (in Exmouth, Fremantle, Dampier and Geelong).	Mobilisation of AMOSC owned shoreline protection equipment from Exmouth / Fremantle / Geelong, and BHP stock from Dampier.	Small	AMOSC	0-2	Minor	H	H	H	H	H	Positive environmental benefit gained from implementation of this control measure. The objective of shoreline protection is to separate the oil from shoreline sensitivities.	The response capacity is small but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements with AMOSC / OSRL. Control has minor cost implications for operations.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS5.5**
	Shoreline response delayed due to poor understanding of impact area and specific operational response.	Shoreline tactical response plans for key sensitivities.	These plans outline the equipment and resources requirements for pre impact and post impact response.	N/A	N/A	0-1	Minor	H	H	H	H	H				**PS RS5.4**
	Response resources not available.	Access to shoreline protection equipment.	Mobilisation of OSRL shoreline protection equipment from Singapore and other countries.	Small	OSRL	~14 days	Minor	Low (due to time to mobilise)	H	H	H	H	These plans outline the equipment and resources requirements for pre impact and post impact response. Reduces time for response personnel to determine site requirements.	This control has high effectiveness; are available, functional and reliable and in general are survivable and compatible with other control measures.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS5.2**, **PS RS5.5** and **PS RS5.6**

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
														Control has minor cost implications for operations.		
	Response resources not available.	Access to small support vessels (AMOSC, local charter).	Mobilisation of AMOSC owned small craft from Geelong and / or vessels of opportunity available on the local spot charter market in Exmouth.	Small	4	7	Minor	H	H	H	H	H	The environmental benefit associated with shoreline protection is potentially significant, which has the potential to reduce the environmental impact.	The response capacity is small for vessel operations but the control effectiveness is generally high (vessel operations are only possible during daylight hours) and the cost of using marine vessels available through AMOSC and on the local spot-charter market in Exmouth / Dampier / Broome has minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	PS RS5.2, PS RS5.5 and PS RS5.6
Scalable Options																
Administrate	Response resources not available.	Support vessels (Perth / Australia).	Acquisition of more support vessels via charter on the spot-market from Perth and around Australia.	Small	As required	3-8	Moderate	H	H	H	H	H	The environmental benefit associated with shoreline protection is considered to be significant, which has the potential to reduce the environmental impact.	The response capacity is small but the control effectiveness is generally high and the cost of acquiring small marine vessels and more equipment as required through the spot-charter market around Australia has minor cost implications. Cost during activation would be moderate.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	PS RS5.2, PS RS5.5 and PS RS5.6

Risk Assessment				ALARP Assessment												
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Effectiveness (High / Low): Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
	Response resources not available.	Obtain additional marine shoreline protection equipment.	Acquisition of more shoreline protection equipment to be on standby.	Small	As required	7 days	Minor	Low (due to time to mobilise)	H	H	H	H	Scalable options involve accessing more vessels and equipment from around Australia and the broader region including SE Asia.	Stockpiles of boom held by AMOSC are sufficient to meets the needs of the areas at risk. In addition, BHP has access to additional stockpiles held by AMSA, Mutual Aid and supplemented by OSRL international stocks.		**PS RS5.2, PS RS5.5 and PS RS5.6**
	Response resources not available.	Dedicated shoreline protection vessel with boom deployment equipment on standby at Exmouth/ Dampier Supply base.	On standby 24/7 during operations to expedite initiation of shoreline protection operations.	Small	1	0-1	Major $35K/day x ~ 295 days = $10.3M	H	H	L	H	H	The environmental benefit associated with shoreline protection is considered to be significant, which has the potential to reduce the environmental impact	Dedicated standby vessels have substantial costs, in the order of $500K during operations.	**Reject:** Sufficient equipment is available in Exmouth, which is the closest oil spill equipment storage location.	-

4 Shoreline Clean-up

Table 4: RS8 Shoreline Clean-up Response Strategy risk assessment including evaluation of effectiveness of controls, environmental benefit gained compared with practicability and ALARP summary

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
Eliminate	Negative environmental impact from the execution of this response strategy	No shoreline clean-up	Do nothing option	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No environment benefit would be gained from this option; experience from past oil spills suggests that environmental sensitivities can be protected effectively when shoreline clean-up operations are activated.	There may be occasions when shoreline clean-up is not implemented, e.g. during poor weather, but in general, the do nothing option is not considered within the external context (e.g. stakeholder views) to be a viable option.	**Reject:** Shoreline clean-up is a recognised strategy for the mitigation of oil spill impacts.	-
Separate	Sensitive vegetation impacted by machinery	No machinery to be used in mangroves. No machinery to be used within 20 m of an identified turtle nest.	Separate the potential of impacts due to machinery on sensitive receptors.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by separating the potential of impacts due to machinery on sensitive receptors.	Control has high effectiveness; are available, functional, and reliable and in general are serviceable and compatible with other control measures. Control has no cost implications.	**Accept**: Control is practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	PS RS8.11
Administrate	Response strategy executed adhoc with no real planning	Shoreline clean-up operations reviewed and managed by IMT through Incident Action Plan (IAP) process.	Within the first 24 hours, the BHP IMT will develop IAPs.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The shoreline clean-up operations would be adapted based on real-time information regarding the spill incident: determine if sea state and weather conditions are conducive to operations and applicability with other response strategies.	Controls have high effectiveness; are available, functional, and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	PS RS8.1, PS RS 8.2, and PS RS8.7
	Response activities not considered in preparedness planning therefore not allowing for input into the NEBA.	Operational NEBA to include evaluation of requirement for implementation of shoreline clean-up operations.	The shoreline clean-up response strategy will be activated if Operational NEBA indicates the implementation would provide a net environmental benefit to prevent environmental impacts to sensitive environmental receptors.	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational NEBA will be completed based on specific circumstances of the			PS RS8.2

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
													spill incident, using real-time information (spill trajectory modelling, spill observations, weather, and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors.			
	Poor situational awareness and understanding of oil spill trajectory prior to response execution (i.e. oil could be heading out to sea).	Modelling predictions of oil trajectory to be undertaken to support the Operational NEBA.	Used as tool to gain situational awareness through real-time spill trajectory modelling to enable direction of daily shoreline clean-up operations.	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Shoreline clean-up will be activated if the Operational NEBA indicates the potential harm of implementation is less than leaving the oil untreated on the shoreline; and if the implementation of the response strategy would provide a net environmental benefit to prevent/minimise environmental impacts to sensitive shorelines and shoreline receptors.			
	Response strategy not executed effectively through planning or fast enough to prevent impact highly sensitive areas impacted	Implement shoreline clean-up response strategy in accordance with optional shoreline protection methods for different coastal types (refer to Table 11-6 to Table 11-8; and North West Cape Sensitivity Mapping (AOHSE-ER-0036).	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental sensitivity.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by using established shoreline protection plans to increase efficiency of response efforts, increases the potential that impacts to sensitive receptors will be prevented and reduces the possibility that mistakes are made that magnify the severity of the situation.			PS RS8.3
	Deployment of resources ineffective due to poor understanding of impact area	Conduct observations/ surveys prior to deployment of equipment and personnel to develop a deployment/ operations plan, which includes avoidance of impacts to wildlife, organisation of ground disturbance, protection of sensitive areas, and	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental sensitivity.	N/A	N/A	N/A	Minor	H	H	H	H	H	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental sensitivity.			PS RS8.3

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
		consultation with DBCA and local stakeholders.														
	Regulatory approval not in place prior to execution of shoreline clean-up activities	All necessary regulatory approvals in place prior to implementation of shoreline clean-up activities.	Ensures that shoreline clean-up activities are approved and subject to any conditions required of the State agencies.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by ensuring that shoreline clean-up activities are approved and subject to any conditions required of the State agencies.			PS RS8.4
	Poor shoreline clean-up practices with remobilisation of oil in the marine environment	Prevent further surface water contamination by conducting all flushing clean-up activities to a contained area.	Ensures that shoreline accumulated oil is contained and that impacts are not spread across a wider area.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by ensuring that shoreline accumulated oil is contained and that impacts are not spread across a wider area.			PS RS8.9
	Poor understanding of the effectiveness of shoreline clean-up and its impact on the environment	Implement environmental monitoring to determine the ongoing acceptability of the environmental risk associated with the application of shoreline clean-up methods.	Water, sediment, and benthic infauna quality monitoring to evaluate the effectiveness of shoreline clean-up techniques.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by understanding the effectiveness of shoreline clean-up techniques.			PS RS8.10
	Shoreline activities impacting areas of cultural significance	Shoreline clean-up operations will avoid cultural heritage sensitivities.	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas of known cultural significance.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by taking into consideration any advice from State government agencies and spatial information to avoid impacts to sensitive cultural heritage sensitivities.			PS RS8.5
	Response continues with no end point or is removed early	Response strategy activities continued until termination criteria met.	Ensures that the shoreline response strategy continues until the performance outcome has been achieved.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained from ensuring that the shoreline clean-up response strategy continues until the performance outcome has been achieved.			PS RS8.12
Current Capability																
Administrate	Response resources not available	Access to shoreline clean-up equipment owned by AMOSC (in Exmouth, Fremantle, Dampier and Geelong).	Mobilisation of AMOSC owned shoreline clean-up equipment from Exmouth / Fremantle / Geelong.	Small	AMOSC	24-48 hours	Minor	H	H	H	H	H	Positive environmental benefit gained from implementation of this control measure. The objective of shoreline clean-up is to remove	The response capacity is small but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements	Accept: Controls are practicable and the cost sacrifice is not grossly	PS RS8.8

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
	Response resources not available	Access to shoreline clean-up equipment owned by OSRL	Mobilisation of OSRL shoreline clean-up equipment from Singapore and other countries.	Small	OSRL	14 days	Minor	Low (due to time to mobilise)	H	H	H	H	the oil from shoreline sensitivities.	with AMOSC / OSRL. Control has minor cost implications.	disproportionate to the environmental benefit gained.	**PS RS8.8**
	Response resources not available	Access to small support vessels (AMOSC, local charter)	Mobilisation of AMOSC owned small craft from Geelong and / or vessels of opportunity available on the local spot charter market in Exmouth.	Small	4	7	Minor	H	H	H	H	H		The response capacity is small for vessel operations but the control effectiveness is generally high (vessel operations are only possible during daylight hours) and the cost of using marine vessels available through AMOSC and on the local spot-charter market in Exmouth / Dampier / Broome has minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS8.8**
	Mobilisation of response personnel to impact location delayed	Mobilise First Strike Team to Exmouth (or Onslow) within 24 hours following notification by IMT.	Mobilisation of BHP personnel from Perth to provide first-hand situational awareness to the IMT.	Small	BHP	0-1	Minor	H	H	H	H	H	Positive environmental benefit gained from implementation of this control measure. The objective is to provide first-hand situational awareness to the IMT.	The response capacity is small but the control effectiveness is generally high. The cost of using BHP employees is minor.		**PS RS8.6**
	No arrangement with 3rd Party services leading to insufficient resourcing during response	AMOSC and OSRL contracts and other third party agreements for provision of resources for shoreline clean-up in place during operations.	Mobilisation of AMOSC / OSRL personnel to provide situational awareness and expert advice to the IMT on clean-up protection priorities.	Small	AMOSC / OSRL	24-48 hours (AMOSC) 14 days (OSRL)	Minor	H	H	H	H	H	Positive environmental benefit gained from mobilisation of AMOSC / OSRL personnel to provide situational awareness and expert advice to the IMT on clean-up protection priorities.	The response capacity is small but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements with AMOSC / OSRL. Control has minor cost implications.		**PS RS8.8**
Scalable Options																
Administrate	Response resources not available	Support vessels (Perth / Australia).	Acquisition of more support vessels via charter on the spot-market from Perth and around Australia.	Small	As required	3	Moderate	H	H	H	H	H	Positive environmental benefit gained from implementation of this control measure. The objective of shoreline clean-up is to remove the oil from shoreline sensitivities.	The response capacity is small but the control effectiveness is generally high and the cost of acquiring small marine vessels and more equipment as required through the spot-charter market around Australia has minor cost implications. Cost during activation would be moderate.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS8.8**
	Response resources not available	Access to more oil spill responders.	Acquisition of more oil spill responders (skilled and unskilled) from AMOSC / OSRL and resource labour companies (e.g. Hays) in Perth and around Australia.	Small	As required		Moderate	H	H	H	H	H				**PS RS8.8**

5 Environmental Monitoring

Table 5: RS10 Environmental Monitoring Response Strategy risk assessment including evaluation of effectiveness of controls, environmental benefit gained compared with practicability and ALARP summary

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
Eliminate	Negative environmental impact from the execution of this response strategy.	No environmental monitoring.	Do nothing option.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No environment benefit would be gained from this option; environmental data on any oil spill impacts will be required to understand recovery from any disturbance and to inform the effectiveness of the response strategies.	This control is practicable and not implementing it would not be satisfactory from a stakeholder perspective.	**Reject:** Environmental monitoring is a recognised strategy for understanding the effects of an oil spill on environmental sensitivities.	-
Administrate	Response strategy executed adhoc with no real planning leading ineffective response.	Environmental monitoring operations reviewed and managed by IMT through Incident Action Plan (IAP) process.	Within the first 24 hours, the BHP IMT will develop IAPs.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of shoreline protection operations will take place almost immediately in the event of a Level 2 spill. The shoreline protection operations would be adapted based on real-time information regarding the spill incident: determine if sea state and weather conditions are conducive to operations and applicability with other response strategies.	Controls have high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	**PS RS10.1**

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
	Response activities not considered in preparedness planning therefore not allowing for input into the NEBA.	Operational NEBA to include evaluation of requirement for implementation of environmental monitoring operations, initiate mobilisation of resources within 24 hours notification by Incident Commander.	The environmental monitoring response strategy will be activated if Operational NEBA indicates the implementation would provide a net environmental benefit in understanding potential environmental impacts to sensitive environmental receptors.	N/A	N/A	0-1	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational NEBA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather and sea state conditions etc.) to confirm the appropriate response strategies to adopt for priority protection of priority locations and sensitive receptors. Environmental monitoring will be activated by the Operational NEBA to understand environmental impacts to sensitive receptors.			**PS RS10.2** **and** **PS RS10.3**
	Poor situational awareness and understanding of oil spill trajectory prior to response execution (i.e. oil could be heading out to sea).	Modelling predictions of oil trajectory to be undertaken to support the Operational NEBA.	Used as tool to gain situational awareness through real-time spill trajectory modelling to enable direction of daily environmental monitoring operations.	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Positive environmental benefit gained as oil spill trajectory modelling will assist in the effective deployment of environmental monitoring field teams to areas where sensitive receptors require priority protection.			**PS RS10.4**

Risk Assessment				ALARP Assessment													Performance Standard
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Effectiveness (High / Low)					Environmental Benefit Gained	Practicability	ALARP Summary		
								Availability	Functionality	Reliability	Survivability	Independence / Compatibility					
	Insufficient number of trained personnel.	Trained personnel to implement environmental monitoring operations.	Use of skilled personnel to implement environmental monitoring operations will increase efficiency of oil spill protection efforts.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by using skilled personnel to implement environmental monitoring guidelines, which will increase efficiency of response efforts, increases the potential that impacts to sensitive receptors will be prevented and reduces the possibility that mistakes are made that magnify the severity of the situation.				**PS RS10.3**
	Poor understanding of the effectiveness of response strategies and their impact on the environment.	Activation of environmental monitoring guidelines will follow pre-designated plans for establishing works areas, as described in North West Cape Sensitivity Mapping (AOHSE-ER-0036), to protect environmental sensitivities.	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental sensitivity.	N/A	N/A	N/A	Minor	H	H	H	H	H					**PS RS10.5**
	Vessel selection and use may cause more impact than the benefit.	Vessels used to implement environmental monitoring will be fit-for-purpose and no anchoring of vessels will occur on emergent reefs or other fragile / sensitive benthic habitats [**see Note 1 at end of table**].	Increases the potential that impacts to sensitive receptors will be prevented by using plant and equipment that is fit-for-purpose.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by using small marine craft that are fit for purpose in working in shallow water and not anchoring on emergent coral reefs or other sensitive benthic habitats.				**PS RS10.6**
	Monitoring activities impacting areas of cultural significance.	Environmental monitoring operations will avoid cultural heritage sensitivities.	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas of known cultural significance.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by taking into consideration any advice from State government agencies and spatial information to avoid impacts to sensitive cultural heritage sensitivities.				**PS RS10.10**
	Response continues with no end point or is removed early.	Response strategy activities continued until termination criteria met.	Ensures that the environmental response strategy continues until the performance	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained from ensuring that the environmental				**PS RS10.11**

Risk Assessment				ALARP Assessment												Performance Standard
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Effectiveness (High / Low): Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
			outcomes have been achieved.										response strategy continues until the performance outcomes have been achieved.			
Current Capability																
Administrate	Insufficient specialised personnel available – resourcing.	Access to first strike environmental monitoring responders for water quality, sediment quality and benthic infauna (pre-approved vendors who can be called upon at short notice to provide services if required).	Mobilisation of emergency responders to Exmouth from Perth to collect water and sediment samples in the post-spill pre-impact period.	Small	SGS	48-72 hours	Minor	H	H	H	H	H	Positive environmental benefit gained from implementation of this control measure. The objective of environmental monitoring is to collect data to understand the effect of an oil spill on environmental sensitivities.	The response capacity is small but the control effectiveness is generally high. Pre-approved vendors in place during petroleum activities for activation of environmental monitoring services in the event of an oil spill. Control has minor cost implications	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS10.7**
	Insufficient specialised personnel available – resourcing.	Access to scientific field sampling personnel.	Mobilisation of scientific field sampling personnel to Exmouth from Perth to collect environmental data (birds, marine mammals, megafauna, benthic habitats and benthic primary producers, marine reptiles, fisheries and fishes) following sampling designs and procedures outlined in the relevant environmental monitoring procedure.	Small	80	48-72 hours	Minor	H	H	H	H	H				**PS RS10.7**
	Poor sampling techniques and plans leading to inadequate monitoring and poor quality data / results.	Sampling operations for marine water, sediment quality and benthic infauna to follow procedures outlined in AOHSE-ER-0037 to allow determination of any environmental impacts and inform effectiveness of response strategies. Laboratory analyses will follow: US EPA Method 8260 (volatile organic hydrocarbons); and US EPA Method 8015 (total petroleum hydrocarbons).	Standard procedures and methodologies (US EPA) are in place for laboratory analysis.	Small	N/A	N/A	Minor	H	H	H	H	H				**PS RS10.8**

Risk Assessment				ALARP Assessment												
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Effectiveness (High / Low): Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
	Poor sampling techniques and plans leading to inadequate monitoring and poor quality data / results.	Sampling operations for marine mammals and megafauna, avifauna, shallow water benthic habitats, marine reptiles, commercial/ recreational fish species and mobile and site-attached fishes associated with coral reefs, seagrasses, macroalgal beds, deep-water sponge gardens and mangroves will follow procedures outlined in AOHSE-ER-0038, AOHSE-ER-0039, AOHSE-ER-0040, AOHSE-ER-0043, AOHSE-ER-0048 and AOHSE-ER-0051 to allow determination of any environmental impacts and inform effectiveness of response strategies.	Development of oil spill environmental monitoring appropriate to the nature and scale of the environmental risk to determine the extent, severity and duration of impact to relevant environmental receptors.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				**PS RS10.9**
Scalable Options																
Administrate	Insufficient specialised personnel available – resourcing.	Access to more environmental monitoring responders.	Mobilisation of more scientific field sampling personnel to Exmouth from Perth to collect environmental data (birds, marine mammals, megafauna, benthic habitats and benthic primary producers, marine reptiles, fisheries and fishes) following sampling designs and procedures outlined in the relevant environmental monitoring procedure.	Small	50	14-21	Minor	H	H	H	H	H	Positive environmental benefit gained from implementation of this control measure. The objective of environmental monitoring is to collect data to understand the effect of an oil spill on environmental sensitivities.	The response capacity is small but the control effectiveness is generally high. BHP has access to this capability through preferred vendors. Control has minor cost implications.	**Accept**: Control is practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS10.7**
	Insufficient specialised personnel available – resourcing.	Dedicated environmental monitoring crew with sampling equipment on standby at Exmouth.	On standby 24/7 during operations to expedite initiation of environmental monitoring operations.	Small	10	0-1	Major, >10 people at $1,000 / day by ~295 days	H	H	Low	H	H	Positive environmental benefit gained from implementation of this control measure. The objective of environmental monitoring is to collect data to understand the	Dedicated standby field crews have substantial costs that would be incurred for the duration of the operation.	**Reject**: This controls has high costs that are dis-proportionate to the potential environmental benefit that might be gained	-

Risk Assessment				ALARP Assessment												Performance Standard
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
													effect of an oil spill on environmental sensitivities. Scalable options for marine recovery operations involve having dedicated vessels on standby with marine recovery equipment on-board in the unlikely event of loss of hydrocarbons.		particularly taking into consideration the availability of first strike responders who are contracted to be on 24/7 standby during the activity and can be onsite with 'next flight' status.	

[1] For the purpose of this control, deploying remote video cameras onto sensitive and fragile habitats will not be considered 'anchoring'.

6 Oiled Wildlife Response

Table 6: RS11 Oiled Wildlife Response Strategy risk assessment including evaluation of effectiveness of controls, environmental benefit gained compared with practicability and ALARP summary

Risk Assessment				ALARP Assessment												
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Effectiveness (High / Low): Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
Eliminate	Negative environmental impact from the execution of this response strategy	No oiled wildlife response	Do nothing option	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No environment benefit would be gained from this option.	This control is practicable and not implementing it would not be satisfactory from a stakeholder perspective.	**Reject:** Oiled wildlife response is a recognised strategy for preventing impacts of an oil spill on environmental sensitivities.	-
Administrate	Response strategy executed adhoc with no real planning leading to ineffective response	Oiled wildlife response operations will be reviewed and managed by IMT through Incident Action Plan (IAP) process.	Within the first 24 hours, the BHP IMT will develop IAPs.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of oiled wildlife operations will take place almost immediately in the event of a Level 2 spill. The oiled wildlife operations would be adapted based on real-time information (situational awareness / OSTM) regarding the spill incident to inform collection of wildlife.	Controls have high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	**PS RS11.1**
	Response activities not considered in preparedness planning therefore not allowing for input into the NEBA.	Operational NEBA to include evaluation of requirement for implementation of oiled wildlife response.	The oiled wildlife response strategy will be activated if Operational NEBA indicates the implementation would provide a net environmental benefit in preventing impacts to sensitive receptors.	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational NEBA will be completed based on specific circumstances of the spill incident, using real-time information (spill trajectory modelling, spill observations, weather and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors. Oiled wildlife response will be activated by the Operational NEBA to prevent impacts to sensitive receptors.			**PS RS11.2**
	Unsuitably qualified personnel	Lead response personnel are trained and experienced for the activities to which they are assigned.	Use of skilled personnel to implement oiled wildlife response will increase efficiency of oil spill protection efforts.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by using skilled personnel to implement oiled wildlife response following Industry and WA State Government drafted guidelines, which will increase efficiency of response efforts, increases the potential that impacts to sensitive receptors will be prevented and reduces the possibility that mistakes are made that magnify the severity of the situation.			**PS RS11.3**

Risk Assessment				ALARP Assessment													
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Effectiveness (High / Low) Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
	Response strategy executed adhoc with no real planning leading to ineffective response	Activation and implementation of oiled wildlife response will follow pre-designated plans for establishing works areas, as described in Western Australian Oiled Wildlife Response plan (WAOWRP); and Pilbara Region Oiled Wildlife Response Plan (PROWRP).	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas with environmental sensitivity.	N/A	N/A	N/A	Minor	H	H	H	H	H				**PS RS11.5**
	Response activities impacting areas of cultural significance	Oiled wildlife response operations will avoid cultural heritage sensitivities.	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas of known cultural significance.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by taking into consideration any advice from State government agencies and spatial information to avoid impacts to sensitive cultural heritage sensitivities.			**PS RS11.8**
	Response continues with no end point or is removed early.	Response strategy activities continued until termination criteria met.	Ensures that the oiled wildlife response strategy continues until the performance outcome has been achieved.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained from ensuring that the oiled wildlife response strategy continues until the performance outcome has been achieved.			**PS RS11.7 and PS RS11.9**
Current Capability																
Administrate	No access to equipment and personnel in reasonable timeframes.	Access to oiled wildlife response equipment and personnel	Contract with AMOSC and OSRL for access to oiled wildlife and equipment	N/A	N/A	24-48 hours (AMOSC) 14 days (OSRL)	Minor	H	H	H	H	H	Positive environmental benefit gained from implementation of this control measure. The objective of oiled wildlife response is to prevent effects of an oil spill on environmental sensitivities.	The response capacity is small but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements with AMOSC and OSRL. Control has minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**RS11.4,**

Risk Assessment				ALARP Assessment												Performance Standard
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing (days)	Cost	Effectiveness (High / Low): Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	
Administrate	Insufficient specialised personnel available – resourcing.	Access to more oiled wildlife responders.	Mobilise more oiled wildlife responders from around Australia and internationally.	N/A	N/A	14-21	Minor	H	H	H	H	H	Positive environmental benefit gained from implementation of this control measure. The objective of oiled wildlife response strategy is to prevent effects of an oil spill on environmental sensitivities.	The response capacity is small but the control effectiveness is generally high. BHP has access to this capability through contractual arrangements with AMOSC. Control has minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS11.3, and PS RS11.4**
	No access to suitable specialised equipment in reasonable timeframes.	Pre-deployment of oiled wildlife container and wildlife personnel on standby at Exmouth during operations.	On standby 24/7 during operations to expedite initiation of wildlife response.	Small	1	0-1	Major	H	H	Low	H	H	Positive environmental benefit gained from implementation of this control measure. The objective of oiled wildlife response is to prevent effects of an oil spill on environmental sensitivities. Scalable options for oiled wildlife response involve a pre-deployment and establishment of the oiled wildlife facility to be on standby, fully functional and capable of receiving oiled wildlife on Day 1 of an incident.	Dedicated standby oiled wildlife crews have substantial cost.	**Reject**: This control has major costs that are disproportionate to the potential environmental benefit that might be gained. DBCA is the lead organisation for OWR in State waters. BHP will act as the support organisation providing access to AMOSC and OSRL wildlife capability and any other requests by DBCA.	-

7 Waste Management

Table 9: RS13 Waste Management Response Strategy Risk assessment including evaluation of effectiveness of controls, environmental benefit gained compared with practicability and ALARP summary

Risk Assessment				ALARP Assessment												
								Effectiveness (High / Low)								
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing(Days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
Eliminate	Negative environmental impact from the execution of this response strategy.	No waste management	Do nothing option	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No environmental benefit would be gained from this option; experience from past oil spills suggests that environmental sensitivities can be protected effectively when waste management operations are activated.	Waste management is practicable and the do nothing option is not considered within the external context (e.g. stakeholder views) to be a viable option.	**Reject:** Waste management is a recognised strategy for the mitigation of oil spill impacts.	-
Administrate	Response strategy executed adhoc with no real planning leading to ineffective response.	Waste management operations reviewed and managed by IMT through Incident Action Plan (IAP) process.	Within the first 24 hours, the BHP IMT will develop IAPs.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The review/evaluation of waste management operations will take place almost immediately in the event of a Level 2 spill. The waste management operations would be adapted based on real-time information regarding the spill incident.	Controls have effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications.	**Accept**: Controls are practicable and the cost sacrifice is not disproportionate to the environmental benefit gained.	**PS RS13.3**
	Response activities not considered in preparedness planning therefore not allowing for input into the NEBA.	Operational NEBA to include evaluation of requirement for implementation of waste management operations.	The waste management response strategy will be activated to prevent environmental impacts to sensitive environmental receptors.	N/A	N/A	0-2 hours	Minor	H	H	H	H	H	Positive environmental benefit from identification of the most effective response strategies with the least detrimental impacts. The Operational NEBA will be completed based on specific circumstances of the spill incident,			**PS RS13.2**

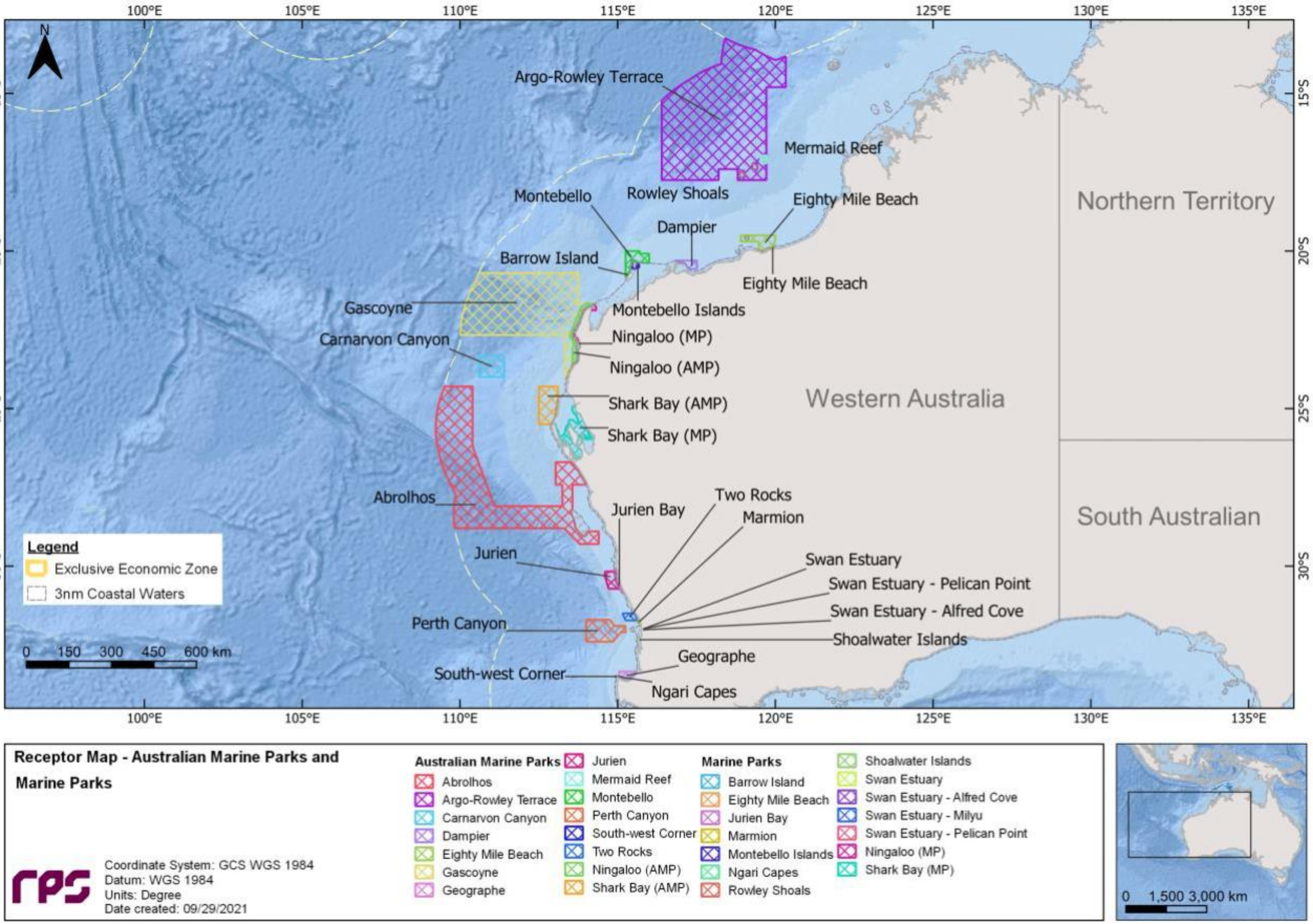
Risk Assessment				ALARP Assessment													
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing(Days)	Cost	Effectiveness (High / Low) Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
													using real-time information (spill trajectory modelling, spill observations, weather and sea state conditions etc.) to confirm the appropriate response strategies to adopt for protection of priority locations and sensitive receptors. Waste management will be activated to prevent/minimise environmental impacts to sensitive shorelines and shoreline receptors.			
	No access to suitable specialised equipment in reasonable timeframes.	Mobilisation of equipment and personnel to conduct waste management response within 24 hours of notification by IMT following outcomes of first IAP and maintained regularly in IAP outcomes.	Timely implementation of waste management plan and contractor.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained from rapid response of waste management plant, equipment and resources from Dampier / Karratha.			**PS RS13.1 and PS RS13.5**
	Recovered waste is not handled or managed effectively or efficiently further impacting the environment.	Waste retrieved to be managed in accordance with the Waste Management Plan.	Ensures waste management policies and procedures are being followed.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained from rapid response of waste management plant, equipment and resources from Dampier / Karratha.			**PS RS13.6**
	Poor understanding of the effectiveness of waste management and its impact on the environment.	Implement environmental monitoring to determine the ongoing acceptability of the environmental risk associated with waste	Environmental monitoring will be used to determine the effectiveness of waste management controls and techniques for removing waste oil from site.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained from environmental monitoring in understanding the effectiveness of waste management controls and techniques for removing waste oil			**PS RS13.7**

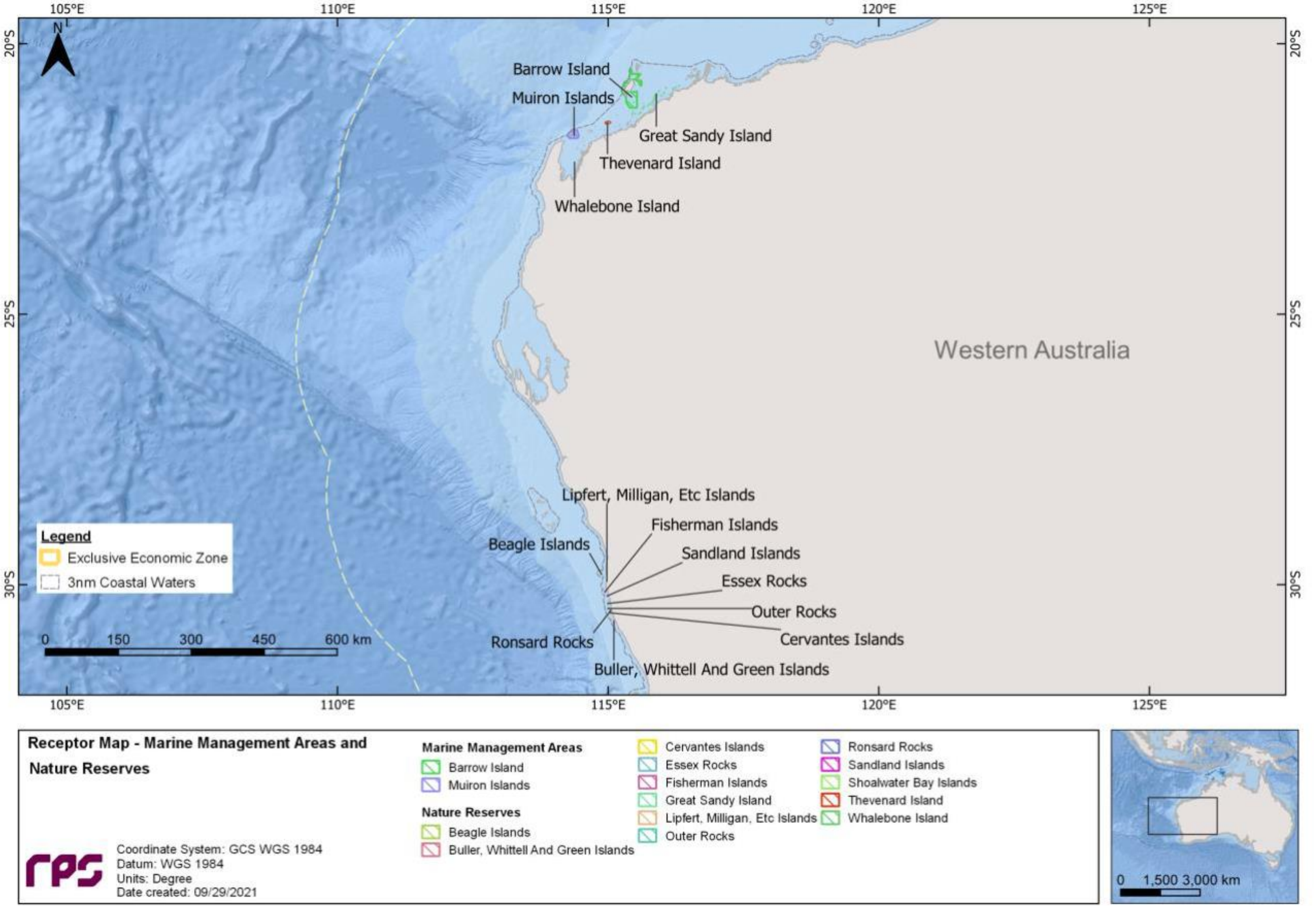
Risk Assessment				ALARP Assessment													
								Effectiveness (High / Low)									
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing(Days)	Cost	Availability	Functionality	Reliability	Survivability	Independence / Compatibility	Environmental Benefit Gained	Practicability	ALARP Summary	Performance Standard
		management methods.											from site. Outcomes of environmental monitoring will be used to inform waste management response strategy through the IAP's.			
	Response activities impacting areas of cultural significance.	Waste management operations will avoid cultural heritage sensitivities.	Increases the potential that impacts to sensitive receptors will be prevented by avoiding areas of known cultural heritage significance.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained by taking into consideration any advice from State government agencies and spatial information to avoid impacts to cultural heritage sensitivities.			**PS RS13.8**
	Response continues with no end point or is removed early.	Response strategy activities continued until termination criteria met.	The waste management response strategy will continue to prevent environmental impacts to sensitive environmental receptors until the performance outcome has been achieved.	N/A	N/A	N/A	Minor	H	H	H	H	H	Positive environmental benefit gained from ensuring that the waste management response strategy continues until the performance outcome has been achieved.			**PS RS13.9**
Current Capability																
Administrate	No access to suitable specialised equipment in reasonable timeframes.	Access to waste management plant and equipment in place during operations.	Enables rapid response of waste management resources from Dampier / Karratha.	Large	Veolia / NWWA	0-1	Moderate	H	H	H	H	H	Positive environmental benefit gained from implementation of this control measure. The objective of waste management is to prevent impacts to sensitive receptors by the removal of oiled waste from site.	Control has high effectiveness; are available, functional and reliable and in general are serviceable and compatible with other control measures. Controls have minor cost implications for operations but moderate to major costs if implemented.	**Accept**: Control is practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS 13.1 and PS RS13.4**
Scalable Options																

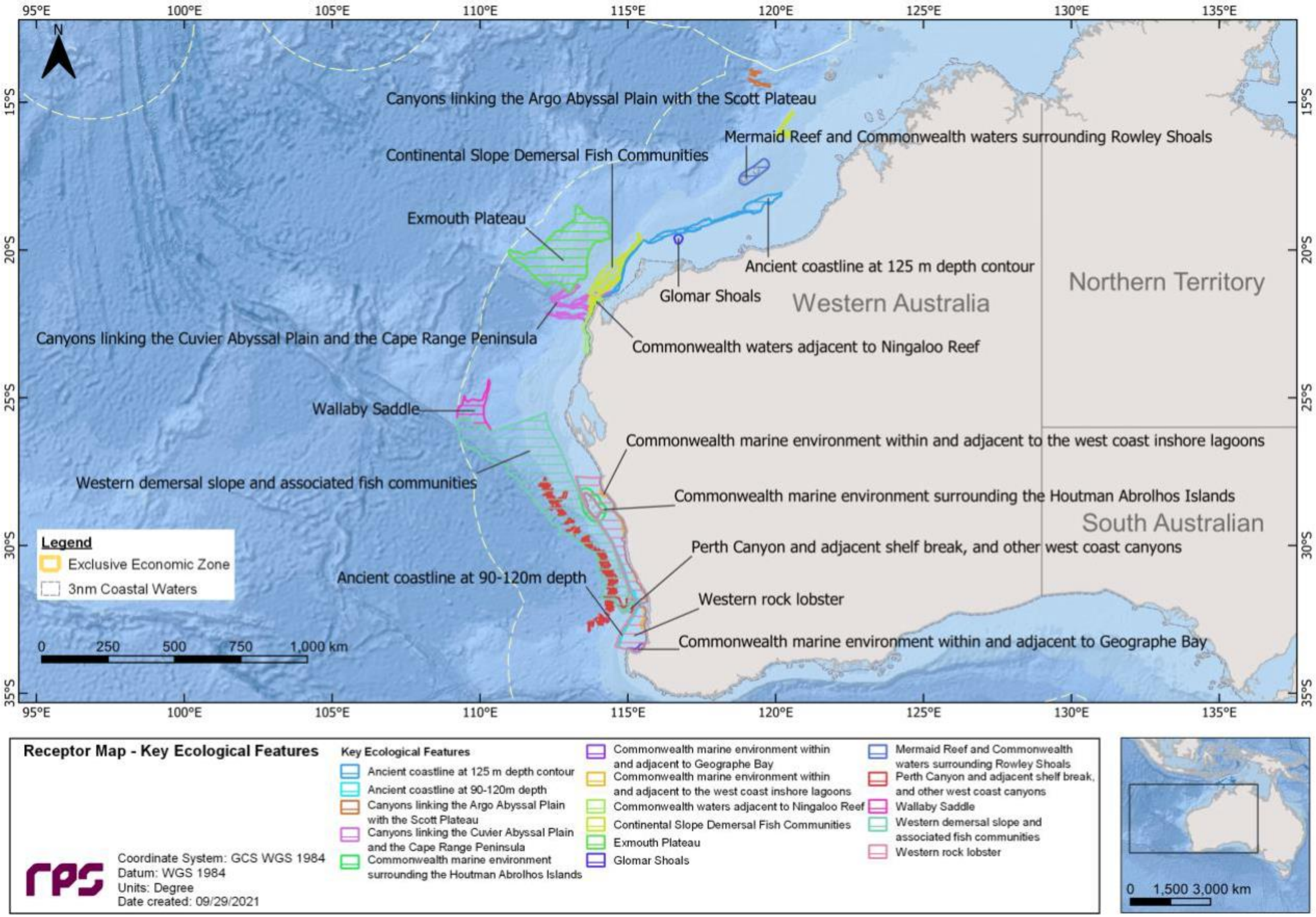
Risk Assessment				ALARP Assessment												Performance Standard
Function	Risk	Control Measure	Rationale	Response Capacity	Units	Timing(Days)	Cost	Effectiveness (High / Low)					Environmental Benefit Gained	Practicability	ALARP Summary	
								Availability	Functionality	Reliability	Survivability	Independence / Compatibility				
Administrate	No access to suitable specialised equipment in reasonable timeframes.	Access to more waste management plant and equipment.	Acquisition of more waste management plant and equipment from Perth and around Australia.	Small	As required	10	Moderate	H	H	H	H	H	Positive environmental benefit gained from ensuring that the waste management response strategy continues until the performance outcome has been achieved. Scalable options involve accessing more plant and equipment from Perth and if needed around Australia.	This control is effective and the cost of acquiring more plant equipment from Perth and around Australia would potentially have moderate cost implications. Cost during activation would be major.	**Accept**: Controls are practicable and the cost sacrifice is not grossly disproportionate to the environmental benefit gained.	**PS RS 13.1 and PS RS13.4**

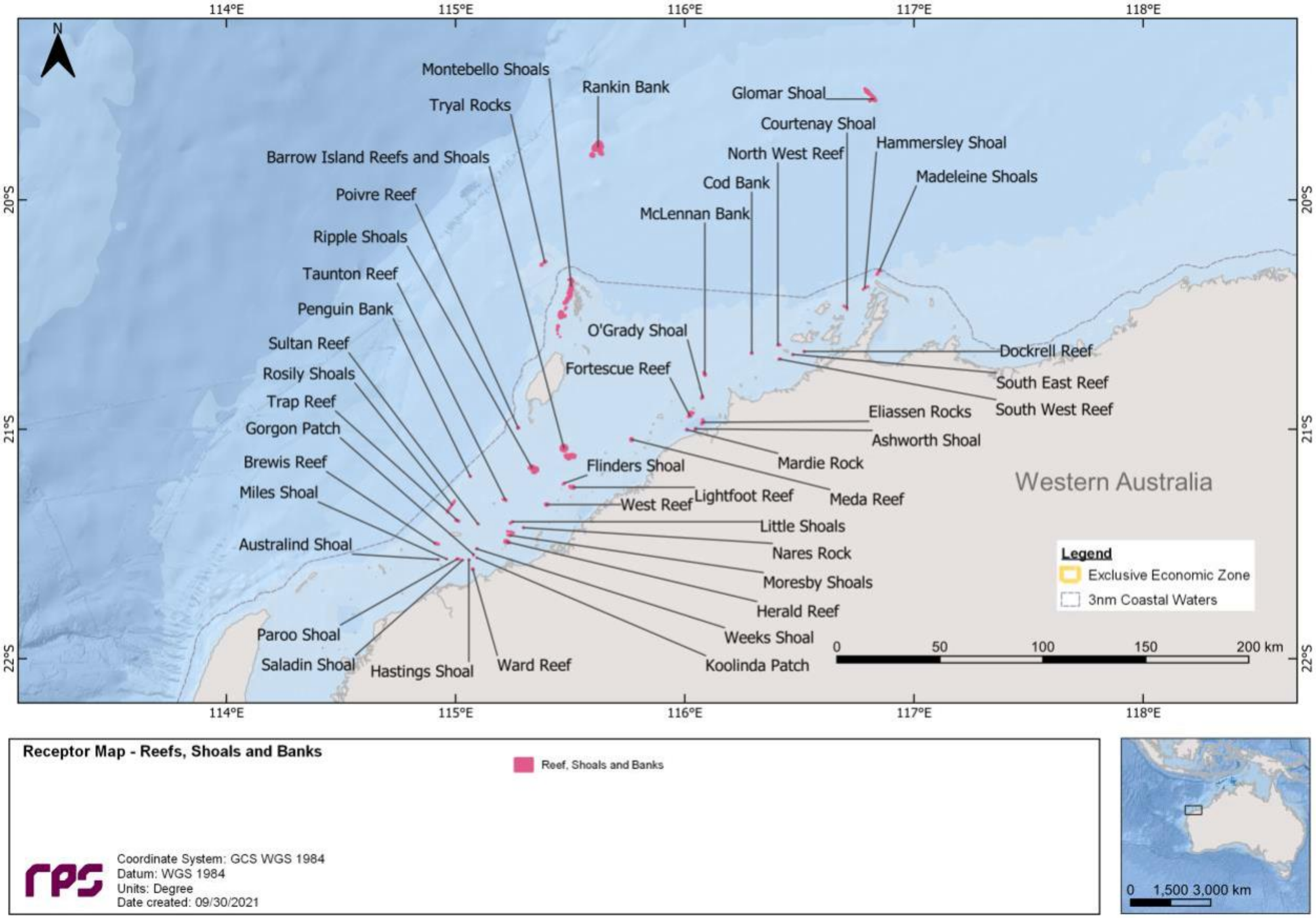
Appendix H

Environmental Receptor Locations Used in Oil Spill Modelling


100°E
105°E
110°E
115°E
120°E
125°E
130°E
135°E
15°S
20°S
25°S
30°S
N
Argo-Rowley Terrace
Mermaid Reef
Montebello
Rowley Shoals
Eighty Mile Beach
Dampier
Barrow Island
Eighty Mile Beach
Gascoyne
Montebello Islands
Ningaloo (MP)
Carnarvon Canyon
Ningaloo (AMP)
Shark Bay (AMP)
Shark Bay (MP)
Western Australia
Northern Territory
South Australian
Abrolhos
Jurien Bay
Two Rocks
Marmion
Jurien
Swan Estuary
Swan Estuary - Pelican Point
Swan Estuary - Alfred Cove
Perth Canyon
Shoalwater Islands
Geographe
South-west Corner
Ngari Capes
Legend
Exclusive Economic Zone
3nm Coastal Waters
0 150 300 450 600 km
Receptor Map - Australian Marine Parks and Marine Parks
Australian Marine Parks
Abrolhos
Argo-Rowley Terrace
Carnarvon Canyon
Dampier
Eighty Mile Beach
Gascoyne
Geographe
Jurien
Mermaid Reef
Montebello
Perth Canyon
South-west Corner
Two Rocks
Ningaloo (AMP)
Shark Bay (AMP)
Marine Parks
Barrow Island
Eighty Mile Beach
Jurien Bay
Marmion
Montebello Islands
Ngari Capes
Rowley Shoals
Shoalwater Islands
Swan Estuary
Swan Estuary - Alfred Cove
Swan Estuary - Milyu
Swan Estuary - Pelican Point
Ningaloo (MP)
Shark Bay (MP)
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree
Date created: 09/29/2021
0 1,500 3,000 km


105°E
110°E
115°E
120°E
125°E
20°S
25°S
30°S
N
Barrow Island
Muiron Islands
Great Sandy Island
Thevenard Island
Whalebone Island
Western Australia
Lipfert, Milligan, Etc Islands
Fisherman Islands
Beagle Islands
Sandland Islands
Essex Rocks
Outer Rocks
Cervantes Islands
Ronsard Rocks
Buller, Whittell And Green Islands
Legend
Exclusive Economic Zone
3nm Coastal Waters
0 150 300 450 600 km
Receptor Map - Marine Management Areas and Nature Reserves
Marine Management Areas
Barrow Island
Muiron Islands
Nature Reserves
Beagle Islands
Buller, Whittell And Green Islands
Cervantes Islands
Essex Rocks
Fisherman Islands
Great Sandy Island
Lipfert, Milligan, Etc Islands
Outer Rocks
Ronsard Rocks
Sandland Islands
Shoalwater Bay Islands
Thevenard Island
Whalebone Island
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree
Date created: 09/29/2021
0 1,500 3,000 km


Canyons linking the Argo Abyssal Plain with the Scott Plateau
Mermaid Reef and Commonwealth waters surrounding Rowley Shoals
Continental Slope Demersal Fish Communities
Exmouth Plateau
Ancient coastline at 125 m depth contour
Glomar Shoals
Western Australia
Northern Territory
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula
Commonwealth waters adjacent to Ningaloo Reef
Wallaby Saddle
Commonwealth marine environment within and adjacent to the west coast inshore lagoons
Western demersal slope and associated fish communities
Commonwealth marine environment surrounding the Houtman Abrolhos Islands
South Australian
Legend
Exclusive Economic Zone
3nm Coastal Waters
Perth Canyon and adjacent shelf break, and other west coast canyons
Ancient coastline at 90-120m depth
Western rock lobster
Commonwealth marine environment within and adjacent to Geographe Bay
0 250 500 750 1,000 km
Receptor Map - Key Ecological Features
Key Ecological Features
Ancient coastline at 125 m depth contour
Ancient coastline at 90-120m depth
Canyons linking the Argo Abyssal Plain with the Scott Plateau
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula
Commonwealth marine environment surrounding the Houtman Abrolhos Islands
Commonwealth marine environment within and adjacent to Geographe Bay
Commonwealth marine environment within and adjacent to the west coast inshore lagoons
Commonwealth waters adjacent to Ningaloo Reef
Continental Slope Demersal Fish Communities
Exmouth Plateau
Glomar Shoals
Mermaid Reef and Commonwealth waters surrounding Rowley Shoals
Perth Canyon and adjacent shelf break, and other west coast canyons
Wallaby Saddle
Western demersal slope and associated fish communities
Western rock lobster
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree
Date created: 09/29/2021
0 1,500 3,000 km



114°E
115°E
116°E
117°E
118°E
20°S
21°S
22°S
N
Montebello Shoals
Rankin Bank
Glomar Shoal
Tryal Rocks
Courtenay Shoal
Hammersley Shoal
North West Reef
Barrow Island Reefs and Shoals
Cod Bank
Madeleine Shoals
Poivre Reef
McLennan Bank
Ripple Shoals
Taunton Reef
Penguin Bank
O'Grady Shoal
Sultan Reef
Dockrell Reef
Fortescue Reef
Rosily Shoals
South East Reef
Trap Reef
Eliassen Rocks
South West Reef
Gorgon Patch
Ashworth Shoal
Mardie Rock
Brewis Reef
Flinders Shoal
Western Australia
Miles Shoal
Lightfoot Reef
Meda Reef
West Reef
Little Shoals
Australind Shoal
Nares Rock
Legend
Exclusive Economic Zone
3nm Coastal Waters
Moresby Shoals
Herald Reef
Paroo Shoal
Weeks Shoal
0 50 100 150 200 km
Saladin Shoal
Hastings Shoal
Ward Reef
Koolinda Patch
Receptor Map - Reefs, Shoals and Banks
Reef, Shoals and Banks
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree
Date created: 09/30/2021
0 1,500 3,000 km

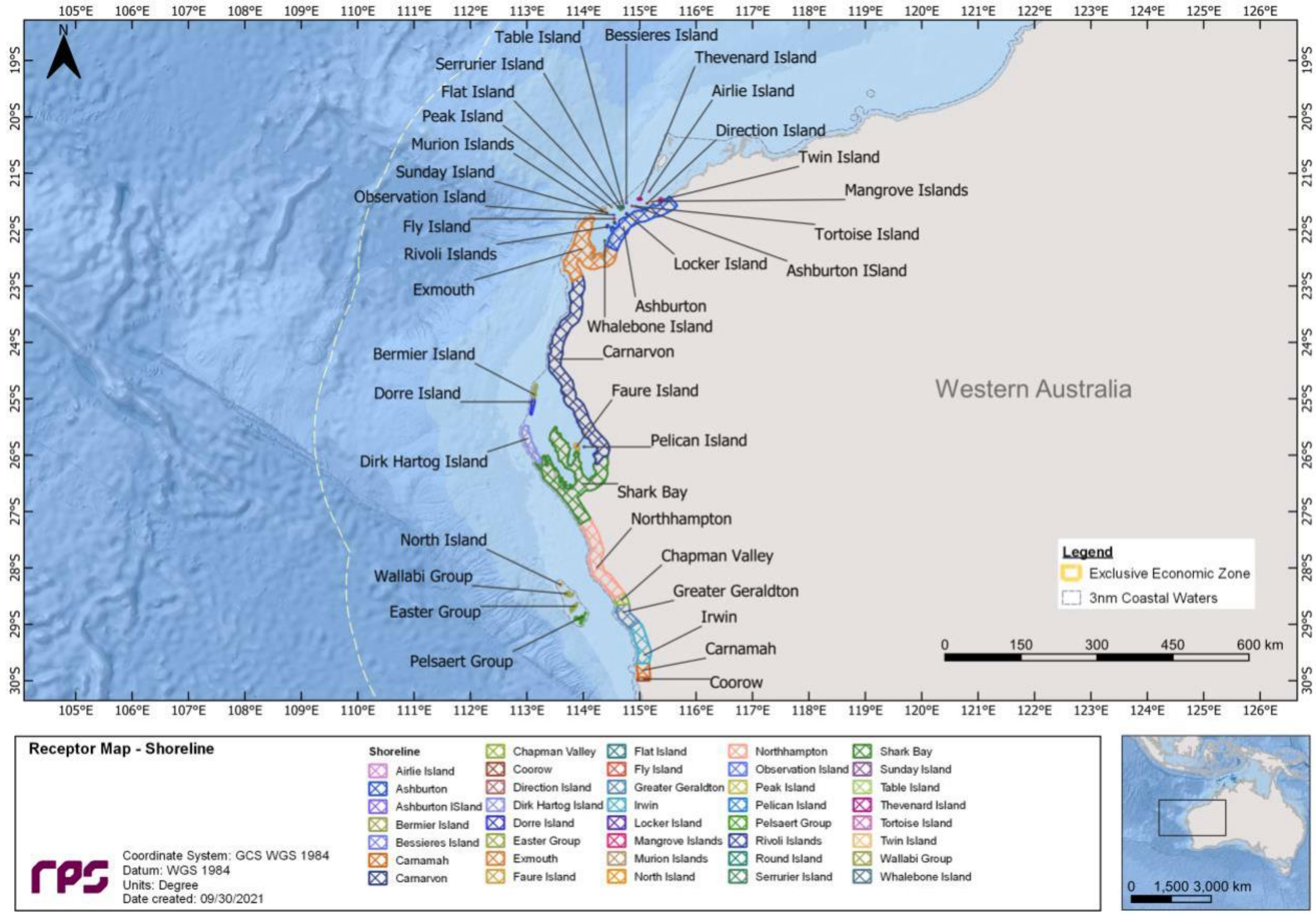


Table Island
Bessieres Island
Serrurier Island
Thevenard Island
Flat Island
Airlie Island
Peak Island
Murion Islands
Direction Island
Sunday Island
Twin Island
Observation Island
Mangrove Islands
Fly Island
Tortoise Island
Rivoli Islands
Locker Island
Ashburton ISland
Exmouth
Ashburton
Whalebone Island
Carnarvon
Bermier Island
Dorre Island
Faure Island
Western Australia
Pelican Island
Dirk Hartog Island
Shark Bay
Northhampton
North Island
Chapman Valley
Wallabi Group
Greater Geraldton
Easter Group
Irwin
Carnamah
Pelsaert Group
Coorow
Legend
Exclusive Economic Zone
3nm Coastal Waters
0 150 300 450 600 km
Receptor Map - Shoreline
Shoreline
Airlie Island
Ashburton
Ashburton ISland
Bermier Island
Bessieres Island
Carnamah
Carnarvon
Chapman Valley
Coorow
Direction Island
Dirk Hartog Island
Dorre Island
Easter Group
Exmouth
Faure Island
Flat Island
Fly Island
Greater Geraldton
Irwin
Locker Island
Mangrove Islands
Murion Islands
North Island
Northhampton
Observation Island
Peak Island
Pelican Island
Pelsaert Group
Rivoli Islands
Round Island
Serrurier Island
Shark Bay
Sunday Island
Table Island
Thevenard Island
Tortoise Island
Twin Island
Wallabi Group
Whalebone Island
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree
Date created: 09/30/2021
0 1,500 3,000 km

Appendix I

RS10 Environmental Monitoring Response Strategies

RS10 – Environmental Monitoring *AOHSE-ER-0037: Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna*	
Objectives / Scope/ Rationale	**AOHSE-ER-0037 Objective:** To define practices to be undertaken to ensure that BHP is capable of monitoring effects of an oil spill on the marine environment and to inform the effectiveness of response strategies associated with any oil spill event. **Scope:** Assess the effects of an oil spill and response activities on water quality, sediment quality and benthic infauna and monitor post-spill recovery of these receptors.
Baseline	Baseline information regarding Benthic Infauna can be located in Section 5 of the Griffin GEP Decommissioning Environment Plan.
Initiation Criteria	Notification of Level 2 spills. RS2 Monitor and Evaluate will inform monitoring site selection and deployment timing.
Termination Criteria	• Oil concentrations in marine waters must not exceed normal background concentrations; and (if activated). • No statistical difference in hydrocarbon concentrations in sediments between impact and reference locations; and (if activated). • No statistical difference in benthic infauna abundance and diversity between impact and reference locations. • Deemed unsafe to continue implementing RS10 activities. • Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.
Activation Time	Activated <8 hours after notification from BHP IMT.
Resources	• Monitoring Service Providers • 4WDs • Commercial vessels • Sea glider / UAVs • Water quality monitoring equipment • Sediment quality monitoring equipment • Benthic infauna monitoring equipment
General Methods	**<u>Water Quality</u>** *Physical and Biological*: • Mobilise to sampling locations as per Procedure AOHSE-ER-0037; • Collect samples from selected vessel; • Lower pre-calibrated water quality profiler into the water column and leave just below the water surface for 1 minute to allow sensors time to stabilise. Instrument must be deployed through clean surface water, which can be achieved by deploying a bottomless perimeter in clean water and then moving into any oil spill if present; • Lower instrument through the water column until it reaches the seabed and retrieve to surface; • Follow sampling design in AOHSE-ER-0037 - replicate water samples should not be separated by more than a few metres; • Download data to field computer, backup and store data; and • Submit Daily Field Report (DFR) to Operations Section Chief on the IMT. *Subsea Plume Tracking*: • Mobilise to sampling locations as per Procedure AOHSE-ER-0037; • AUV to be deployed from selected vessel in the defined drop zone offshore to track the offshore plume. Flight path to include areas inside and outside of plume track; • Download data to field computer, backup and store data; and • Submit Daily Field Report (DFR) to Operations Section Chief on the IMT. *Chemical:* • Mobilise to sampling locations as per Procedure AOHSE-ER-0037; • Lower water sampler (e.g. Niskin bottle) into the water column through clean surface water, which can be achieved by deploying a bottomless perimeter in clean water and then moving into any oil spill if present; • Follow sampling design per Procedure AOHSE-ER-0037; • Water samples are to be collected in a clean, new sample container, as provided from the analytical laboratory, and stored on ice in an esky; • Samples sizes should be 2 litres for TPH and at least 50 ml for BTEX; • Label sample with waterproof paper containing Location/Site/Zone/replicate details, date, collector; and • All water samples are to be transferred to refrigerated storage (ideally 4 degrees) as soon as reasonably practicable pending transportation to the analytical laboratory.

<table>
<tr><td></td><td><u>Sediment Quality Monitoring</u>
• Mobilise to sampling locations as per Procedure AOHSE-ER-0037;
• Deploy grab sampler or other clean sampling device to the seabed and retrieve sample to surface;
• Sediment samples should be collected from centre of grab/sampling device avoiding the sides using clean scoops/spatulas, placed in clean sample jars;
• Label jars with location/zone/site/replicate, time and date;
• Grab sampler to be decontaminated prior to collecting the next sample;
• Follow sampling design (per Procedure AOHSE-ER-0037), replicate samples should not be separated by more than a few metres; and
• All sediment samples are to be transferred to refrigerated storage (ideally 4 degrees) as soon as reasonably practicable pending transportation to the analytical laboratory.

<u>Benthic Infauna Monitoring</u>
• Mobilise to sampling locations as per Procedure AOHSE-ER-0037;
• Identify sampling site on shoreline ensuring that samples will be collected perpendicular to the shore commencing below the high spring tide mark and moving down to the low spring tide mark;
• Ensure sampling site is in a water depth as safe as reasonably practicable to collect cores, i.e. no deeper than knee height;
• Follow sampling design Procedure AOHSE-ER-0037 - replicate cores should not be separated by more than a few metres;
• Insert core to a depth of 20 cm as identified by a mark on the outside of the core;
• Lightly excavate sediment from around core taking care not to disturb the inserted core, and place an end cap over the deepest end of core;
• Insert end cap over upper end of core, and remove core from the seabed;
• Using a sieve with clean 1 mm mesh, the contents of each core is to be sieved in the field;
• Transfer all macroinvertebrates from mesh to a sample bag;
• Carefully inspect mesh and remove any macroinvertebrates with forceps and transfer to the sample bag;
• Insert internal label on waterproof paper containing location/site/zone/replicate details, date, collector; and
• Place sample bag into poly drum with preservative and transfer to secure storage pending transportation to laboratory.</td></tr>
<tr><td>Roles and Responsibilities</td><td>Responsible: Planning Section to oversee the activation of RS10 and information gathering to influence response strategies.
Sub team/role: Environmental Unit Leader to manage all contracted monitoring teams and coordinate data.</td></tr>
<tr><td>Competencies</td><td>• The Environment Unit Leader will be employed by BHP in the role of Environmental Specialist (or equivalent).
• Contracted water quality monitoring team leader to be an experienced and qualified water quality scientist with field experience in vessel-based water quality monitoring (or equivalent).
• Contracted field personnel to be experienced marine scientists or technicians with appropriate training and experienced in water quality sampling.
• Contracted sediment quality monitoring team leader to be an experienced and qualified marine scientist with field experience in vessel-based sediment and water quality monitoring (or equivalent).
• Contracted field personnel to will include experienced and qualified marine scientists with field experience in vessel-based sediment and water quality monitoring.
• Contracted benthic infauna monitoring team leader to have significant experience with marine fauna management (or equivalent) and field experience in managing marine fauna surveys (aerial, boat-based).
• Contracted office support personnel to be experienced water quality analysts for office-based analyses.
• Laboratory services with NATA accreditation.
• Commercial certified / surveyed vessels.</td></tr>
</table>

RS10 – Environmental Monitoring *AOHSE-ER-0038: Monitoring Effects on an Oil Spill on Birds*	
Objectives / Scope/ Rationale	**AOHSE-ER-0038 Objective:** To define practices to be undertaken to ensure that BHP Petroleum is capable of monitoring effects of an oil spill on the marine environment and to inform the effectiveness of response strategies associated with any oil spill event. **Scope:** Assess the effects of an oil spill and response activities on birds and monitor post-spill recovery of these receptors.
Baseline	Baseline information regarding avifauna can be located in Section 5 of the Griffin GEP Decommissioning Environment Plan. Regional datasets such as Shorebird 2020.
Initiation Criteria	Notification of Level 2 spills. RS2 Monitor and Evaluate indicates that seabirds and shorebirds (and their habitat) are contacted, or are predicted to be contacted, by a hydrocarbon spill. RS2 Monitor and Evaluate will inform monitoring site selection and deployment timing.
Termination Criteria	• Oil concentrations in marine waters must not exceed normal background concentrations; and • No statistical difference in oiled seabird or migratory shorebird abundance and diversity between impact and reference locations; • Deemed unsafe to continue implementing RS10 activities; and • Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.
Activation Time	Activated <8 hours after notification from BHP IMT.
Resources	• Monitoring Service Providers • Aircraft – fixed wing or helicopter • Commercial or recreational vessels • UAV's • Binoculars / spotting scope • Digital Cameras • GPS • Field laptops • Field guides
General Methods	• Mobilise to sampling locations as per AOHSE-ER-0038; • Follow sampling design per AOHSE-ER-0038 - replicate observations within each site should not be separated by more than a few hundred metres but with sufficient separation so as to not count birds that have been recorded in any previous observations; • Observations are to be made (ideally) during high tide periods; • A spotting scope and field personnel with experience in bird taxonomy will be used to estimate migratory shorebird numbers and identify birds to species-level; • Presence of nests and any nesting birds is to be recorded; • Presence of any oiled adults/chicks/nests and an estimate of the percentage of body covered is to be recorded; • Download data to field computer, backup and store data; and • Submit Daily Field Report (DFR) to Operations Section Chief on the IMT.
Roles and Responsibilities	**Responsible:** Planning Section to oversee the activation of RS10 and information gathering to influence response strategies **Sub team/role:** Environmental Unit Leader to manage all Contracted monitoring teams and coordinate data
Competencies	• The Environment Unit Leader will be employed by BHP in the role of Environmental Specialist (or equivalent). • Contracted avifauna monitoring team leader to be an experienced ornithologist with field experience in coastal seabird surveys (aerial, vessel). • Contracted field personnel (vessel and aerial based) to include experienced and qualified ornithologists with experience in vessel and shore based monitoring activities. • Contracted office support personnel to be experienced analysts for office-based analyses. • Commercial certified / surveyed vessels and aircraft.

RS10 – Environmental Monitoring *AOHSE-ER-0039: Monitoring Effects of an Oil Spill on Marine Mammals*	
Objectives / Scope/ Rationale	**AOHSE-ER-0039 Objective:** To define practices to be undertaken to ensure that BHP is capable of monitoring effects of an oil spill and response activities on the marine environment and to inform the effectiveness of response strategies associated with any oil spill event. **Scope:** Assess the effects of an oil spill and response activities on marine mammals and megafauna and monitor post-spill recovery of these receptors.
Baseline	Baseline information regarding marine mammals can be located in Section 5 of the Griffin GEP Decommissioning Environment Plan. Access industry funded programs WAMSI publicly available data.
Initiation Criteria	Notification of Level 2 spills. RS2 Monitor and Evaluate indicates that marine mammals have been contacted, or are predicted to be contacted, by a hydrocarbon spill. RS2 Monitor and Evaluate will inform monitoring site selection and deployment timing.
Termination Criteria	• Oil concentrations in marine waters must not exceed normal background concentrations; • No statistical difference in marine mammal, whale shark abundance between impact and reference locations; • Deemed unsafe to continue implementing RS10 activities; and • Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.
Activation Time	Activated <8 hours after notification from BHP IMT.
Resources	• Monitoring Service Providers • Aircraft – Fixed wing or helicopter • Commercial and recreational vessels • UAV and or satellite • Binoculars • Digital cameras • GPS • Field laptops • Field guides
General Methods	<u>**Marine Mammals and Megafauna**</u> • Mobilise to sampling locations as per procedure AOHSE-ER-0039; • Follow sampling design in procedure AOHSE-ER-0039; • Observations to be made from an aircraft that complies with BHP Petroleum aviation requirements; • Use personnel with appropriate training and experience in marine mammal / whale shark identification; • Using line transect methods (e.g. Buckland *et al.,* 2012), two observers identify all marine fauna to the lowest taxonomic resolution possible from an aircraft flying 1000 m altitude at 100 knots. A systematic grid of transects should be placed over the study region with min. 3.5 km separation between successive lines. Detected marine fauna are to be recorded in a perpendicular distance bands from aircraft out to 1,500 m. This distance interval can be indicated by aligned markers on the windows and/or wing struts of the aircraft; • Download data to field computer, backup and store data; and • Submit Daily Field Report (DFR) to Operations Section Chief on the IMT.
Roles and Responsibilities	**Responsible:** Planning Section to oversee the activation of RS10 and information gathering to influence response strategies **Sub team/role:** Environmental Unit Leader to manage all contracted monitoring teams and coordinate data
Competencies	• The Environment Unit Leader will be employed by BHP in the role of Environmental Specialist (or equivalent). • Contracted Marine mammals and megafauna monitoring team leader to be an experienced in marine fauna management with field experience in managing marine fauna surveys (aerial, vessel, telemetry, acoustic). Also experience in marine megafauna technical surveys and reporting. • Contracted field personnel (vessel and aerial based) to include experienced and qualified marine zoologists with experience in surveys of marine megafauna. • Contracted office support personnel to be experienced analysts for office-based analyses. • Commercial certified / surveyed vessels and aircraft.

<table>
<tr><th colspan="2">RS10 – Environmental Monitoring
AOHSE-ER-0040: Monitoring of an Oil Spill on Benthic Habitats and Benthic Primary Producers</th></tr>
<tr><td>Objectives / Scope/ Rationale</td><td>AOHSE-ER-0040 Objective: To define practices to be undertaken to ensure that BHP is capable of monitoring effects of an oil spill and response activities on the marine environment and to inform the effectiveness of response strategies associated with any oil spill event.
Scope: Assess the effects of an oil spill and response activities on benthic habitats and benthic primary producers (e.g. mangroves, corals, macroalgae, seagrasses, sponge communities) and monitor post-spill recovery of these receptors.</td></tr>
<tr><td>Baseline</td><td>Baseline information regarding Benthic Habitats and Benthic Primary Producers can be located in Section 5 of the Griffin GEP Decommissioning Environment Plan.
WAMSI hyperspectral data.</td></tr>
<tr><td>Initiation Criteria</td><td>Notification of Level 2 spills.
RS2 Monitor and Evaluate indicates that subtidal and intertidal benthic habitats/benthic primary producers are contacted, or are predicted to be contacted, by a hydrocarbon spill.
RS2 Monitor and Evaluate will inform monitoring site selection and deployment timing.</td></tr>
<tr><td>Termination Criteria</td><td>Oil concentrations in marine waters must not exceed normal background concentrations; and
No statistical difference in species diversity, abundance, distribution and percentage cover of benthic habitats (e.g. corals, macroalgae, sponge communities and seagrasses) between impact and reference locations; and (if activated)
No statistical difference in mangrove bioindicators (e.g. faunal burrows, pneumatophore counts, leaf health status) between impact and reference locations;
Deemed unsafe to continue implementing RS10 activities; and
Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.</td></tr>
<tr><td>Activation Time</td><td>Activated <8 hours after notification from BHP IMT.</td></tr>
<tr><td>Resources</td><td>Monitoring Service Providers
Commercial and recreational vessels
Underwater video / drop cameras and frames
Field laptops
GPS
Field guides
Binoculars
Digital cameras</td></tr>
<tr><td>General Methods</td><td>Assessment of impacts and recovery of benthic habitats and benthic primary producers such as mangroves, seagrasses, macroalgae, corals and other habitats such as sponge communities.
<u>Benthic Habitats</u>
Mobilise to sampling locations as per Procedure AOHSE-ER-0040;
Follow sampling design in Procedure AOHSE-ER-0040;
Implement subtidal surveys using transects (and/or quadrats) to quantify the distribution, abundance and community composition of habitats and associated benthos (e.g. corals, macroalgae, seagrasses and filter feeders such as sponge communities), documenting:
distribution and areal extent of key habitats;
species diversity and percentage cover of organisms, biomass and/or size frequency distribution for relevant indicator species or functional groups; and
any observations of recently dead, sick/inactive, or oil covered organisms.
Monitoring will be undertaken by transect (and/or quadrats) video assessment using vessels.
Transect length will depend on particular circumstances of the spill but, generally, towed video transects of between 50 to 100 m length should be practicable;
Download data to field computer, backup and store data; and
Submit Daily Field Report (DFR) to Operations Section Chief on the IMT.
<u>Mangroves</u>
Mobilise to sampling locations as per Procedure AOHSE-ER-0040;
Follow sampling design Procedure AOHSE-ER-0040;
Monitoring methods will include:
Faunal Burrows and Pneumatophore Counts</td></tr>
</table>

	▪ Number of pneumatophores and fauna burrows are to be counted within 1 m x 1 m quadrats to provide an assessment of benthic health. *Changes in the number of pneumatophores can indicate a change in health or plant productivity, while faunal burrows provide an indication of the infaunal organisms supported by the benthic habitat, which can provide insight to ecological productivity.* ○ Leaf Health Status ▪ Estimates of leaf health status within 4 m x 4 m quadrats using the classification described below. *Loss of or yellowing of leaves is a common feature of mangroves when under stress. By monitoring the foliage health and density within each quadrat it is possible to compare the health and the percentage cover over time, with the assumption that a substantial reduction in percentage cover of foliage or an observed decrease in foliage health over time is a likely indicator of stress.* ○ Tree Height and Species Cover ▪ Estimates of tree height within 4 m x 4 m quadrats are to be recorded using a 2 m measuring pole. These measurements are to include a maximum, minimum and average height. ▪ Species type and an estimation of the percentage cover of each species identified within each 4 m x 4 m quadrat is to be recorded. Submit Daily Field Report (DFR) to Operations Section Chief on the IMT.
Roles and Responsibilities	**Responsible:** Planning Section to oversee the activation of RS10 and information gathering to influence response strategies **Sub team/role:** Environmental Unit Leader to manage all Contracted monitoring teams and coordinate data
Competencies	• The Environment Unit Leader will be employed by BHP in the role of Environmental Specialist (or equivalent). • Contracted Benthic monitoring team leader to be an experienced and qualified marine scientist with vessel-based marine benthic expertise (or equivalent). • Contracted field personnel to be experienced marine scientists or technicians with appropriate training and experienced in benthic surveys including benthic monitoring and habitat analysis. • Contracted office support personnel to be experienced benthic survey analysts for office-based analyses. • Laboratory services with NATA accreditation • Dive teams to have Australian standard commercial certification. • Commercial certified / surveyed vessels.

RS10 – Environmental Monitoring *AOHSE-ER-0043: Monitoring Effects on an Oil Spill on Marine Reptiles*	
Objectives / Scope/ Rationale	**Objective:** To define practices to be undertaken to ensure that BHP Petroleum is capable of monitoring effects of an oil spill and response activities on the marine environment and to inform the effectiveness of response strategies associated with any oil spill event. **Scope:** Assess the effects of an oil spill and response activities on sea turtles and monitor post-spill recovery of these receptors.
Baseline	Baseline information regarding avifauna can be located in Section 5 of the Griffin GEP Decommissioning Environment Plan. Ningaloo Outlook data. Access datasets such as Ningaloo Turtle Program.
Initiation Criteria	Notification of Level 2 spills. RS2 Monitor and Evaluate indicates that marine reptiles (or their habitat – nesting sites) have been contacted, or are predicted to be contacted, by a hydrocarbon spill. RS2 Monitor and Evaluation will inform monitoring site selection and deployment timing.
Termination Criteria	• Oil concentrations in marine waters must not exceed normal background concentrations; and • No statistical difference in turtle nesting abundance and spatial distribution, population dynamics and turtle morphology between impact and reference locations; • Deemed unsafe to continue implementing RS10 activities; and • Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.
Activation Time	Activated <8 hours after notification from BHP IMT.
Resources	• Monitoring Service Providers • Commercial and recreational vessels • Digital Cameras • Field laptops / notebooks • GPS • Tape measures • Field guides • Head torches • Nesting boxes • Flipper / PIT tags and tagging equipment
General Methods	**<u>Turtles</u>** • Mobilise to sampling locations; • Follow sampling design in AOHSE-ER-0043; *Nesting Abundance and Spatial Distribution*: • The number of turtles encountered each night of the survey is recorded and a mean calculated to provide the average number of turtles on the beach per night. Total number of turtles encountered per season can then be calculated. • Spatial distribution of clutches laid on the beach is to be recorded using a GPS. This can then be represented spatially in GIS software such as ArcGIS. *Population Dynamics – Turtle Tagging*: • Beach surveys are to be done for 3 - 4 h either side of the high tide at night. • Any nesting turtles encountered are to be tagged with a titanium flipper tag (Stockbrands, Perth, Western Australia) through the axial scale of the left front flipper (Limpus 1992). Consideration should also be given to implants with Passive Integrated Transponder (PIT) tags (Stockbrands, Perth, Western Australia) in the left shoulder. • Tagging and handling of turtles must not commence until any nesting turtle has finished laying eggs to eliminate disturbance of the turtle by taggers. • Tagging must be conducted in accordance with wildlife handling licenses from the DBCA. *Turtle Morphology*: • The curved carapace length to notch (CCL min) and curved carapace width (CCW) of all turtles encountered are to be measured using a flexible tape. Measurements from the top of the carapace to the apex of the posterior midline notch between the supracaudal scutes (described as the minimum length (CCL min) will ensure monitoring data are comparable to those collected at other flatback turtle rookeries in Australia where minimum length measurement is recorded. Submit Daily Field Report (DFR) to Operations Section Chief on the IMT.
Roles and Responsibilities	**Responsible:** Planning Section to oversee the activation of RS10 and information gathering to influence response strategies.

	Sub team/role: Environmental Unit Leader to manage all Contracted monitoring teams and coordinate data.
Competencies	• The Environment Unit Leader will be employed by BHP in the role of Environmental Specialist (or equivalent). • Contracted Marine mammals and megafauna monitoring team leader to be an experienced in marine fauna management with field experience in managing marine fauna surveys (aerial, vessel, telemetry, acoustic). Also experience in marine megafauna technical surveys and reporting. • Contracted field personnel (vessel and aerial based) to include experienced and qualified marine zoologists with experience in surveys of marine megafauna. • Contracted office support personnel to be experienced analysts for office-based analyses. • Commercial certified / surveyed vessels and aircraft.

RS10 – Environmental Monitoring *AOHSE-ER-0048: Monitoring Effects on an Oil Spill on Commercial and Recreational Fish Species*	
Objectives / Scope/ Rationale	**AOHSE-ER-0048 Objective:** To define practices to be undertaken to ensure that BHP Petroleum is capable of monitoring effects of an oil spill and response activities on the marine environment and to inform the effectiveness of response strategies associated with any oil spill event. **Scope:** • Determine the extent and level of hydrocarbon contamination or tainting of fish and shellfish and/or bioaccumulation of toxins in fish that may impact commercial and recreational fish species by sampling at impact and reference locations; • Document any fish-kills that occur during a spill event; • Determine if seafood from within the spill area meets statutory limits for hydrocarbon residues and is marketable; • Provide regulatory agencies, fisheries managers and other spill responders with information to help them to evaluate the likelihood of contamination of seafood (commercial, aquaculture, recreational) from an oil spill event; and • Assist in the decision-making process to restrict, ban, close or re-open fisheries.
Baseline	Baseline information regarding Commercial and Recreational Fish Species can be located in Section 5 of the Griffin GEP Decommissioning Environment Plan. Access DPIRD data.
Initiation Criteria	Notification of Level 2 spills. RS2 Monitor and Evaluate will inform monitoring site selection and deployment timing.
Termination Criteria	• Oil concentrations in marine waters must not exceed normal background concentrations; and • Hydrocarbon levels in representative commercial and recreational fish species tissue meet statutory specification for food products as per Yender *et al.* (2002); • No statistical difference in hydrocarbon levels in representative commercial and recreational fish species tissue between impact and reference locations; • DPIRD is satisfied that levels of hydrocarbons in targeted fish species are no longer related to the oil spill event; • Deemed unsafe to continue implementing RS10 activities; and • Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.
Activation Time	Activated <8 hours after notification from BHP IMT.
Resources	• Monitoring Service Providers • Commercial and recreational vessels • Digital Cameras • Field laptops / notebooks • GPS • Fish dissecting and tissue sampling equipment • Field guides

General Methods	**<u>Commercial and Recreational Fish Species</u>**
	• Mobilise to sampling locations as per Procedure AOHSE-ER-0048;
	• Follow sampling design;
	• Specimens of each target species will be obtained from licenced commercial fishers and charter boat operators. In the event that fisheries are closed due to the hydrocarbon spill, a commercial vessel and crew, accompanied by environmental field crews (tertiary qualified), may be chartered to obtain samples for testing. At least one (1) member of the field team is to have sound commercial and recreational fish species identification skills;
	• Sampling personnel must wear clean clothing with no trace of hydrocarbon and wear nitrile gloves at all times during sampling collection and processing. Nitrile gloves will be replaced between each sample collection. Samples will be collected using an aseptic technique as much as possible to minimise contamination. The following information will be recorded for each sample:
	  o Location, date and time of fishing effort;
	  o Name of vessel;
	  o Collection method;
	  o Species name;
	  o Preferred habitat;
	  o Length;
	  o Weight;
	  o Sex;
	  o Stage of maturation; and
	  o Any visible external lesions.

	Fish Tissue Sampling: • A minimum of 10 specimens of each target species will be sampled and placed in HPLC-grade rinsed aluminium foil wrapped tightly, placed in a press-seal food-grade plastic bag with a waterproof label. Specimens will be chilled at 4 °C or below if testing within 24 hours, or frozen at <-20 °C for testing within 1 month (NOAA, 2001). • Muscle tissue will be obtained by the removal of a minimum of 30 grams of skinless dorsal muscle (fish) or tail muscle (prawn) with an aseptic technique with a sterile scalpel and forceps. Samples are to be placed in individual containers. Samplers should wear nitrile gloves that should be disposed of after every use. *Collection of Dead Fish*: • In the event that fish kills are observed, whole, samples of dead fish will be collected and preserved (frozen) for necropsy. If a large number of dead fish are observed, the total number of fish will be estimated with a reduced number (~20 fish per species) or representative specimens will be retained for necropsy. The standard procedure for reporting fish kills to the WA DPIRD will be adhered to (http://www.fish.wa.gov.au/Sustainability-and-Environment/Fisheries-Science/Aquatic-Animal-Health/Pages/Fish-Kills.aspx) as amended from time to time. Submit Daily Field Report (DFR) to Operations Section Chief on the IMT.
Roles and Responsibilities	**Responsible:** Planning Section to oversee the activation of RS10 and information gathering to influence response strategies. **Sub team/role:** Environmental Unit Leader to manage all Contracted monitoring teams and coordinate data.
Competencies	• The Environment Unit Leader will be employed by BHP in the role of Environmental Specialist (or equivalent). • Contracted fish monitoring Team Leader is to will be a fisheries scientist with at least 5 years professional experience in epidemiological studies of marine fish and aquaculture species (or equivalent). • Contracted fish monitoring field sampling team member to be experienced and qualified marine scientists with experience in the collection of fish samples. • Contracted office support personnel to be experienced analysts for office-based analyses. • Laboratory services with NATA accreditation. • Commercial certified / surveyed vessels.

RS10 – Environmental Monitoring *AOHSE-ER-0051: Monitoring Effects on an Oil Spill on Fishes*	
Objectives / Scope/ Rationale	**AOHSE-ER-0051 Objective**: To define practices to be undertaken to ensure that BHP Petroleum is capable of monitoring effects of an oil spill and response activities on the marine environment and to inform the effectiveness of response strategies associated with any oil spill event. **Scope:** Assess the effects of an oil spill on mobile and site-attached fishes associated with coral reefs, seagrasses, macroalgal beds, deep-water sponge gardens (to 100 m) and mangroves and monitor post-spill recovery of these receptors.
Baseline	Baseline information regarding Fish Species can be located in Section 5 of the Griffin GEP Decommissioning Environment Plan.
Initiation Criteria	Notification of Level 2 spills. RS2 Monitor and Evaluate will inform monitoring site selection and deployment timing.
Termination Criteria	• Oil concentrations in marine waters must not exceed normal background concentrations; and • No statistical difference in species diversity and abundance, of mobile and site-attached fishes between impact and reference locations; and • DPIRD is satisfied that the patterns of species diversity and abundance of fishes associated with coral reefs, seagrasses, mangroves, macroalgal beds and deep-water sponge gardens (to a depth of 100 m) are no longer related to the oil spill event; • Deemed unsafe to continue implementing RS10 activities; and • Agreement is reached with the jurisdictional authority relevant to the spill to terminate the response.
Activation Time	Activated <8 hours after notification from BHP IMT.
Resources	• Monitoring Service Providers • Commercial and recreational vessels • BRUVs Units • Field laptops / notebooks • Field guides • GPS • Gill / seine nets • Fish measurement board • Floats, weights
General Methods	Assess fish communities associated with habitats such as coral reefs, seagrasses, macroalgae and deep-water sponge gardens: • Baited Remote Underwater Video (BRUVs) surveys of areas impacted by oil (or at risk of oiling) to quantify the diversity and abundance of mobile and site-attached fishes documenting distribution and areal extent of key habitats within the field of view of the camera (see below); • The percentage cover of abiotic substratum types and biotic habitat types in the field of view are to be estimated from still images captured as soon as the BRUVS lands on the seafloor. The categories in terms of substratum type are to include (but not necessarily limited to) sand, rubble, calcareous reef, indeterminate, boulder, and bedrock. The categories scored for epibenthic cover are to include (but not necessarily limited to) none, seagrass, macroalgae, sea whips, hard corals, soft corals, sponges, and gorgonian sea fans with each component estimated to the nearest 10 percent; • BRUVs deployed and retrieved from a vessel following procedures described in Cappo *et al.* (2011). *Mangroves:* • Gill or seine nets of areas within or immediately adjacent to mangrove stands, i.e. the pneumatophore zone, that may potentially impacted by oil (or at risk of oiling) to quantify the effects on mobile and site-attached fishes documenting species diversity and abundance of mobile and site-attached fishes associated with mangroves; • Gill or seine nets deployed and retrieved from an appropriate vessel; • Gill nets are to marked with clearly labelled floats; • Deployment time not to exceed 1 hour per net. Submit Daily Field Report (DFR) to Operations Section Chief on the IMT.
Roles and Responsibilities	**Responsible:** Planning Section to oversee the activation of RS10 and information gathering to influence response strategies. **Sub team/role:** Environmental Unit Leader to manage all contracted monitoring teams and coordinate data.

Competencies	• The Environment Unit Leader will be employed by BHP in the role of Environmental Specialist (or equivalent). • Contracted fish monitoring Team Leader is to will be a fisheries scientist with at least 5 years professional experience in epidemiological studies of marine fish and aquaculture species (or equivalent). • Contracted fish monitoring field sampling team member to be experienced and qualified marine scientists with experience in the collection of fish samples. • Contracted office support personnel to be experienced analysts for office-based analyses. • Laboratory services with NATA accreditation. • Commercial certified / surveyed vessels.

Table I-1: Interface between RS2 Monitor and Evaluate Strategies and RS10 Environmental Monitoring Strategies

	RS2 Monitor and Evaluate: *Aerial Surveillance*	RS2 Monitor and Evaluate: *Vessel Surveillance*	RS2 Monitor and Evaluate: *Oil Spill Tracker Buoys*	RS2 Monitor and Evaluate: *Oil Spill Trajectory Modelling*	RS2 Monitor and Evaluate: *Satellite Imagery*	RS10 Environmental Monitoring: *AOHSE-ER-0037: Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna*	RS10 Environmental Monitoring: *AOHSE-ER-0038: Monitoring Effects on an Oil Spill on Birds*	RS10 Environmental Monitoring: *AOHSE-ER-0039: Monitoring Effects of an Oil Spill on Marine Mammals*	RS10 Environmental Monitoring: *AOHSE-ER-0040: Monitoring of an Oil Spill on Benthic Habitats and Benthic Primary Producers*	RS10 Environmental Monitoring: *AOHSE-ER-0043: Monitoring Effects on an Oil Spill on Marine Reptiles*	RS10 Environmental Monitoring: *AOHSE-ER-0048: Monitoring Effects on an Oil Spill on Commercial and Recreational Fish Species*	RS10 Environmental Monitoring: *AOHSE-ER-0051: Monitoring Effects on an Oil Spill on Fishes*
RS2 Monitor and Evaluate: *Aerial Surveillance*						✓,A	✓,A	✓,A	✓,A	✓,A	✓,A	✓,A
RS2 Monitor and Evaluate: *Vessel Surveillance*						✓,A	✓	✓,A	✓	✓,A	✓,A	✓,A
RS2 Monitor and Evaluate: *Oil Spill Tracker Buoys*						✓	✓	✓	✓	✓	✓	✓
RS2 Monitor and Evaluate: *Oil Spill Trajectory Modelling*	✓,A	✓,A	✓,A		✓,A	✓,A	✓,A	✓,A	✓,A	✓,A	✓,A	✓,A
RS2 Monitor and Evaluate: *Satellite Imagery*	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
RS10 Environmental Monitoring: *AOHSE-ER-0037: Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna*							✓,A	✓,A	✓,A	✓,A	✓,A	✓,A
RS10 Environmental Monitoring: *AOHSE-ER-0038: Monitoring Effects on an Oil Spill on Birds*						✓			✓		✓	✓
RS10 Environmental Monitoring: *AOHSE-ER-0039: Monitoring Effects of an Oil Spill on Marine Mammals*						✓					✓	✓
RS10 Environmental Monitoring: *AOHSE-ER-0040: Monitoring of an Oil Spill on Benthic Habitats*							✓	✓		✓		

	RS2 Monitor and Evaluate: *Aerial Surveillance*	RS2 Monitor and Evaluate: *Vessel Surveillance*	RS2 Monitor and Evaluate: *Oil Spill Tracker Buoys*	RS2 Monitor and Evaluate: *Oil Spill Trajectory Modelling*	RS2 Monitor and Evaluate: *Satellite Imagery*	RS10 Environmental Monitoring: *AOHSE-ER-0037: Monitoring of Oil Hydrocarbons in Marine Waters, Sediments and Effects on Benthic Infauna*	RS10 Environmental Monitoring: *AOHSE-ER-0038: Monitoring Effects on an Oil Spill on Birds*	RS10 Environmental Monitoring: *AOHSE-ER-0039: Monitoring Effects of an Oil Spill on Marine Mammals*	RS10 Environmental Monitoring: *AOHSE-ER-0040: Monitoring of an Oil Spill on Benthic Habitats and Benthic Primary Producers*	RS10 Environmental Monitoring: *AOHSE-ER-0043: Monitoring Effects on an Oil Spill on Marine Reptiles*	RS10 Environmental Monitoring: *AOHSE-ER-0048: Monitoring Effects on an Oil Spill on Commercial and Recreational Fish Species*	RS10 Environmental Monitoring: *AOHSE-ER-0051: Monitoring Effects on an Oil Spill on Fishes*
and Benthic Primary Producers												
RS10 Environmental Monitoring: *AOHSE-ER-0043: Monitoring Effects on an Oil Spill on Marine Reptiles*						✓			✓			
RS10 Environmental Monitoring: *AOHSE-ER-0048: Monitoring Effects on an Oil Spill on Commercial and Recreational Fish Species*						✓	✓	✓	✓			✓
RS10 Environmental Monitoring: *AOHSE-ER-0051: Monitoring Effects on an Oil Spill on Fishes*						✓	✓	✓	✓		✓	

Key: ✓ = informs other plans; A = provides Activation Trigger for other plans

(Table should be read from the first row across the columns – see arrow)

Appendix J

Stakeholder Information Fact Sheet

Petroleum

Invitation for Feedback: Stakeholder Information Fact Sheet

Griffin Decommissioning Environment Plans

Northern Carnarvon Basin, North West Australia

BHP is decommissioning the Griffin Field (in production licences WA-10-L) and the associated gas export pipeline (GEP) (pipeline licences WA-3-PL, TPL/10, and PL 20) (Figure 1). BHP is the designated operator of the Griffin Field and pipeline on behalf of BHP Petroleum Pty Ltd, INPEX Alpha Ltd, and Mobil Exploration and Producing Australia Pty Ltd.

The Griffin Field lies approximately 67 km north-east of Onslow, Western Australia. The GEP extends from the Griffin Field to shore, near the former Griffin Gas Export facility, now AGIG's Tubridgi gas storage facility.

Decommissioning activities to date in the Griffin Field include plug and abandonment of all wells in 2017 and removal of the mid-depth buoys.

In November 2021 BHP consulted on the removal of the majority of the remaining equipment located in the Griffin Field. On 22 December 2021 the associated environment plan (EP) for these removal activities, the *Griffin Decommissioning and Field Management EP*, was submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for assessment.

BHP is now planning additional decommissioning activities and is seeking stakeholder feedback to inform the development of the associated EPs for submission to NOPSEMA and the Department of Mines, Industry Regulation and Safety (DMIRS). These activities comprise:

- Construction, operation and rehabilitation of a temporary pumping and liquid storage area (onshore Western Australia).
- Removal of residual mercury contamination within the GEP (onshore Western Australia, coastal waters, and Commonwealth waters) to acceptable thresholds for mercury in sediment, as defined by *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2018) and Department of Water and Environmental Regulation (DWER) guidelines.
- Abandoning the GEP *in situ* following verification of successful mercury removal and surveying (coastal waters and Commonwealth waters).
- Abandoning *in situ* selected equipment in the Griffin Field (Commonwealth waters).

Separate EPs will be required for the proposed additional activities, with two EPs to be submitted to NOPSEMA for activities planned for Commonwealth waters and an EP to be submitted to the DMIRS for activities planned for State waters/lands. The EPs are being written to allow the activity to occur at any time of year as schedules are subject to change and to allow our business flexibility.

BHP is considering leaving the following equipment *in situ* at the completion of decommissioning activities:

- Concrete gravity bases
- The riser turret mooring (RTM) following removal of sections containing foam and other contaminants (plastics, batteries)
- The RTM mooring leg anchors, which are embedded in the seabed

- Piled foundations embedded in the seabed following removal of the portion of the piles above the seabed
- the GEP

BHP undertook an environmental impact assessment of the feasible decommissioning options for the equipment groups and GEP being left *in situ*. This assessment concluded that leaving these items *in situ* was a better environmental outcome due to:

- the environmental damage caused by their removal. The items listed above are either very heavy (the RTM is approximately 2,000 tonnes) or deeply embedded in the seabed.
- the very low environmental risk from the degradation of equipment. Once mercury removal from the GEP and foam and contaminants removal from the RTM is complete, the remaining equipment consists almost entirely of steel and concrete. The degradation products of steel and concrete are not considered toxic and these materials are routinely used in the construction of marinas, breakwaters etc.
- the marine communities associated with the equipment, particularly the GEP and RTM. Studies of the fish assemblages along the GEP noted a higher diversity and abundance of fishes, including substantially greater biomass of commercially and recreationally important fish species.

The equipment BHP is considering abandoning *in situ* in Commonwealth waters is subject to NOPSEMA's *Section 572 Maintenance and Removal of Property* (2020). This policy requires that BHP demonstrate that any alternatives to full removal of property, such as abandonment *in situ*, yields equal or better environmental outcomes compared to full removal.

The decommissioning activities will not take place within any marine conservation areas. Marine conservation areas and their distances from the decommissioning activities operational area are listed in Table 1.

The decommissioning activities described in this Stakeholder Fact Sheet are planned to commence in Q1 2023, pending approvals, vessel availability and weather constraints.

Table 1 Marine conservation areas in proximity to the decommissioning activities operational area

Marine Conservation Area	**Approx. Distance from the Operational Area**
Muiron Islands Marine Management Area (State)	38 km
Ningaloo Marine Park (State)	52 km
Ningaloo Marine Park (Commonwealth)	59 km
Barrow Island Marine Management Area (State)	66 km
Montebello Marine Park (Commonwealth)	69 km
Gascoyne Marine Park (Commonwealth)	78 km

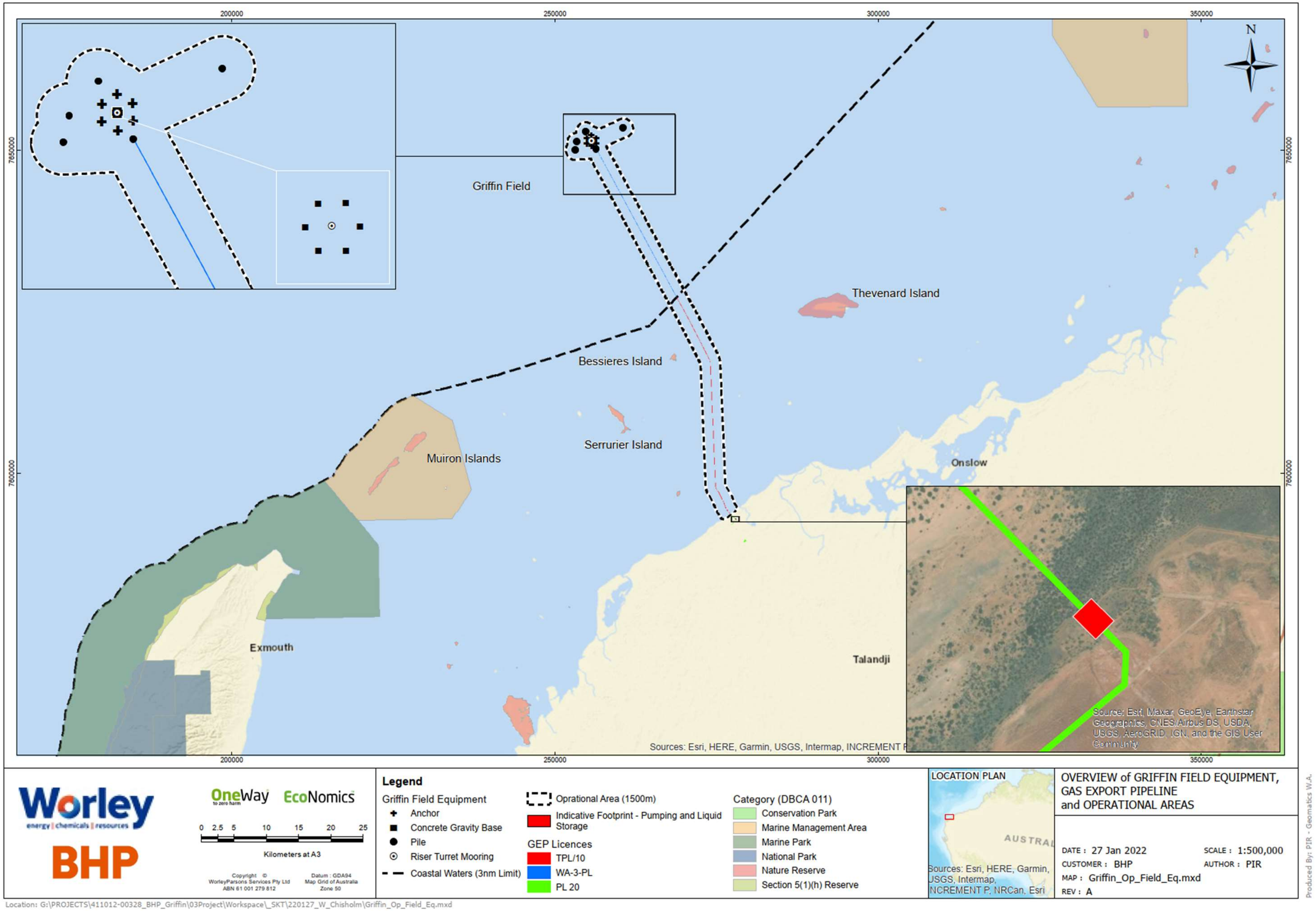


Figure 1 Overview of decommissioning activities in this stakeholder fact sheet

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Proposed Activity

A summary of decommissioning activities is presented in Table 2. The decommissioning activities are anticipated to include:

- Construction, operation and rehabilitation of temporary onshore pumping and liquid storage area.
- Removal of mercury contamination within the GEP.
- Abandonment *in situ* of the GEP. The GEP is a concrete-coated, 219 mm diameter steel pipeline that extends between the Griffin field and the former Griffin onshore gas plant. The length of the GEP between the Griffin field and the shore crossing is approximately 61.6 km long. The GEP is largely buried in state waters due to trenching during installation, with some sections that couldn't be buried secured to the seabed by rock bolts. The majority of the GEP in Commonwealth waters was laid directly on the seabed as no additional stabilisation was required. The GEP is stable on the seabed, with little evidence of any lateral displacement following installation.
- Abandonment *in situ* of the following equipment within the Griffin Field:
    - Six concrete gravity bases for the mid-depth buoys. These are large concrete structures and are mostly buried, sitting flush with the seabed.
    - The riser turret mooring (RTM), following placement of the mooring on the seabed and removal of the top sections containing foam and other contaminants. The remaining section of the RTM is a steel structure with iron ore ballast and is ~65 m long and 6 m in diameter.
    - Piled foundations for the pipeline end manifold (PLEM) and four distribution skids. Piles will be cut as close as practical to the mudline. Piles are steel and cement structures, 30-inch diameter and ~20 m long.
    - Anchors used to hold the RTM in place (anchor legs removed from above the seabed). There are 12 anchors, 2 per mooring leg. They are buried and any protrusions will be cut at as close as practical to the mudline.

The location of the equipment is in Table 3.

The GEP contains residual mercury. BHP will remove mercury from the GEP using a chemical cleaning process that involves specialist chemicals being pushed by pipeline inspection gauges (PIGs) from shore to the end of the GEP in Commonwealth waters. The fluids will then be pushed back to shore, along with extracted mercury in the GEP, where they will be recovered and disposed of.

A temporary onshore pumping and liquid storage area is required to send and receive cleaning fluids along the GEP. This temporary pumping and liquid storage area will be constructed onshore behind the dunes along the PL 20 pipeline licence. Access to and from the temporary pumping and liquid storage area will be by existing roads and tracks where practicable. The tank storage for liquids, including potentially hazardous hydrocarbon and mercury removal liquids, and high-risk spill locations will be bunded to prevent accidental releases polluting the environment.

After the mercury removal activities are completed, all equipment will be removed from the temporary pumping and liquid storage area. The area disturbed by the construction and operation of the temporary pumping and liquid storage area will then be rehabilitated.

The mercury removal process will require a vessel at the PLEM to support the pigging operations. BHP will verify the effectiveness of mercury removal from the GEP following the pigging activities. There are no planned releases of chemicals in Commonwealth or State waters. The PLEM and GEP Z spool will be removed, as described in the *Griffin Field Management and Equipment Removal EP*. If mercury levels in the GEP cannot be reduced to acceptable thresholds, additional mitigation measures will be implemented, such as burial or removal.

Following cleaning, BHP will undertake a survey of the GEP, which may include multibeam sonar, side scan sonar and visual inspection, after which the GEP will be abandoned *in situ*.

The equipment in the Griffin Field that BHP proposes to abandon *in situ* will be left as is following the equipment removal campaign. This equipment consists of benign materials, such as concrete and steel, and lies in approximately 130 m water depth. The RTM, along with the GEP, supports diverse benthic habitats and associated communities. These habitats support relatively high diversity and abundance fish communities, including fish species targeted by recreational and commercial fishers. Removal of the equipment proposed to be abandoned *in situ* would eliminate these habitats and associated fish, as well as substantially disturb the seabed.

The buried structures do not support benthic habitats or associated communities, but given the degree of burial, materials of construction and the object sizes, their recovery will create a significant environmental disturbance. The buried structures are made from concrete and steel, which poses negligible environmental risk as they degrade over time.

Table 2 Summary of decommissioning activities

Griffin Subsea Infrastructure Decommissioning Activities	
Earliest expected commencement date	Earliest start is Q1 2023, subject to approvals, vessel availability, and weather constraints.
Petroleum licences	WA-10-L (Cwlth), WA-12-L (Cwlth), WA-3-PL (Cwlth), TPL/10 (WA), PL 20 (WA)
Operational area	A 1,500 m radius temporary Operational Area (precautionary) around the GEP and equipment in the Griffin Field A temporary onshore site hosting tanks, pumping equipment, and supporting facilities. All material from the temporary onshore site will be removed following completion of the mercury removal activities. The site will then be rehabilitated.
Estimated duration	90-120 days
Infrastructure	1 x gas export pipeline (GEP) 1 x riser turret mooring (RTM) 12 x RTM anchors 5 x piled foundations (1 x PLEM, 4 x distribution skids) 6 x concrete gravity bases
Vessels	Support vessels are planned to be used to support removal of mercury from the GEP. No more than 2 vessels will be used at any one time
Distance to nearest towns/land fall (from field centre point)	Muiron Islands ~43 km Thevenard Island ~20 km Onslow ~41 km Exmouth ~85 km North West Cape ~71 km

Table 3 Indicative locations of equipment considered in this stakeholder fact sheet

Subsea Infrastructure	Easting[1]	Northing[1]	Activity
Gas export pipeline – start (PLEM)	256393	7650218	Remove mercury and leave *in-situ*
Gas export pipeline – KP0	277214	7593548	
Riser turret mooring (RTM)	255645	7651464	Leave *in situ* after placement on seabed and removal of sections containing foam
RTM anchor pair 1[2]	255639	7652302	Leave *in situ*
RTM anchor pair 2[2]	256364	7651890	
RTM anchor pair 3[2]	256388	7651058	
RTM anchor pair 4[2]	255671	7650628	
RTM anchor pair 5[2]	254930	7651040	
RTM anchor pair 6[2]	254934	7651863	
PLEM pile foundation	256393	7650218	Cut at the seabed, remove cut section, and leave buried section *in situ*
Distribution skid 1/2	260535	7653488	
Distribution Skid 4	253150	7650065	

Subsea Infrastructure	Easting[1]	Northing[1]	Activity
Distribution Skid 5	253418	7651297	
Distribution Skid 6	254782	7652896	
Concrete gravity base 1	255714	7651571	Leave *in situ*
Concrete gravity base 2	255779	7651463	
Concrete gravity base 3	255716	7651352	
Concrete gravity base 4	255589	7651351	
Concrete gravity base 5	255524	7651460	
Concrete gravity base 6	255587	7651567]	
Onshore temporary pumping and liquid storage area	Indicative footprint shown in Figure 1		Construction, operation, and rehabilitation

[1] All coordinates in MGA50/GDA94

[2] Both anchors within 100 m of point

Project Vessels

At least one offshore support vessel is required for the mercury removal from the GEP and subsequent pipeline survey. Vessels may require routine support, such as resupply and personnel transfers.

Communication with Mariners

A 1,500 m radius Operational Area will apply around the GEP to allow for vessels to undertake decommissioning activities. A temporary 500 m exclusion zone will apply around the vessel supporting mercury removal activities at the PLEM.

Marine notices will be issued prior to activity commencement to alert vessels which may be operating in waters nearby.

Implications for Stakeholders

BHP will consult relevant stakeholders whose functions, interests, and activities may be affected by the proposed decommissioning activities outlined in this Stakeholder Fact Sheet. We will also keep other stakeholders who have identified an interest in the activities informed about our planned activities.

Summary of Key Impacts and Risks

BHP has identified potential impacts and risks to the environment based on the nature and scale of the decommissioning activities. Mitigation and management measures for these impacts and risks are summarised in Table 4. Further details will be provided in the EP.

Table 4 Potential risks and associated management measures

Potential Risks	Management and/or mitigation measures
Planned Activities	
Physical presence: Interactions with other marine users	• BHP's existing infrastructure is marked on nautical charts. • Establishment of a 1,500 m operational area around the GEP for the duration of the activity. • Consultation with relevant stakeholders (e.g., adjacent petroleum titleholders, commercial fishers and their representative organisations, and government departments and agencies) to inform decision making for the proposed activity and the development of the EP. • BHP will notify relevant fishing industry representative organisations/associations and Government maritime safety agencies of the start and end dates for the activity, and details of exclusion zones prior to commencement of the activity.
Emissions: Light	• Lighting is minimised to that required for safety and navigational purposes.

Potential Risks	Management and/or mitigation measures
Emissions: Above water and under water noise	• Measures will be in place for interacting with protected marine fauna as per the Environment Protection Biodiversity Conservation (EPBC) Regulations (Part 8).
Planned discharges to the marine environment	• Chemical use will be managed in accordance with BHP and contractor chemical selection and approval procedures. • All routine marine discharges will be managed according to legislative and regulatory requirements and BHP's Environment Performance Standards where applicable.
Waste generation	• Waste generated aboard the support vessels will be managed in accordance with legislative requirements and a Waste Management Plan. • Wastes will be managed and disposed of in a safe and environmentally responsible manner that prevents accidental loss to the marine or terrestrial environment. • Wastes transported onshore will be sent to appropriate recycling or disposal facilities by a licenced waste contractor.
Emissions: Air	• Vessels will comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78 Annex VI and Marine Order 97 (Marine Pollution Prevention – Air Pollution)
Benthic habitat disturbance	• Minimise disturbance where possible noting that physical removal of subsea infrastructure may have measurable but limited impacts to the environment, where recovery of ecosystem function is expected within <1 year.
Cleaning of vegetation	• Clearing to be limited to area in approved EP • Make use of existing roads where practicable • Rehabilitation of cleared areas following completion of onshore activities • Stockpiling of topsoil during clearing for rehabilitation use
Introduction of weeds	• Weed management of vehicles and equipment
Disturbance of heritage sites	• Heritage survey prior to commencing ground disturbance • Avoidance of known and discovered heritage sites
Unplanned Risks	
Marine fauna interaction	• Measures will be in place for interacting with protected marine fauna as per the EPBC Regulations (Part 8).
Invasive marine species	• BHP contracted vessels comply with Australian biosecurity requirements and guidance, and Australian ballast water requirements. • Vessels will be assessed and managed in line with BHP procedures to prevent the introduction of invasive marine species.
Unplanned releases including hydrocarbons	• All personnel undertaking activities will undergo relevant inductions and training. • Procedures for lifts, equipment maintenance, inspections and bunding. • All offshore activities will be managed in accordance with lifting and transfer procedures. • Recovery of solid wastes lost overboard where safe and practicable to do so. • Oil Pollution Emergency Plan (OPEP) and Operational and Scientific Monitoring Plan (OSMP) in place and tested. • Appropriate vessel spill response plans, equipment and materials will be in place and maintained. • Bunding of onshore storage of hazardous liquids
Vessel collision	• Marine notifications will be made to relevant stakeholders, describing the location of the activity and the 1,500 m operational area, to manage the risk of vessel collisions.

Protecting Our People and the Environment

Safety of our people and the communities in which we operate always comes first. Identifying, controlling, and mitigating safety risks is managed through an overarching, consistent approach guided by BHP's Risk Management governance framework, with supporting processes and performance standards. All activities (routine and non-routine) will be performed in accordance with the industry-leading standards established in BHP's Charter, HSEC Framework and Controls, BHP's Wells and Seismic Delivery Management System, Engineering Standards and Procedures, and the EP accepted by NOPSEMA.

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Offshore petroleum activities are regulated through a robust and comprehensive environmental protection regime administered by NOPSEMA under the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006*. BHP undertakes risk assessments for all environmental aspects of a petroleum activity and stringently adheres to the regulatory regime.

The objective of the EP is to ensure that potential adverse impacts on the environment associated with activities, during both routine and non-routine activities, are identified, and will be continuously reduced to as low as reasonably practicable (ALARP) and an acceptable level. BHP is committed to understanding the impacts of our activities on stakeholders with an interest in the Griffin field and seeks feedback as part of the development of the EP.

Responding to Emergencies

BHP's incident response plans are accepted by the regulator NOPSEMA. The Commonwealth Oil Pollution Emergency Plan (OPEP) is required by law under the Environmental Regulations and forms an appendix to the full EP. The OPEP outlines responsibilities, specific procedures and identifies resources available in the unlikely event of an oil pollution incident. BHP maintains a constant vigilance and readiness to prevent and/or respond to hydrocarbon loss of containment incidents. The readiness and competency of BHP to respond to incidents is maintained and tested by conducting activity-specific emergency response exercises.

Should you have any questions, concerns or grievances regarding these activities or any other BHP Petroleum activities, please call BHP WA Community Hotline on **1800 421 077** or send an email to **bhppetexternalaffairs@bhp.com**

BHP believes in putting health and safety first, being environmentally responsible and supporting our communities.

BHP