APPENDIX A – RELEVANT ENVIRONMENTAL REQUIREMENTS

Legislation	Summary	Relevance to GEP Installation
Commonwealth		
Australian Maritime Safety Authority Act 1990 (Cth)	This Act establishes AMSA, which manages the National Plan for Maritime Environmental Emergencies in coordination with industry. AMSA is also responsible for administering the Marine Orders in Commonwealth waters.	AMSA has been consulted as part of the relevant and interested persons engagement process. This Act applies to the use of any vessel associated with operations and is relevant to the activity in regards to the unplanned pollution from vessels. Refer **Section 7.9** and **Appendix E**.
Australian Ballast Water Requirements, Version 7	Australian Ballast Water Management Requirements outline the mandatory ballast water management requirements to reduce the risk of introducing harmful aquatic organisms into Australia's marine environment through ballast water from international vessels. These requirements are enforceable under the *Biosecurity Act 2015*.	Potential internationally sourced vessel operating in Australian Waters which could have the potential for introduction of Invasive Marine Species and potential ballast water exchange. Refer **Section 5.3.2**.
Australian Heritage Council Act 2003	This Act identifies areas of heritage value listed on the Register of the National Estate and sets up the Australian Heritage Council and its functions.	There is one Commonwealth heritage site within the EMBA. Refer **Section 4.8.1**.
Biosecurity Act 2015 (Cth)	This Act relates to the management of diseases and pests that may cause harm to human, animal or plant health or the environment. The Act includes provisions for ballast water management plans and certificates, record-keeping obligations and powers to ensure compliance.	Santos will ensure activity vessels comply with the requirements of this Act. Refer **Sections 5.3.2** and **7.3.4**.
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. 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.	A Commercial Activity Licence from the Director of National Parks has been granted in April 2019. The 'Licenced Activities' include "the construction, installation, operation, inspection, maintenance, repair and decommissioning of the GEP and the related capture of images, video and sound within or of the Park".

Legislation	Summary	Relevance to GEP Installation
Environment Protection and Biodiversity Conservation Act 1999 (Cth) Environment Protection and Biodiversity Conservation Regulations 2000 (Cth) Environment Protection and Biodiversity Conservation Amendment Regulations 2007 (Cth)	While the Environment Regulations under the OPGGS Act (see below) manage day to day petroleum activities and apply to any activity that may have an impact on the environment, the EPBC Act (Chapter 4) regulates assessment and approval of proposed actions that are likely to have a significant impact on a matter of National Environmental Significance (NES). Actions that are likely to have a significant impact on a matter of NES require approval by the Commonwealth Environment Minister; the assessment process is administered by the Department of the Environment, Water, Heritage and the Arts. The EPBC Act does not replace the need for an Environment Plan to be approved under the OPGGS (E) Regulations before an action can proceed. Schedule 8 of the EPBC Regulations outlines the Australian IUCN Reserve Management Principles.	Santos will adhere to the requirements of the EPBC Act and Regulations, as relevant to the installation of the GEP. Santos will have regard to the Australian IUCN Reserve Management Principles, where relevant.
EPBC Regulations – Part 8 Division 8.1 Interacting with cetaceans	These Regulations provide for the protection and conservation of cetaceans.	Described requirements for vessel interactions with cetaceans. Refer **Sections 5.3.3** and **5.2.3.**
Maritime Legislation Amendment (Prevention of Air Pollution from Ships) Act 2007 (Cth)	This Act implements the requirements of MARPOL 73/78 Annex VI for shipping in Commonwealth waters.	Santos, in consultation with the vessel owners, shall induct the vessel masters to this Act as relevant to the installation of the GEP. Vessel owners/contractors are to ensure MARPOL and this Act are adhered to as relevant to the installation of the GEP.
Maritime Powers Act 2013	Protects the heritage values of shipwrecks and relics for shipwrecks over 75 years. It is an offence to interfere with a shipwreck covered by this Act. Available historic shipwreck locations covered by international conventions enacted by this legislation have been identified and assessed (as applicable) within this EP.	Shipwrecks over 75 years old located in the EMBA. There is no planned interaction or interference with shipwrecks, and any unplanned impacts is only expected to affect the surface waters. Refer **Section 4.8.5**.
Marine Safety (Domestic Commercial Vessel) National Law Act 2012 (Cth)	This Act is a single regulatory framework for the certification, construction, equipment, design and operation of domestic commercial vessels inside Australia's exclusive economic zone.	All vessel movements associated with the activity will be governed by AMSA marine safety regulations under the Act. **Refer Sections 7.3 and 6**.

Legislation	Summary	Relevance to GEP Installation
Navigation Act 2012 (Cth)	A number of Marine Orders enacted under this Act apply directly to offshore petroleum activities: Marine Order 21 (Safety of navigational and emergency procedures) Marine Order 30 (Prevention of collisions) Marine Order 70 (Seafarer certification) Marine Order 71 (Masters and deck officers) Marine Order 91 (Marine pollution prevention – oil) Marine Order 94 (Pollution prevention – packaged harmful substances) Marine Order 95 (Marine pollution prevention – garbage) Marine Order 96 (Marine pollution prevention – sewage) Marine Order 97 (Marine pollution prevention – air pollution) AMSA has the authority and responsibility for the operational activities under the Act, including vessel certification, seafarers' qualifications, marine pollution prevention, monitoring and enforcement activities.	Santos, in consultation with the vessel owners/contractor shall induct the vessel masters to this Act and relevant Marine Orders as relevant to the installation of the GEP. Vessel owners are to ensure this Act and relevant port state Marine Orders are adhered to as relevant to the installation of the GEP. **Refer Sections 7.3 and 6**.
National Greenhouse and Energy Reporting Act 2007	Introduces a single national reporting framework for the reporting and dissemination of information about greenhouse gas emissions, greenhouse gas projects and energy use and production of corporations.	This Act applies to the atmospheric emissions through combustion engine use to operate the vessels associated with the activity. Implementation of the Act will reduce the impact of GHG emissions associated with vessel use for the installation and commissioning activity, through compliance with MARPOL Annex VI (Marine Order Part 97: Marine Pollution Prevention – Air Pollution), and require the use of low sulphur fuel.
Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth) Offshore Petroleum and Greenhouse Gas Storage Environment Regulations 2009 (Cth)	The Regulations require an accepted EP to be in place which demonstrates how the titleholder will carry out the petroleum activity in a manner which reduces environmental impacts and risks of the activity to as low as reasonably practicable and to an acceptable level.	This EP for the described petroleum activity must be accepted by NOPSEMA before activities commence.
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 undertaken at sea as part of the activity. Compliance with the Act reduces the risk of bunker oil pollution. **Refer Sections 5.3.8 and 6.**

Legislation	Summary	Relevance to GEP Installation
Protection of the Sea (Harmful Antifouling Systems) Act 2006 (Cth)	This Act relates to the protection of the sea from the effects of harmful anti-fouling systems. It prohibits the application or reapplication of harmful anti-fouling compounds on Australian ships or foreign ships that are in an Australian shipping facility.	Activity vessels will comply with the relevant requirements of this Act.
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cth) Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994 (Cth)	This Act and Regulations relate to the protection of the sea from pollution by oil and other harmful substances discharged from ships. This Act disallows any harmful discharge of sewage, oil and noxious substances into the sea and sets the requirements for a shipboard waste management plan. The following Marine Orders relating to marine pollution prevention have been put in place to give effect to relevant regulations of Annexes I, II, III, IV, V and VI of MARPOL 73/78: Marine Order 91 (Marine pollution prevention – oil) Marine Order 94 (Pollution prevention – packaged harmful substances) Marine Order 95 (Marine pollution prevention – garbage) Marine Order 96 (Marine pollution prevention – sewage) Marine Order 97 (Marine pollution prevention – air pollution) Marine Order 98 (Marine pollution prevention – anti-fouling systems)	Santos, in consultation with the vessel owners/contractor shall induct the vessel masters to this Act and relevant Marine Orders as relevant the installation of the GEP. Vessel owners/contractor are to ensure the requirements of MARPOL 73/78, this Act and Regulations, and relevant port state Marine Orders are adhered to as relevant to the installation of the GEP.
Underwater Cultural Heritage Act 2018	This Act replaces the *Historic Shipwrecks Act 1976*, and extends protection to other wrecks such as submerged aircraft and human remains. It also increases penalties applicable to damaged sites. The Act came into effect on 1 July 2019.	No planned interaction or interference to shipwrecks. Potential impact could be due to a hydrocarbon spill but the credible spill is to surface, and therefore shipwrecks are highly unlikely to be impacted. Numerous shipwrecks identified with EMBA and MEVA. **Refer Section 4.8.5**.
Northern Territory / Western Australian		
Fisheries Act 1988 (NT)	This Act establishes a framework for establishing a Disease and Pest Control Committee responsible for implementing NT marine biosecurity management.	Introduction of IMS. **Refer Section 5.3.2**.
Fish Resources Management Act 1994 (WA) *Fish Resources Management Regulations 1995 (WA)*	This Act establishes a framework for management of fishery resources and is the nominated lead agency responsible for implementing WA marine biosecurity management requirements through implementation of the *Fish Resources Management Act 1994* (FRMA 1994) and associated regulations.	Introduction of IMS. **Refer Section 5.3.2**.

Legislation	Summary	Relevance to GEP Installation
Heritage Act 2011 (NT)	This Act protects places that have been declared as heritage places.	One listed site is located within the EMBA. **Refer Section 4.8.5.**
Northern Territory Aboriginal Sacred Sites Act 1989 (NT)	This Act defines and describes, among other things, how a sacred site is registered, the penalties for damaging a sacred site, and what the role of the Aboriginal Areas Protection Authority.	No planned interaction or inference will occur. In the unlikely event of a credible spill, the sites are highly unlikely to be impacted. One declared Aboriginal reserve and is located within the EMBA and MEVA. **Refer Sections 4.8.6.**
International Agreements and Conventions		
Agreement Between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and Their Environment 1974 (commonly referred to as the Japan Australia Migratory Bird Agreement or JAMBA)	This agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between Australia and Japan. Implemented in EPBC Act 1999.	Only relevant in so far as the credible spill scenario may result in impact to migratory seabirds foraging in area. **Refer Appendix E.**
Agreement Between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and Their Environment 1986 (commonly referred to as the China Australia Migratory Bird Agreement or CAMBA)	This agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between Australia and China. Implemented in EPBC Act 1999.	Only relevant in so far as the credible spill scenario may result in impact to migratory seabirds foraging in area. **Refer Appendix E**.
Convention on the Conservation of Migratory Species of Wild Animals 1979 (Bonn Convention)	The Bonn Convention aims to improve the status of all threatened migratory species through national action and international agreements between range states of particular groups of species.	Only relevant in so far as the credible spill scenario may result in impact to MNES protected migratory species. **Refer Appendix E**.
Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (OPRC 90)	This convention comprises national arrangements for responding to oil pollution incidents from ships, offshore oil facilities, sea ports and oil handling. The convention recognises that in the event of pollution incident, prompt and effective action is essential.	In the event that worse-case credible spill scenarios may enact a national arrangement for response. **Refer Appendix E**.

Legislation	Summary	Relevance to GEP Installation
International Convention for the Control and Management of Ships' Ballast Water and Sediments	The IMO has been addressing the problem of IMS in ships' ballast water since the 1980s. Ballast water and sediments guidelines were adopted in 1991 and the ballast water convention was adopted in 2004. Recent accession by Finland has triggered the final entry into force of these international requirements. As a result, the International Convention for the Control and Management of Ships' Ballast Water and Sediment will enter into force on 8th September 2017 (IMO Briefing 22 2016). It aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Ballast Water Management systems must be approved by the Administration in accordance with this IMO Guidelines.	Introduction of IMS. **Refer Section 5.3.2**.

APPENDIX B – ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION PROTECTED MATTERS SEARCH REPORT

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.

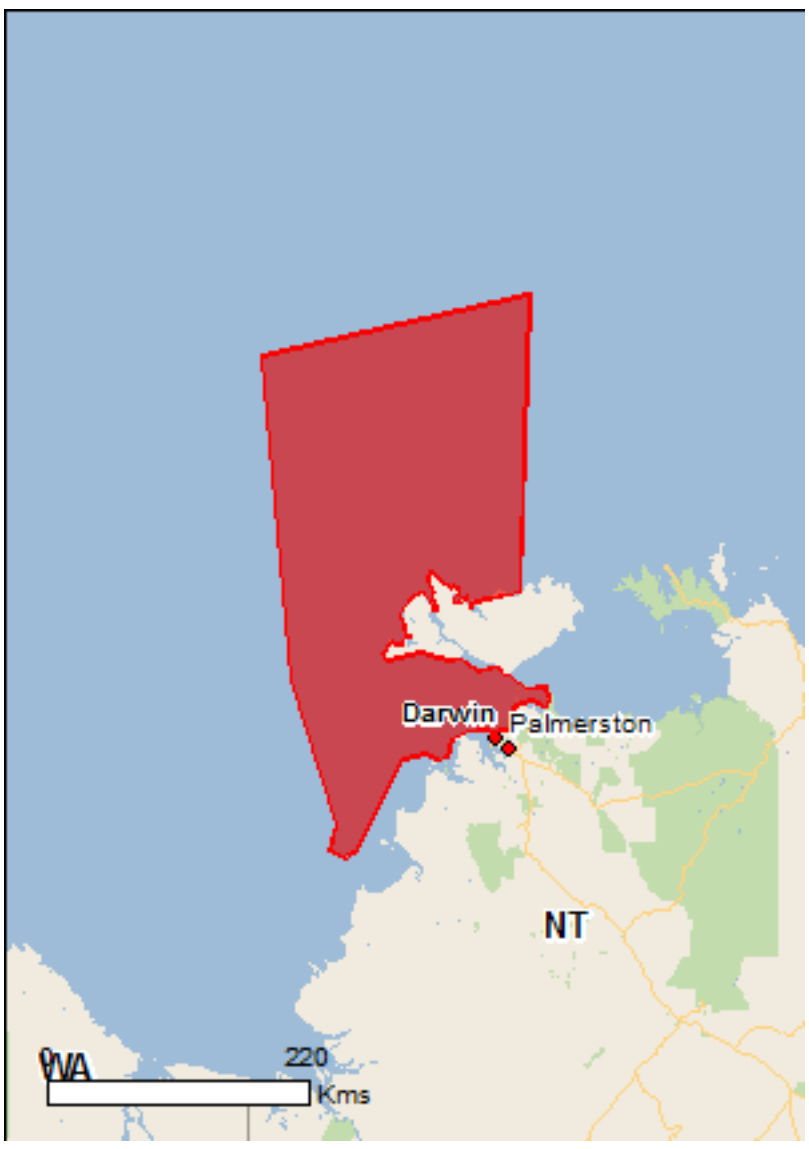
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 04/10/21 23:53:49

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



Coordinates

Buffer: 1.0Km

Summary

Matters of National Environmental 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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	53
Listed Migratory Species:	76

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 environment anywhere.

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 Land:	5
Commonwealth Heritage Places:	None
Listed Marine Species:	117
Whales and Other Cetaceans:	25
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	4

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	4
Regional Forest Agreements:	None
Invasive Species:	30
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	2

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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea
Extended Continental Shelf

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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 tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Epthianura crocea tunneyi Alligator Rivers Yellow Chat, Yellow Chat (Alligator Rivers) [67089]	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat known to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Geophaps smithii smithii Partridge Pigeon (eastern) [64441]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Melanodryas cucullata melvillensis Tiwi Islands Hooded Robin, Hooded Robin (Tiwi Islands) [67092]	Critically Endangered	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
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area
Tyto novaehollandiae melvillensis Tiwi Masked Owl, Tiwi Islands Masked Owl [26049]	Endangered	Species or species habitat known to occur within area
Mammals		
Antechinus bellus Fawn Antechinus [344]	Vulnerable	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 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
Conilurus penicillatus Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma [132]	Vulnerable	Species or species habitat known to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Mesembriomys gouldii gouldii Black-footed Tree-rat (Kimberley and mainland Northern Territory), Djintamoonga, Manbul [87618]	Endangered	Species or species habitat known to occur within area
Mesembriomys gouldii melvillensis Black-footed Tree-rat (Melville Island) [87619]	Vulnerable	Species or species habitat known to occur within area
Petrogale concinna canescens Nabarlek (Top End) [87606]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Phascogale pirata		
Northern Brush-tailed Phascogale [82954]	Vulnerable	Species or species habitat likely to occur within area
Saccolaimus saccolaimus nudicluniatus		
Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
Sminthopsis butleri		
Butler's Dunnart [302]	Vulnerable	Species or species habitat known to occur within area
Trichosurus vulpecula arnhemensis		
Northern Brushtail Possum [83091]	Vulnerable	Species or species habitat known to occur within area
Xeromys myoides		
Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat known to occur within area
Plants		
Burmannia sp. Bathurst Island (R.Fensham 1021)		
[82017]	Endangered	Species or species habitat likely to occur within area
Hoya australis subsp. oramicola		
a vine [55436]	Vulnerable	Species or species habitat known to occur within area
Mitrella tiwiensis		
a vine [82029]	Vulnerable	Species or species habitat likely to occur within area
Stylidium ensatum		
a triggerplant [86366]	Endangered	Species or species habitat likely to occur within area
Typhonium jonesii		
a herb [62412]	Endangered	Species or species habitat likely to occur within area
Typhonium mirabile		
a herb [79227]	Endangered	Species or species habitat likely to occur within area
Xylopia monosperma		
a shrub [82030]	Endangered	Species or species habitat known to occur within area
Reptiles		
Acanthophis hawkei		
Plains Death Adder [83821]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour 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	Breeding likely to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Lepidochelys olivacea		
Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area

Name	Status	Type of Presence
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Glyphis garricki Northern River Shark, New Guinea River Shark [82454]	Endangered	Breeding known to occur within area
Glyphis glyphis Speartooth Shark [82453]	Critically Endangered	Species or species habitat known to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	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	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
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
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat 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 known to occur within area
Sternula albifrons Little Tern [82849]		Breeding known to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known 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 may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur

Name	Threatened	Type of Presence 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 may 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	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known 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
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat 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

Name	Threatened	Type of Presence
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	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	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Breeding known 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
Migratory Terrestrial Species		
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat known to occur within area
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat may occur within area
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting 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

Name	Threatened	Type of Presence
		within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius dubius Little Ringed Plover [896]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting known to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Roosting known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding likely to occur

Name	Threatened	Type of Presence
		within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa incana Wandering Tattler [831]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [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.

Name
Commonwealth Land - Director of Property Services Defence Estate
Defence - DARWIN - AP10 RADAR SITE - LEE POINT
Defence - DARWIN - AP3 RECEIVING STATION - LEE POINT
Defence - LEANYER BOMBING RANGE
Defence - QUAIL ISLAND BOMBING RANGE

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat may occur within area
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
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area

Name	Threatened	Type of Presence
Calidris alba Sanderling [875]		Roosting 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 known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Charadrius dubius Little Ringed Plover [896]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat 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 known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting known to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Roosting known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area

Name	Threatened	Type of Presence
Heteroscelus incanus Wandering Tattler [59547]		Roosting known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Hirundo daurica Red-rumped Swallow [59480]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		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
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna albifrons Little Tern [813]		Breeding known to occur within area

Name	Threatened	Type of Presence
Sterna bergii Crested Tern [816]		Breeding likely to occur within area
Stiltia isabella Australian Pratincole [818]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Bhanotia fasciolata Corrugated Pipefish, Barbed Pipefish [66188]		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 suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		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
Corythoichthys haematopterus Reef-top Pipefish [66201]		Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
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

Name	Threatened	Type of Presence
Festucalex cinctus Girdled Pipefish [66214]		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 dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		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 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 cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys parvicarinatus Short-keel Pipefish, Short-keeled Pipefish [66230]		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 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
Micrognathus micronotopterus Tidepool Pipefish [66255]		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

Name	Threatened	Type of Presence
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
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may 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 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
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding 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
Enhydrina schistosa Beaked Seasnake [1126]		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

Name	Threatened	Type of Presence
		habitat may occur within area
Hydrophis atriceps Black-headed Seasnake [1101]		Species or species habitat may occur within area
Hydrophis coggeri Slender-necked Seasnake [25925]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis inornatus Plain Seasnake [1107]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Hydrophis pacificus Large-headed Seasnake, Pacific Seasnake [1112]		Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Parahydrophis mertoni Northern Mangrove Seasnake [1090]		Species or species habitat may occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
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 may 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

Name	Status	Type of Presence
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
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat 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 chinensis Indo-Pacific Humpback Dolphin [50]		Breeding known to 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
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

Name	Status	Type of Presence
		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]

Name	Label
Oceanic Shoals	Habitat Protection Zone (IUCN IV)
Oceanic Shoals	Multiple Use Zone (IUCN VI)
Oceanic Shoals	National Park Zone (IUCN II)
Oceanic Shoals	Special Purpose Zone (Trawl) (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Buffalo Creek	NT
Casuarina	NT
Djukbinj	NT
Tree Point Conservation Area	NT

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Bubalus bubalis Water Buffalo, Swamp Buffalo [1]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Plants		
Andropogon gayanus Gamba Grass [66895]		Species or species habitat likely to occur within area
Annona glabra Pond Apple, Pond-apple Tree, Alligator Apple, Bullock's Heart, Cherimoya, Monkey Apple, Bobwood, Corkwood [6311]		Species or species habitat may occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Mimosa pigra Mimosa, Giant Mimosa, Giant Sensitive Plant, ThornySensitive Plant, Black Mimosa, Catclaw Mimosa, Bashful Plant [11223]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Pennisetum polystachyon Mission Grass, Perennial Mission Grass,		Species or species

Name	Status	Type of Presence
Missiongrass, Feathery Pennisetum, Feather Pennisetum, Thin Napier Grass, West Indian Pennisetum, Blue Buffel Grass [21194]		habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area

Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Lepidodactylus lugubris Mourning Gecko [1712]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Key Ecological Features (Marine)

[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
Carbonate bank and terrace system of the Van	North
Shelf break and slope of the Arafura Shelf	North

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, 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 distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-9.57482 129.11815,-9.11995 131.11917,-11.31432 131.05176,-11.38385 130.70894,-11.43576 130.68282,-11.34176 130.66314,-11.33604 130.65664,-11.35632 130.64112,-11.38615 130.603,-11.39984 130.58049,-11.38806 130.55844,-11.35842 130.55884,-11.34097 130.57928,-11.34295 130.58671,-11.32205 130.60312,-11.30007 130.60345,-11.28922 130.59488,-11.2661 130.55435,-11.2769 130.54596,-11.28492 130.53068,-11.25008 130.47899,-11.16614 130.40169,-11.16972 130.37341,-11.24793 130.36353,-11.26487 130.37009,-11.31747 130.3987,-11.3439 130.38602,-11.36584 130.3903,-11.42102 130.41988,-11.45492 130.41825,-11.44909 130.40333,-11.41611 130.39442,-11.35937 130.35761,-11.31796 130.33862,-11.34558 130.25217,-11.42366 130.1857,-11.47563 130.14949,-11.55785 130.17486,-11.64122 130.19062,-11.6416 130.22618,-11.65914 130.21268,-11.65024 130.19981,-11.69743 130.16148,-11.70371 130.12672,-11.66916 130.08578,-11.77891 130.02047,-11.82367 130.05109,-11.77101 130.31538,-11.83035 130.50879,-11.81324 130.61678,-11.91085 130.72595,-11.87397 130.88459,-11.93205 130.93851,-11.93614 130.97115,-12.03861 131.09921,-12.02058 131.24229,-12.10856 131.26853,-12.12312 131.26108,-12.13889 131.25005,-12.16282 131.25392,-12.14971 131.22428,-12.11822 131.15261,-12.13495 131.0672,-12.16866 130.99601,-12.21484 131.01093,-12.29543 131.00995,-12.33313 130.94773,-12.3303 130.89548,-12.35146 130.87414,-12.32961 130.79277,-12.34165 130.67038,-12.39463 130.53865,-12.53892 130.49657,-12.55108 130.4475,-12.50358 130.35064,-12.5474 130.16394,-13.21185 129.83345,-13.27294 129.74131,-13.21903 129.62781,-13.02342 129.67246,-11.96493 129.33685,-9.57482 129.11815

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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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.

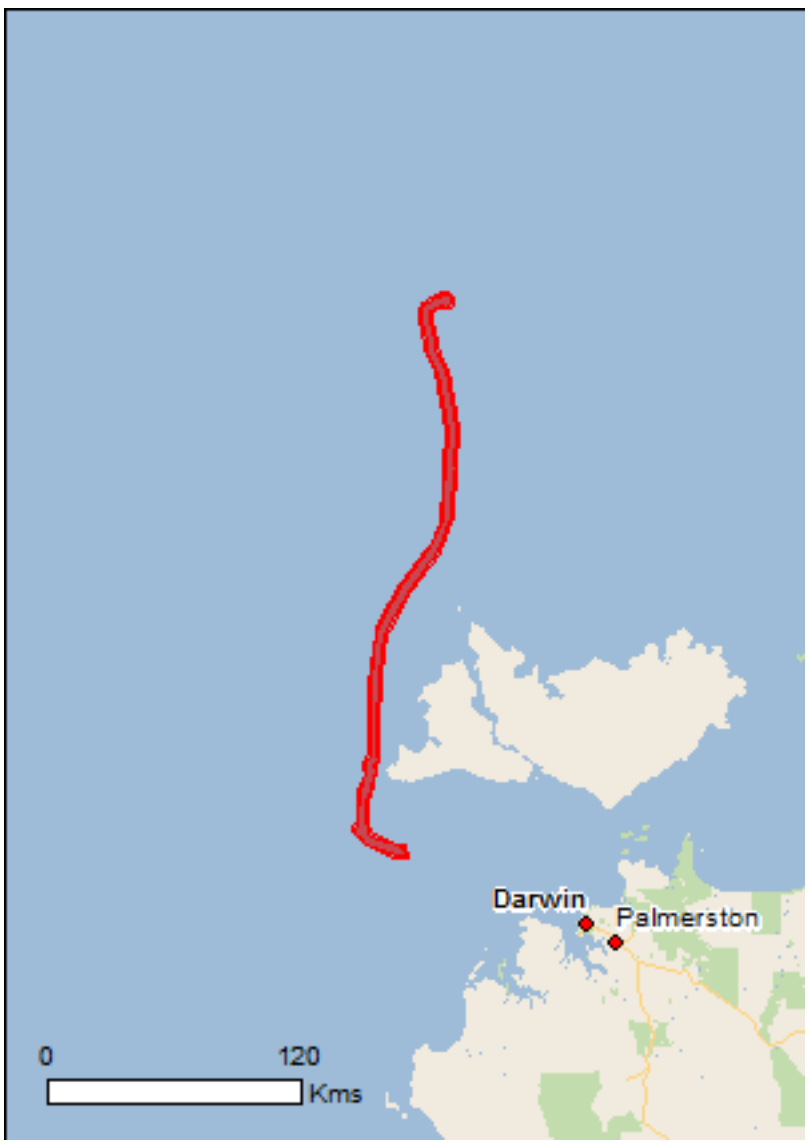
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 08/10/21 13:18:01

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



Coordinates

Buffer: 1.0Km

Summary

Matters of National Environmental 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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	20
Listed Migratory Species:	41

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 environment anywhere.

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 Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	69
Whales and Other Cetaceans:	25
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	2

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	2

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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Mammals		
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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Chelonia mydas Green Turtle [1765]	Vulnerable	Congregation or aggregation known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Congregation or aggregation known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Glyphis garricki Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat may occur within area
Glyphis glyphis Speartooth Shark [82453]	Critically Endangered	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 pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	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	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur

Name	Threatened	Type of Presence 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 may 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 may 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
Chelonia mydas Green Turtle [1765]	Vulnerable	Congregation or aggregation known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely 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 known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known 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
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Congregation or aggregation known to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray		Species or species habitat likely to occur

Name	Threatened	Type of Presence
[84995]		within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Orcaella heinsohni		
Australian Snubfin Dolphin [81322]		Species or species habitat may 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 pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	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	Species or species habitat may occur within area
Sousa chinensis		
Indo-Pacific Humpback Dolphin [50]		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
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
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within

Name	Threatened	Type of Presence area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
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
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to 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
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Fish		
Bhanotia fasciolata Corrugated Pipefish, Barbed Pipefish [66188]		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 suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		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
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
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
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 dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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 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
Micrognathus micronotopterus Tidepool Pipefish [66255]		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
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
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may 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

Name	Threatened	Type of Presence
		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
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Congregation or aggregation known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to 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
Enhydrina schistosa Beaked Seasnake [1126]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis atriceps Black-headed Seasnake [1101]		Species or species habitat may occur within area
Hydrophis coggeri Slender-necked Seasnake [25925]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis inornatus Plain Seasnake [1107]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Hydrophis pacificus Large-headed Seasnake, Pacific Seasnake [1112]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Congregation or aggregation known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Parahydrophis mertoni Northern Mangrove Seasnake [1090]		Species or species habitat may occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
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 may 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
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
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat may occur within area

Name	Status	Type of Presence
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 chinensis Indo-Pacific Humpback Dolphin [50]		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
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]
Name	Label
Oceanic Shoals	Habitat Protection Zone (IUCN IV)
Oceanic Shoals	Multiple Use Zone (IUCN VI)

Extra Information

Key Ecological Features (Marine) [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
Carbonate bank and terrace system of the Van	North
Shelf break and slope of the Arafura Shelf	North

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, 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 distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-12.091409 130.085458,-12.128657 130.098184,-12.124907 130.055929,-12.079381 129.928587,-12.050307 129.904867,-12.03655 129.883211,-12.018381 129.879873,-12.002427 129.888879,-11.998255 129.895229,-11.862931 129.903924,-11.784268 129.929157,-11.766404 129.927053,-11.746925 129.926449,-11.73177 129.931917,-11.712764 129.946542,-11.426864 129.945268,-11.419272 129.945672,-11.19764 129.972989,-11.184661 129.976551,-11.174625 129.980568,-10.998528 130.082535,-10.852602 130.19733,-10.830315 130.21093,-10.739776 130.252339,-10.727344 130.25445,-10.581689 130.256351,-10.55813 130.258204,-10.525241 130.266016,-10.518226 130.266957,-10.497914 130.263598,-10.374028 130.271691,-10.361433 130.270979,-10.113665 130.225555,-10.036948 130.188157,-10.025184 130.184043,-10.016144 130.182546,-10.001193 130.182508,-9.89139 130.158709,-9.871494 130.157979,-9.859708 130.160851,-9.849497 130.165654,-9.839986 130.172689,-9.831065 130.182897,-9.824746 130.193249,-9.814573 130.210814,-9.81121 130.219439,-9.809603 130.22592,-9.806376 130.240173,-9.798033 130.248506,-9.794387 130.257264,-9.795732 130.273657,-9.800756 130.281692,-9.810343 130.28853,-9.819531 130.29063,-9.831105 130.28863,-9.842286 130.280065,-9.847722 130.26701,-9.846754 130.255209,-9.842443 130.246762,-9.847176 130.226609,-9.863628 130.200323,-9.871973 130.195168,-9.892066 130.196227,-9.986718 130.217492,-10.014446 130.219078,-10.095664 130.257622,-10.105027 130.261032,-10.35458 130.306969,-10.374725 130.30823,-10.493301 130.29995,-10.508538 130.302756,-10.521158 130.303436,-10.533063 130.301717,-10.555966 130.295512,-10.688236 130.29148,-10.717558 130.28656,-10.866252 130.23198,-11.020198 130.111909,-11.189366 130.014022,-11.201244 130.009741,-11.209189 130.008121,-11.387317 129.981977,-11.599821 129.973522,-11.610288 129.969498,-11.622353 129.973663,-11.702322 129.974843,-11.723621 129.977592,-11.739418 129.972841,-11.749695 129.9638,-11.774647 129.965068,-11.884085 129.933831,-11.896751 129.928583,-11.99975 129.922372,-12.007512 129.930431,-12.015559 129.934136,-12.028075 129.934542,-12.04954 129.950044,-12.088275 130.057373,-12.091409 130.085458

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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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.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 29/09/21 19:32:24

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Coordinates

Buffer: 1.0Km

Summary

Matters of National Environmental 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:	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	61
Listed Migratory Species:	85

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 environment anywhere.

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 Land:	16
Commonwealth Heritage Places:	4
Listed Marine Species:	135
Whales and Other Cetaceans:	27
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	12

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	7
Regional Forest Agreements:	None
Invasive Species:	32
Nationally Important Wetlands:	6
Key Ecological Features (Marine)	8

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Ashmore reef national nature reserve	Within Ramsar site
Cobourg peninsula	Within Ramsar site
Kakadu national park	Within 10km of Ramsar

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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea
Extended Continental Shelf

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Breeding 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 tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Epthianura crocea tunneyi Alligator Rivers Yellow Chat, Yellow Chat (Alligator Rivers) [67089]	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence
		within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat known to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Falcunculus frontatus whitei Crested Shrike-tit (northern), Northern Shrike-tit [26013]	Vulnerable	Species or species habitat likely to occur within area
Geophaps smithii smithii Partridge Pigeon (eastern) [64441]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area
Melanodryas cucullata melvillensis Tiwi Islands Hooded Robin, Hooded Robin (Tiwi Islands) [67092]	Critically Endangered	Species or species habitat known to occur within area
Mirafra javanica melvillensis Horsfield's Bushlark (Tiwi Islands) [81011]	Vulnerable	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
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat known to occur within area
Tyto novaehollandiae melvillensis Tiwi Masked Owl, Tiwi Islands Masked Owl [26049]	Endangered	Species or species habitat known to occur within area
Mammals		
Antechinus bellus Fawn Antechinus [344]	Vulnerable	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	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	Species or species habitat likely to occur within area
Conilurus penicillatus Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma [132]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Mesembriomys gouldii gouldii Black-footed Tree-rat (Kimberley and mainland Northern Territory), Djintamoonga, Manbul [87618]	Endangered	Species or species habitat known to occur within area
Mesembriomys gouldii melvillensis Black-footed Tree-rat (Melville Island) [87619]	Vulnerable	Species or species habitat known to occur within area
Petrogale concinna canescens Nabarlek (Top End) [87606]	Endangered	Species or species habitat likely to occur within area
Phascogale pirata Northern Brush-tailed Phascogale [82954]	Vulnerable	Species or species habitat known to occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
Sminthopsis butleri Butler's Dunnart [302]	Vulnerable	Species or species habitat known to occur within area
Trichosurus vulpecula arnhemensis Northern Brushtail Possum [83091]	Vulnerable	Species or species habitat known to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat known to occur within area
Plants		
Burmannia sp. Bathurst Island (R.Fensham 1021) [82017]	Endangered	Species or species habitat likely to occur within area
Hoya australis subsp. oramicola a vine [55436]	Vulnerable	Species or species habitat known to occur within area
Mitrella tiwiensis a vine [82029]	Vulnerable	Species or species habitat likely to occur within area
Stylidium ensatum a triggerplant [86366]	Endangered	Species or species habitat known to occur within area
Typhonium jonesii a herb [62412]	Endangered	Species or species habitat known to occur within area
Typhonium mirabile a herb [79227]	Endangered	Species or species habitat known to occur within area
Xylopia monosperma a shrub [82030]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Reptiles		
Acanthophis hawkei Plains Death Adder [83821]	Vulnerable	Species or species habitat known to occur within area
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 may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Cryptoblepharus gurrmul Arafura Snake-eyed Skink [83106]	Endangered	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Glyphis garricki Northern River Shark, New Guinea River Shark [82454]	Endangered	Breeding known to occur within area
Glyphis glyphis Speartooth Shark [82453]	Critically Endangered	Species or species habitat known to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	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

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Breeding known to occur

Name	Threatened	Type of Presence
		within area
Apus pacificus Fork-tailed Swift [678]		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 known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Breeding known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Breeding known to occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Breeding known to occur within area
Phaethon rubricauda Red-tailed Tropicbird [994]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons Little Tern [82849]		Breeding known to occur within area
Sula dactylatra Masked Booby [1021]		Breeding known to occur within area
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area
Sula sula Red-footed Booby [1023]		Breeding known to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known 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	Migration route known 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 may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour 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
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
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat 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 pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	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

Name	Threatened	Type of Presence
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa chinensis		
Indo-Pacific Humpback Dolphin [50]		Breeding known 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
Migratory Terrestrial Species		
Cecropis daurica		
Red-rumped Swallow [80610]		Species or species habitat known to occur within area
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundo rustica		
Barn Swallow [662]		Species or species habitat known to occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat known to occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Acrocephalus orientalis		
Oriental Reed-Warbler [59570]		Species or species habitat known to occur within area
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres		
Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba		
Sanderling [875]		Roosting 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 known to occur within area
Calidris ruficollis		
Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta		
Long-toed Stint [861]		Roosting known to occur within area

Name	Threatened	Type of Presence
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius dubius Little Ringed Plover [896]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting known to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Roosting known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa incana Wandering Tattler [831]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus		
Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [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.

Name
Commonwealth Land -
Commonwealth Land - Australian Government Solicitor
Commonwealth Land - Department of Immigration Local Government & Ethnic Affairs
Commonwealth Land - Deputy Crown Solicitor
Commonwealth Land - Director of Property Services Defence Estate
Defence - AUSTRALIAN ARMY BAND - DARWIN
Defence - DARWIN - AP10 RADAR SITE - LEE POINT
Defence - DARWIN - AP3 RECEIVING STATION - LEE POINT
Defence - DEFENCE FORCE CAREERS REFERENCE CENTRE
Defence - Esanda Builidng
Defence - LARRAKEYAH BARRACKS
Defence - LEANYER BOMBING RANGE
Defence - Patrol Boat Base (DARWIN NAVAL BASE)
Defence - QUAIL ISLAND BOMBING RANGE
Defence - SHOAL BAY RECEIVING STATION
Defence - STOKES HILL OIL FUEL INSTALLATION

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Ashmore Reef National Nature Reserve	EXT	Listed place
Historic		
Larrakeyah Barracks Headquarters Building	NT	Listed place
Larrakeyah Barracks Precinct	NT	Listed place
Larrakeyah Barracks Sergeants Mess	NT	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Acrocephalus orientalis		
Oriental Reed-Warbler [59570]		Species or species habitat known to occur within area
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous minutus		
Black Noddy [824]		Breeding known to occur

Name	Threatened	Type of Presence
		within area
Anous stolidus Common Noddy [825]		Breeding known to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Breeding known to occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting 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 known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Charadrius dubius Little Ringed Plover [896]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Breeding known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Breeding known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting known to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Roosting known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Heteroscelus incanus Wandering Tattler [59547]		Roosting known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Hirundo daurica Red-rumped Swallow [59480]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		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
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur

Name	Threatened	Type of Presence
		within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Breeding known to occur within area
Phaethon rubricauda Red-tailed Tropicbird [994]		Breeding known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna albifrons Little Tern [813]		Breeding known to occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna bengalensis Lesser Crested Tern [815]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Stiltia isabella Australian Pratincole [818]		Roosting known to occur within area
Sula dactylatra Masked Booby [1021]		Breeding known to occur within area
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area
Sula sula Red-footed Booby [1023]		Breeding known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area

Name	Threatened	Type of Presence
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Bhanotia fasciolata Corrugated Pipefish, Barbed Pipefish [66188]		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 suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		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
Corythoichthys haematopterus Reef-top Pipefish [66201]		Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
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
Festucalex cinctus Girdled Pipefish [66214]		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 dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		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
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys parvicarinatus Short-keel Pipefish, Short-keeled Pipefish [66230]		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 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
Micrognathus micronotopterus Tidepool Pipefish [66255]		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
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
Mammals		
Dugong dugon Dugong [28]		Breeding known to occur within area
Reptiles		

Name	Threatened	Type of Presence
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 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 may occur within area
Aipysurus fuscus Dusky Seasnake [1119]		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
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known 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
Enhydrina schistosa Beaked Seasnake [1126]		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

Name	Threatened	Type of Presence
		area
Hydrophis atriceps Black-headed Seasnake [1101]		Species or species habitat may occur within area
Hydrophis coggeri Slender-necked Seasnake [25925]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis inornatus Plain Seasnake [1107]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Hydrophis pacificus Large-headed Seasnake, Pacific Seasnake [1112]		Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Parahydrophis mertoni Northern Mangrove Seasnake [1090]		Species or species habitat may occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
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	Migration route known 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		Species or species

Name	Status	Type of Presence
Dolphin [60]		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
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 simus Dwarf Sperm Whale [58]		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	Species or species habitat likely to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat 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 chinensis Indo-Pacific Humpback Dolphin [50]		Breeding known to 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
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

Name	Status	Type of Presence
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]
Name	Label
Arafura	Multiple Use Zone (IUCN VI)
Arafura	Special Purpose Zone (IUCN VI)
Arafura	Special Purpose Zone (Trawl) (IUCN VI)
Arnhem	Special Purpose Zone (IUCN VI)
Ashmore Reef	Recreational Use Zone (IUCN IV)
Ashmore Reef	Sanctuary Zone (IUCN Ia)
Joseph Bonaparte Gulf	Multiple Use Zone (IUCN VI)
Joseph Bonaparte Gulf	Special Purpose Zone (IUCN VI)
Oceanic Shoals	Habitat Protection Zone (IUCN IV)
Oceanic Shoals	Multiple Use Zone (IUCN VI)
Oceanic Shoals	National Park Zone (IUCN II)
Oceanic Shoals	Special Purpose Zone (Trawl) (IUCN VI)

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Buffalo Creek	NT
Casuarina	NT
Charles Darwin	NT
Djukbinj	NT
Garig Gunak Barlu	NT
Shoal Bay	NT
Tree Point Conservation Area	NT

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos javanicus Banteng, Bali Cattle [15]		Species or species habitat likely to occur within area
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Bubalus bubalis Water Buffalo, Swamp Buffalo [1]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Plants		
Andropogon gayanus Gamba Grass [66895]		Species or species habitat likely to occur within area
Annona glabra Pond Apple, Pond-apple Tree, Alligator Apple, Bullock's Heart, Cherimoya, Monkey Apple, Bobwood, Corkwood [6311]		Species or species habitat may occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area

Name	Status	Type of Presence
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Mimosa pigra Mimosa, Giant Mimosa, Giant Sensitive Plant, ThornySensitive Plant, Black Mimosa, Catclaw Mimosa, Bashful Plant [11223]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Pennisetum polystachyon Mission Grass, Perennial Mission Grass, Missiongrass, Feathery Pennisetum, Feather Pennisetum, Thin Napier Grass, West Indian Pennisetum, Blue Buffel Grass [21194]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Lepidodactylus lugubris Mourning Gecko [1712]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat known to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Adelaide River Floodplain System	NT
Ashmore Reef	EXT
Cobourg Peninsula System	NT
Finniss Floodplain and Fog Bay Systems	NT
Murgenella-Cooper Floodplain System	NT
Port Darwin	NT

Key Ecological Features (Marine) [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
Carbonate bank and terrace system of the Van	North
Pinnacles of the Bonaparte Basin	North
Shelf break and slope of the Arafura Shelf	North
Tributary Canyons of the Arafura Depression	North

Name	Region
Ashmore Reef and Cartier Island and surrounding	North-west
Carbonate bank and terrace system of the Sahul	North-west
Continental Slope Demersal Fish Communities	North-west
Pinnacles of the Bonaparte Basin	North-west

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, 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 distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-11.84493 119.6803,-11.64109 120.21138,-11.48077 120.82744,-11.45221 121.655,-10.76739 121.97327,-10.52656 121.97979,-10.28571 122.04998,-9.87121 121.83676,-9.61719 121.79964,-9.60063 122.04207,-11.00003 122.46145,-10.95584 122.87714,-10.8331 123.18319,-10.51742 123.38137,-10.38818 123.89552,-10.20723 124.47629,-9.79207 124.98257,-9.45396 125.67827,-8.6056 127.10124,-8.32145 127.24269,-8.0086 127.09287,-7.89086 127.24456,-8.22298 127.78346,-8.3242 128.04983,-8.0414 128.47548,-7.96978 129.35425,-8.05505 129.92339,-7.50119 130.33937,-7.73554 130.98768,-7.64984 131.58775,-7.31952 131.65046,-7.30833 131.72223,-7.32409 132.05991,-6.99349 132.17611,-6.84846 132.41542,-7.85281 133.79133,-8.89841 134.50174,-10.19529 135.49591,-10.70717 135.23958,-10.75961 134.34473,-11.45903 136.0764,-11.59552 136.03284,-11.72581 135.34125,-11.69494 134.59773,-11.62416 134.17932,-11.22204 133.14266,-11.22579 132.8634,-11.19416 131.85398,-11.2985 131.81505,-11.45835 131.96564,-11.56829 132.07949,-11.63978 132.41475,-11.76633 132.61266,-11.85239 132.60652,-11.8722 132.14836,-12.2091 132.14865,-12.25998 132.0873,-12.25028 131.99243,-12.17232 131.90775,-12.00185 131.74931,-12.12873 131.60485,-12.17367 131.39388,-12.28015 131.1185,-12.36123 131.02185,-12.34614 130.99255,-12.34451 130.95362,-12.33526 130.9088,-12.33732 130.88741,-12.35851 130.86615,-12.37388 130.85653,-12.39885 130.84308,-12.40666 130.81978,-12.45447 130.82206,-12.47151 130.84944,-12.44847 130.86095,-12.4655 130.88833,-12.48455 130.90015,-12.48247 130.9235,-12.49956 130.94115,-12.53001 130.94426,-12.53393 130.92866,-12.51041 130.91933,-12.51451 130.90001,-12.52049 130.8783,-12.50328 130.86243,-12.52419 130.86043,-12.53548 130.87122,-12.54704 130.86404,-12.5727 130.88411,-12.57959 130.92045,-12.5913 130.93454,-12.60997 130.91786,-12.63203 130.88565,-12.63203 130.87591,-12.61165 130.86934,-12.5745 130.8493,-12.55595 130.84187,-12.55745 130.82086,-12.57805 130.82448,-12.57731 130.81427,-12.55572 130.80942,-12.5399 130.8102,-12.54194 130.79704,-12.55675 130.78782,-12.57993 130.79216,-12.59449 130.78395,-12.58853 130.77688,-12.56145 130.78067,-12.56474 130.76937,-12.54472 130.77444,-12.52345 130.77362,-12.51191 130.77735,-12.49386 130.77148,-12.47783 130.77771,-12.48278 130.76145,-12.43848 130.76578,-12.38194 130.62026,-12.40623 130.5783,-12.42319 130.58669,-12.4296 130.60576,-12.44631 130.62137,-12.45454 130.58713,-12.51496 130.58208,-12.56933 130.56721,-12.67092 130.53526,-12.67903 130.41208,-12.74411 130.35004,-12.83973 130.35034,-12.91895 130.16695,-13.02069 130.13098,-13.21708 130.02502,-13.37736 130.00794,-13.43336 129.83787,-13.71426 129.61037,-13.87522 129.51701,-14.10121 129.38931,-14.375 129.30103,-14.38594 129.25842,-14.06539 129.09769,-13.83914 128.67055,-13.21739 127.79667,-12.83651 127.37959,-12.16179 126.78537,-11.80171 125.08829,-12.41966 123.30121,-12.52278 122.9312,-12.68587 121.55266,-12.47237 119.83206,-11.84493 119.6803

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 C– STAKEHOLDER CONSULTATION

APPENDIX C

STAKEHOLDER CONSULTATION RECORDS

(Conducted October-December 2021 for additional Barossa GEP Segment in Commonwealth Waters)

Santos

STAKEHOLDER CONSULTATION

Consultation Correspondence

From: Consultation_Santos
Bcc: [redacted]
Subject: Barossa Stakeholder Quarterly Update
Date: Friday, 8 October 2021 7:35:00 AM
Attachments: image005.png
image006.png
Barossa Gas Export Pipeline Installation - Environment Plan Revision - October 2021.pdf

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Santos, as Operator of the Barossa Development, is pleased to provide the following Quarterly Update.

Work Progress Highlights

Since our last update in June, significant progress has been made on several work fronts.

First steel for the Floating Production, Storage and Offloading vessel (FPSO) has been cut, manufacturing of well heads has been completed and good progress is being made on tubing, subsea trees, clad pipe for flowlines and plate for pipeline.

The manufacture of 26" line-pipe is also due to start soon. Some images of the progress are below:


XT #1 Assembly


MLP Liner Production at Butting


Stabcon Connector Termination Heads & Hubs


1st shipment of plates for 26" GEO departs POSCO


FPSO Hull 1st Steel Cutting Ceremony


Flowlines Fabricom Bends – Test Rings

Upcoming Activity

Barossa Gas Export Pipeline route survey
A survey of the proposed route for the new 262-km Gas Export Pipeline (GEP) will be undertaken in this quarter, most likely during November.

The survey will involve one vessel traversing the entire pipeline route (below) over a 1-2 week period. Further information will be provided to marine users in advance of the survey's commencement.

The survey will be conducted using a vessel under contract from *Allseas* which is responsible for supply and installation of the new pipeline. A longer pre-lay survey of the pipeline is scheduled to occur in Quarter 4 of 2022.

Environmental Approvals

Barossa Development Drilling & Completions Environment Plan
Santos would like to thank all stakeholders who provided feedback that assisted preparation of the Development Drilling & Completions Environment Plan.

The campaign will involve the drilling of six production wells at three locations within the Barossa field. Each well takes approximately 90 days to drill. The activity is scheduled to commence in May 2022.

The Environment Plan has been submitted to the Commonwealth Government's offshore regulator, NOPSEMA, for formal assessment which typically

occurs over a period of several months.

The document will be available on NOPSEMA's website during the assessment period. It will include a detailed summary of the correspondence between stakeholders and Santos during the preparation period. Full transcripts of this correspondence, as well as any other sensitive information received, have also been provided to NOPSEMA for assessment, but are not published.

Barossa Gas Export Pipeline Installation - Environment Plan Revision

Development approvals already received enable the installation of the Barossa GEP from the Barossa field to a tie-in point at the existing Bayu-Undan to Darwin Pipeline.

This continues to be the 'base case' for the delivery of Barossa gas to DLNG and Santos continues to progress all regulatory approvals for this case.

An alternative now being considered by Santos is to extend the Barossa GEP all the way to DLNG, enabling the Bayu-Undan to Darwin Pipeline to be preserved for life extension and/or re-purposing opportunities. One opportunity being assessed is the re-purposing of the Bayu-Undan to Darwin Pipeline to carry carbon dioxide for potential Carbon Capture and Storage (CCS) at Bayu-Undan in the Timor Sea. The relevant joint ventures are engaging with the Timor-Leste Government.

CCS is recognised by the International Energy Agency and the Intergovernmental Panel on Climate Change as being a critical technology to achieve the world's climate goals. The Bayu-Undan reservoir and facilities have the potential to be a world-leading CCS project.

Extending the Barossa GEP by 25 km in Commonwealth Waters will require a Revision to the NOPSEMA-accepted Environment Plan. The additional Barossa GEP segment would be laid adjacent to the Bayu-Undan to Darwin Pipeline.

Please find attached information on the EP Revision which is being prepared in accordance with the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations*. Should you require additional information or have a comment to make about the proposed activity, please be in touch via the contact details provided in the attached information.

Ongoing Engagement

During the next four years, Santos is required to prepare various regulatory approval applications. We will continue to ensure that relevant stakeholders are engaged during the preparation of Environment Plans and are provided pre-activity notifications of all our on-water activities.

Conscious of the amount of industry information provided to some stakeholders, Santos seeks to limit written information to quarterly development updates. The updates include information on development progress, upcoming regulatory approvals and notifications of proposed and completed on-water activities. From time-to-time there may be a need to conduct out-of-sequence engagement on specific issues and activities.

Please make contact if you have queries about the development or want to discuss the engagement process. We would be pleased to meet in person or facilitate online conversations at any time.

Santos

Michael Marren
Senior External Relations Advisor
Public and Government Affairs
Santos Limited, 100 St George's Terrace, Perth WA 6000
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m: +61 477 739 478

https://www.santos.com/

From: Consultation_Santos
Bcc: [redacted]
Subject: RE: Barossa Stakeholder Quarterly Update
Date: Thursday, 28 October 2021 11:59:00 AM
Attachments: image005.png
image006.png
Barossa Gas Export Pipeline Installation - Environment Plan Revision - October 2021.pdf

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Good afternoon,

I am following up on the update email sent to you on 8 October 2021 (copy below) which included consultation material on the proposed extension of the Barossa Gas Export Pipeline Installation for an additional 25 km in Commonwealth Waters.

Santos is preparing an Environment Plan Revision for this activity in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth).

Should you require additional information or have a comment to make about the proposed activity, please be in touch via the contact details below by 5 November 2021.

Thank you to those who have already provided feedback.

Kind regards

From: Consultation, Santos
Sent: Friday, 8 October 2021 7:35 AM
Subject: Barossa Stakeholder Quarterly Update

Santos, as Operator of the Barossa Development, is pleased to provide the following Quarterly Update.

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Ongoing Engagement

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STAKEHOLDER CONSULTATION

Consultation Material

STAKEHOLDER CONSULTATION

Santos

Barossa Development

Gas Export Pipeline Installation – Environment Plan Revision

Overview

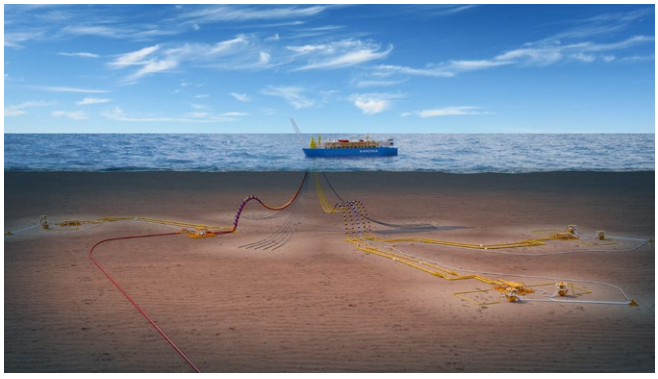
The Barossa Development is an approved offshore natural gas development located approximately 300 kilometres north-west of Darwin. The development will backfill gas supply to the existing Darwin LNG (DLNG) facility at Wickham Point. Santos NA Barossa Pty Ltd (Santos), as Operator, on behalf of co-venturers SK E&S Australia Pty Ltd and Santos Offshore Pty Ltd, is currently executing the Barossa Development, with first gas production targeted for the first half of 2025.

The development area is located in Commonwealth waters with initial development occurring within petroleum production licence NT/L1, known as the Barossa Field. The initial development involves producing the Barossa Field through subsea wells and a network of subsea flowlines and marine risers to a Floating, Production, Storage and Offloading (FPSO) vessel. Processing will then occur on the FPSO to separate the natural gas and condensate.

The condensate will be transferred from the FPSO to specialised offtake tankers for export.

Development approvals enable gas to be transported from the FPSO to the DLNG facility via a new 262-km Barossa Gas Export Pipeline (Barossa GEP) connected to the existing Bayu-Undan to Darwin pipeline. This continues to be the 'base case' for delivery of Barossa gas to the DLNG facility. Santos continues to progress all regulatory approvals for this case.

Santos is currently investigating the potential extension of the Barossa GEP as a new stage of the development. This will mean that the Barossa GEP could be extended by approximately 25 km in Commonwealth waters (Additional GEP Segment) and laid in parallel to the Bayu-Undan to Darwin pipeline.



The potential extension of the Barossa GEP would also involve the installation of a near-shore pipeline segment within the coastal waters of the Northern Territory that will connect, at one end, to the Additional GEP Segment and, at the other end, to the DLNG facility. This extension of the Barossa GEP supports any future opportunity to deliver gas via the pipeline to the DLNG facility while preserving the Bayu-Undan to Darwin pipeline for life extension and/or re-purposing opportunities.

As the pipeline crosses multiple regulatory jurisdictions, Santos is initially consulting on the Commonwealth Waters section regulated by NOPSEMA

As a previously engaged stakeholder, Santos is seeking your feedback on the Additional GEP Segment. Future engagement on the regulatory approvals required for the Nearshore Pipeline Section, to be approximately 100-km in length, will occur under a separate process.

Proposed new stage

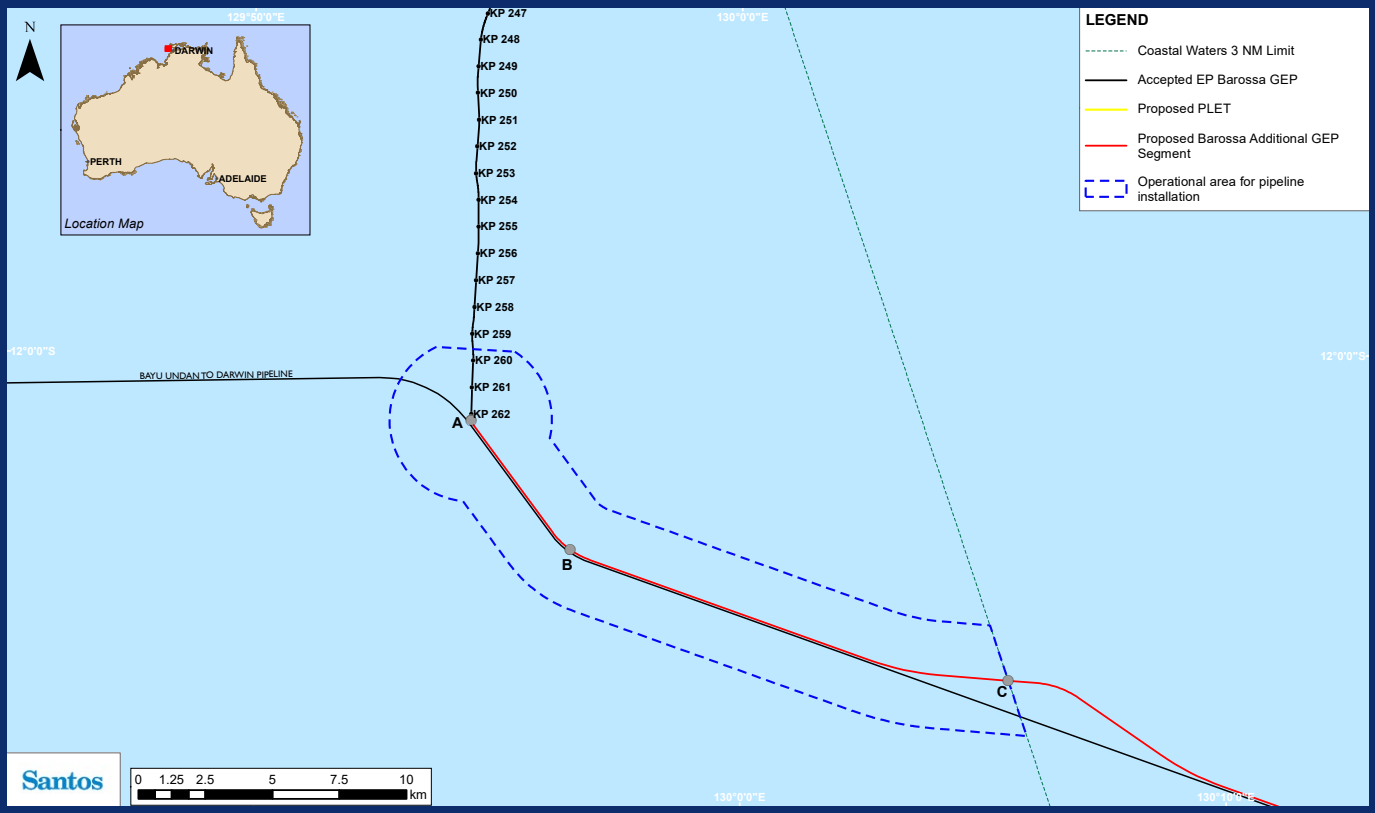
The proposed new stage of the Barossa GEP is the installation of the Additional GEP Segment, a pipeline end termination (PLET) and a spool at the southern end of the Barossa GEP. The Additional GEP Segment will generally be laid parallel to the existing Bayu-Undan to Darwin pipeline, with the exception of an area adjacent to the Commonwealth waters boundary where the Additional GEP Segment is routed away from the Bayu-Undan to Darwin pipeline to avoid a heritage zone.

Consistent with the Barossa GEP, the Additional GEP Segment will be 26 inches in diameter and constructed from carbon steel with external anti-corrosion coating and anodes to maintain integrity. The pipeline installation methods will be consistent, but the installation will occur as a separate campaign at a later timeframe.

After installation, the following activities will be undertaken:

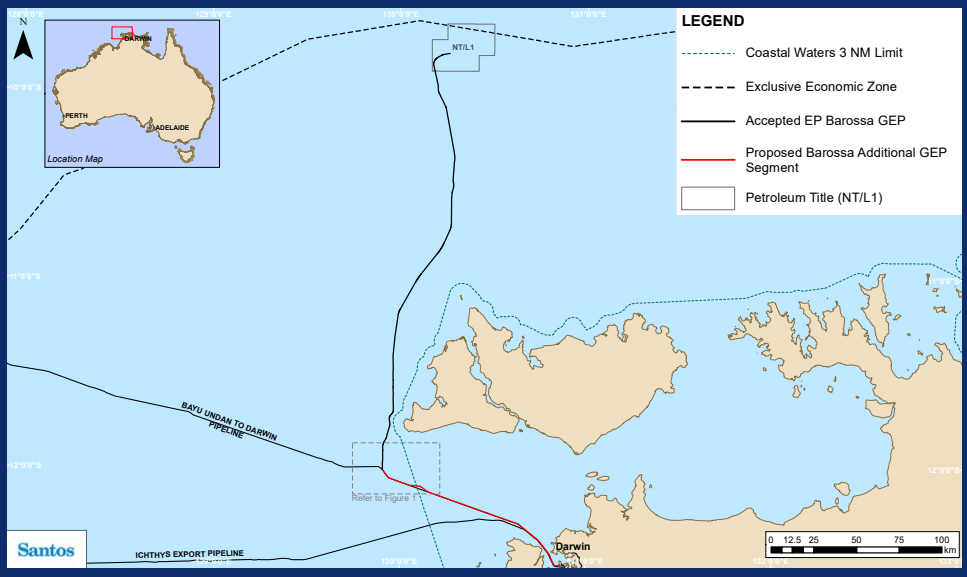
- flooding, cleaning and gauging of the pipeline.
- hydrostatic pressure testing of the pipeline with treated seawater to confirm the structural integrity.
- dewatering of flooding fluid.
- preservation for operations.
- metrology and spool installation.
- ongoing monitoring and maintenance.

Figure 1: Operational Area for proposed Barossa Additional Gas Export Pipeline Segment in Commonwealth Waters



ADDITIONAL PIPELINE SEGMENT – KEY COORDINATES				
Point (as per Figure 1)	**Latitude**	**Longitude**	**Latitude**	**Longitude**
A	12° 1' 22.874"S	129° 54' 25.788" E	-12.023021	129.907163
B	12° 4' 12.197"S	129° 56' 56.133" E	-12.070055	129.948926
C	12° 6' 36.119" S	130° 5' 30.555" E	-12.110033	130.091821

Figure 2



Operational area

The operational area is the geographic extent required for the Additional GEP Segment installation campaign. Consistent with the Barossa GEP, the operational area is defined as 2,000 m either side of the proposed pipeline route. The operational area includes a radius of 3,000 m around the proposed PLET location.

Timing

Installation of the Additional GEP Segment could occur as early as Q3 2023. Pre-lay survey and preparatory works could occur up to 12 months prior to pipeline installation. The estimated total infield vessel duration for the proposed stage is approximately one to two months. The schedule is indicative only; exact timing and duration is subject to vessel availability, sea state, weather conditions and operational challenges.

Table 1: Additional GEP Segment Installation activity summary

ACTIVITY INFORMATION		
Location	Wholly in Commonwealth Waters and parallel to Bayu-Undan to Darwin GEP.	
Schedule	Installation of the Additional GEP Segment could occur as early as Q3 2023, with potential survey and preparatory works up to 12 months before.	
Duration	Additional GEP Segment installation ~3-4 weeks; preparatory works ~3-4 weeks; pre-commissioning and post-lay works ~10-12 weeks.	
Water depth	~45-60m.	
Equipment/vessels	Pipelay, pipe supply, survey and support vessels.	
Key activities	• Pre-lay and post-lay surveys. • Installation of Additional GEP Segment and PLET. • Pipeline stablisation and/or span rectification works. • Pre-commissioning works. • Ongoing monitoring and maintenance works.	
Exclusion Zone	Requested temporary 500-m safety exclusion zone around operating vessels. No exclusion zones around the installed Additional GEP Segment.	
Operational Area	2,000 m either side of pipeline route, plus a radius of 3,000 m around the PLET.	
Description of natural environment	Areas of irregular relief, smooth sandy/silty seabed and rock/reef outcrops with coarse sediments (sand, gravel and shells).	
Proximity to key regional features	**Regional Feature**	**Distance**
	Evans Shoal	200 km
	Shelf break and slope of the Arafura Shelf	180 km
	Lynedoch Bank	125 km
	Tassie Shoal	110 km
	Darwin, NT	100 km
	Goodrich Bank	75 km
	Oceanic Shoals Australian Marine Park	50 km
	Tiwi Islands, NT	25 km
	Carbonate Banks and Terrace System of the Van Diemen Rise	Adjacent
	Shepparton Shoal	Adjacent
	Commercial Fisheries – refer to supplementary information provided to fishing stakeholders	Overlapping
Worst case hydrocarbon spill scenario	A vessel collision could result in a fuel tank rupture and release of marine fuel oil. Operation of the pipeline would be the subject of a future environmental assessment.	
Response tier required	A Level 3 response would be implemented as per the activity-specific Oil Pollution Emergency Plan (OPEP).	

Environmental Impacts and Risks

Santos' preliminary environmental assessments for the planned events (including any routine, non-routine and contingency activities) and unplanned events are that the Additional GEP Segment does not change the impacts and risks presented in the accepted Barossa GEP Environment Plan.

Santos identified the following aspects associated with planned activities within the operational area that may cause environmental impacts. These are the same as those identified for the Barossa GEP:

- Noise emissions
- Light emissions
- Atmospheric emissions
- Seabed and benthic habitat disturbance
- Interaction with other marine users
- Operational discharges
- Pipeline dewatering and pre-commissioning fluid discharges
- Spill response operations, should this be required

Santos identified the following aspects associated with unplanned activities within the operational area that may cause environmental impacts. These are the same as those identified for the Barossa GEP:

- Dropped objects
- Introduction of Invasive Marine Species (IMS)
- Collision with marine fauna
- Loss of hazardous and non-hazardous materials
- Implementation of spill response

The environmental assessments considered the following information:

- The activities involve standard offshore industry installation practices, and the identified environmental aspects, receiving environment and potential impacts and risks are well understood.
- The operational area is in an offshore location that does not coincide with any marine reserves.
- The operational area avoids any Olive Ridley turtle biological important areas (BIAs) but does intersect a defined BIA for Flatback turtles (inter-nesting). Impacts are expected to be minimal given the size of the area and relatively small footprint of the pipeline.
- While transiting marina fauna (e.g. marine reptiles) are expected to occur within the operational area, detectable impacts are not expected. The conservation status of these species and recovery plan objectives will not be affected.
- Atmospheric and water quality changes will be localised, with recovery measured in hours to days given the nature and scale of discharges and dispersive open-ocean environment.
- The benthic habitats that may be disturbed are widely represented at a regional scale. Additional site surveys are planned to confirm this assessment.
- Impacts to other marine users, including commercial fishers, are expected to be negligible. Extensive areas of actively fished areas exist outside of the operational area; and the proposed pipeline will be laid in parallel to an existing pipeline.

General Commitments

Santos will implement control measures to ensure environmental impacts and risks are acceptable and 'as low as reasonably practicable' (ALARP). These measures will be consistent with those in the accepted Barossa GEP Environment Plan available on the NOPSEMA website. Included are commitments to the following control measures to minimise interactions with other marine users during installation of the Additional GEP Segment. Any additional control measures identified during stakeholder engagement will be considered for inclusion in the Barossa GEP Environment Plan Revision.

POTENTIAL AREA OF INTEREST	SANTOS COMMITMENTS
Maritime notices • **Notice to Mariners (NTM)** • **AUSCOAST warnings**	A notification will be provided prior to vessel arrival in the Operational Area and following departure. Notifications are provided to the Australian Maritime Safety Authority Joint Rescue Coordination Centre, Australian Hydrographic Office and designated port authorities.
Stakeholder notifications	Other relevant marine users identified during stakeholder consultation will be provided a commencement notification at least two weeks prior to the activity commencing. Santos will have a process in place to ensure any stakeholder feedback is recorded, evaluated and responded to.
Support vessel in place during activity to reduce potential for collision or interference with other marine users	At least one support vessel will be on standby at all times to monitor the safety exclusion zone to identify approaching third-party vessels and communicate with the vessels.

Environmental Approval

The Barossa GEP Environment Plan was accepted by NOPSEMA in March 2020. To extend the Barossa GEP by the Additional GEP Segment, Santos is planning to submit in Q4 2021 a revision to the Barossa GEP Environment Plan for NOPSEMA acceptance.

Santos also plans to submit a variation to pipeline licence NT/PL5 to NOPTA (being the Commonwealth pipeline licence for the Barossa GEP).

Environmental approvals for the Northern Territory coastal waters segment of the additional pipeline will be progressed with the Northern Territory Environmental Protection Authority in the near term. Further stakeholder consultation is planned for this approval process.

Feedback

Stakeholder engagement for the accepted Barossa GEP Environment Plan was undertaken in 2019. This engagement considered the entire 262-km pipeline route. For the proposed Additional GEP Segment in Commonwealth waters, Santos is engaging with relevant stakeholders and other interested parties that may be affected by the activities to be carried out within the proposed operational area.

If you have any objections, concerns or information requests regarding this new stage, please contact us by **5 November 2021** via phone or email. Santos will endeavour to address all stakeholder feedback prior to the Barossa GEP Environment Plan revision being submitted to NOPSEMA in November 2021.

Contact

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COMMERCIAL FISHING INDUSTRY
STAKEHOLDER CONSULTATION

Santos

Barossa Development

Gas Export Pipeline Installation – Environment Plan Revision

Additional information for commercial fisheries

In addition to the Santos Barossa Gas Export Pipeline Installation Environment Plan Revision stakeholder consultation package, the following additional information is for commercial fishers active in the operational area.

The installation of an additional, nominally 25-km pipeline segment at the southern end of the Barossa Gas Export Pipeline has the potential to affect the following commercial fisheries:

Commonwealth managed fisheries

- Northern Prawn Fishery
- Southern Bluefin Tuna Fishery
- Western Skipjack Tuna Fishery
- Western Tuna and Billfish Fishery

Northern Territory (NT) managed fisheries

- Spanish Mackerel Fishery
- Offshore Net & Line Fishery
- Coastal Line Fishery
- Aquarium Fishery
- Demersal Fishery

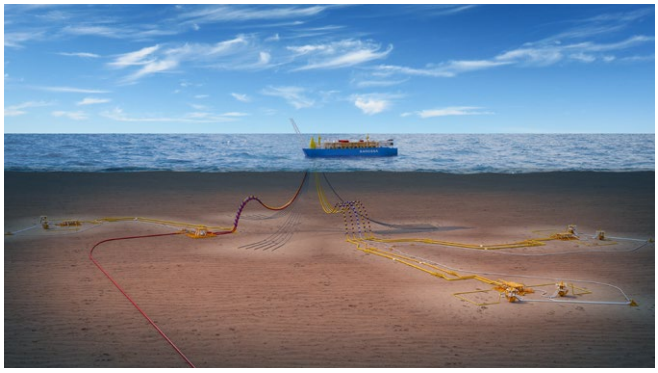
Commonwealth and NT managed commercial fisheries are illustrated in Figure 1 and 2, and the Operational Area in Figure 3.

A summary of Santos' knowledge of fishing effort in these fisheries in relation to the operational area for installation of the additional 25-km pipeline segment is provided in Table 1 and 2.

A summary of key concerns raised with Santos relevant to commercial fisheries from the proposed activities is provided in Table 3. These concerns include:

- Interference with commercial fishing activities and exclusion from fishing areas
- Introduction of Invasive Marine Species (i.e., marine pests)
- Vessel collision and refuelling incidents

Further assessment of potential impacts and risks associated with the activity will be included in the Barossa Gas Export Pipeline Installation Environment Plan Revision.



Feedback

Santos is committed to working together with the commercial fishing industry with the intent that each can proceed with their business in a safe and efficient manner, without loss or conflict.

To this end, if you have any objections, concerns or information requests regarding this activity please contact us by Friday, **5 November 2021** via phone or email. Santos would be pleased to meet in person, or to arrange an online forum, to discuss further.

Equally, if you do not wish to receive further information from Santos on this activity, please advise directly or through your representative body.

Contact

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Table 1: Summary of Commonwealth managed fishery

FISHERY	SUMMARY OF FISHERY IN RELATION TO ADDITIONAL GAS EXPORT PIPELINE SEGMENT OPERATIONAL AREA	ASSESSMENT OF POTENTIAL INSTALLATION IMPACTS
Northern Prawn Fishery	The Northern Prawn Fishery management area extends over Australia's northern coast, between Cape York in Queensland and Cape Londonderry in WA, from the low water mark to the outer edge of the Australian Fishing Zone (AFZ). The majority of fishing effort occurs in the area of the Gulf of Carpentaria, Joseph Bonaparte Gulf and along the Arnhem Land coast. The highest catches come from areas adjacent to mangrove forests and coastal seagrass beds, which are juvenile nursery areas for target species of the fishery. The key target species are banana prawns, tiger prawns and endeavour prawns. There are two fishing seasons, with the season end date depends on catch rates: • Season 1 (mainly banana prawns caught): 1 April – 15 June • Season 2 (mainly tiger prawns caught): 1 August – end of November The fishery is expected to be active in the operational area during the permitted fishing seasons.	Considering the short duration of the pipeline installation, during which higher numbers of vessels will be present within the operational area, the impact to commercial fishing activities from vessels movements is considered to be minor and able to be managed through an ongoing communication process that will also apply for the ongoing presence of the pipeline.
Southern Bluefin Tuna Fishery	The Southern Bluefin Tuna Fishery operates around Australia and extends to the high seas fishing zone (out to 200 nm from the coast). The fishery targets southern bluefin tuna only. Fishing activity is focused in southern Australian waters.	No known activity and therefore no impact to the fishery expected.
Western Skipjack Tuna Fishery	The Western Skipjack Tuna Fishery extends from west from Cape York Peninsula and around Australia to the South Australian/Victorian border, out to the edge of the AFZ. Little fishing activity has been undertaken in this fishery since 2008.	No known activity and therefore no impact to the fishery expected.
Western Tuna and Billfish Fishery	The Western Tuna and Billfish Fishery management area extends over a large area westward from Cape York Peninsula off Queensland, around the west coast of WA, across the Great Australian Bight to the South Australian/Victorian border. The fishery has operated at low levels of effort since the early 2000's due to economic conditions.	No known activity and therefore no impact to the fishery expected.

Figure 1

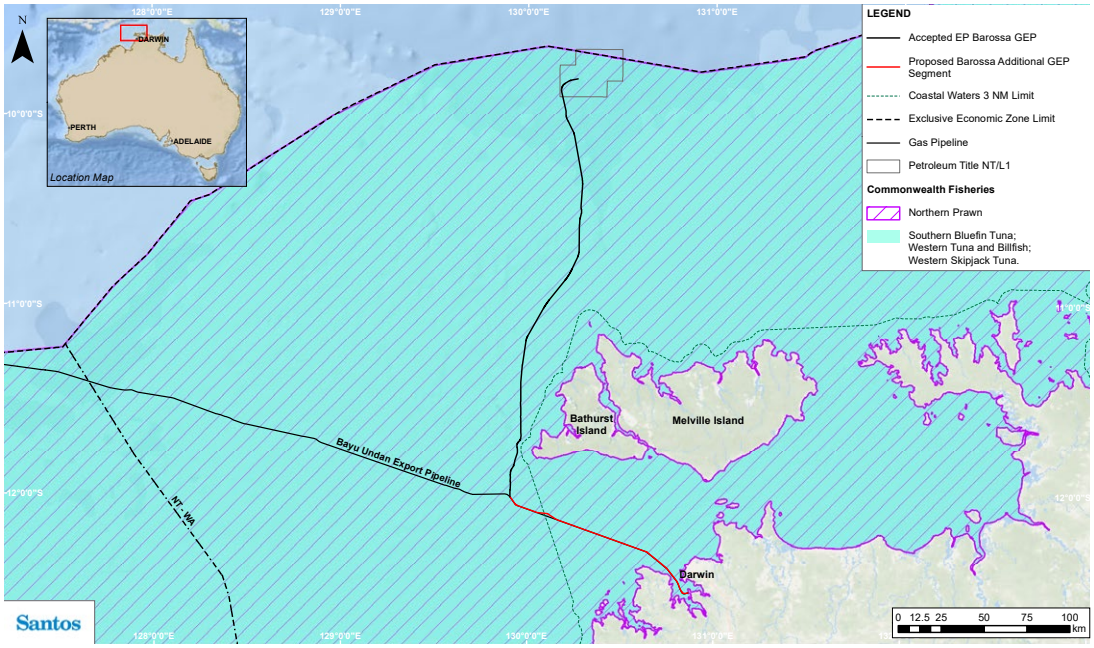


Table 2: Summary of Northern Territory managed fishery

FISHERY	SUMMARY OF FISHERY IN RELATION TO ADDITIONAL GEP SEGMENT	ASSESSMENT OF POTENTIAL IMPACTS
Spanish Mackerel Fishery	The fishery extends seaward from the high-water mark to the edge of the AFZ. The majority of fishing effort occurs in the vicinity of reefs, headlands and shoals and includes waters near Bathurst Island, New Year Island, northern and western Groote Eylandt, the Gove Peninsula, the Wessel Islands, the Sir Edward Pellew Group and suitable fishing grounds on the western and eastern mainland coasts. There is potential for fishing to occur within the operational area or nearby banks/shoals.	Considering the short duration of the pipeline installation, during which higher numbers of vessels will be present within the operational area, the impact to commercial fishing activities from vessels movements is considered to be minor and able to be managed through an ongoing communication process.
Offshore Net & Line Fishery	The Offshore Net and Line Fishery extends from the NT high water mark to the boundary of the AFZ. The majority of the fishing effort is in the coastal zone (within 12 nm of the coast) and immediately offshore in the Gulf of Carpentaria. Limited effort is undertaken in the outer offshore area of the fishery. One licence holder may fish off the south-west end of the Tiwi Islands for small pelagic fish.	Considering the short duration of the pipeline installation, during which higher numbers of vessels will be present within the operational area, the impact to commercial fishing activities from vessels movements is considered to be minor and able to be managed through an ongoing communication process.
Coastal Line Fishery	The Coastal Line fishery extends 15 nm from the low water mark and covers the entire NT coastline. The majority of fishing effort is focused around rocky reefs within 150 km of Darwin where black jewfish are targeted using mainly hook and line gear. Given activity is concentrated in nearshore water, there is low potential for fishing to occur within the operational area.	Low potential for fishing to occur. No impact to the fishery expected.
Aquarium Fishery	The Aquarium Fishery is a small-scale, multi-species fishery that prospects freshwater, estuarine and marine habitats to the outer boundary of the AFZ. The harvest of most marine species occurs within 100 km of Nhulunbuy and Darwin, though one license holder does occasionally collect from offshore locations. This fishery is not expected to be active in the operational area.	Not expected to be active and therefore no impact expected.
Demersal Fishery	The fishery extends from waters 15 nm from the coastal waters mark to the outer limit of the AFZ, excluding the area of the Timor Reef Fishery. The majority of fishing effort occurs in deep offshore water, along the eastern boundary of the Timor Reef fishery. As such this fishery is not expected to be active within the operational area.	Not expected to be active and therefore no impact expected.

Figure 2

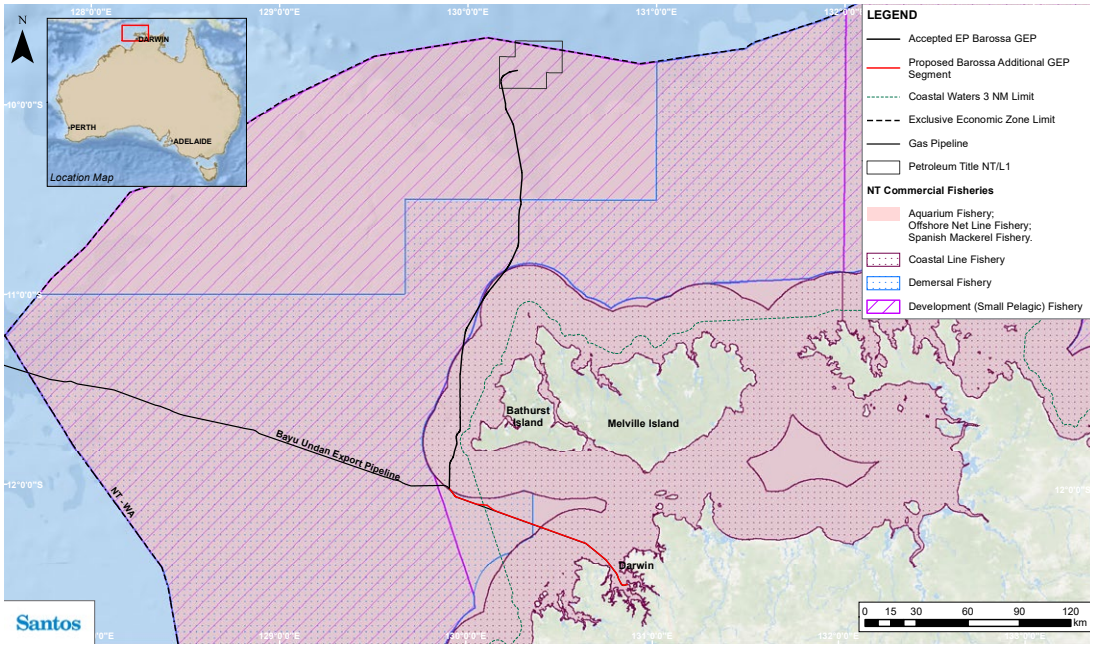
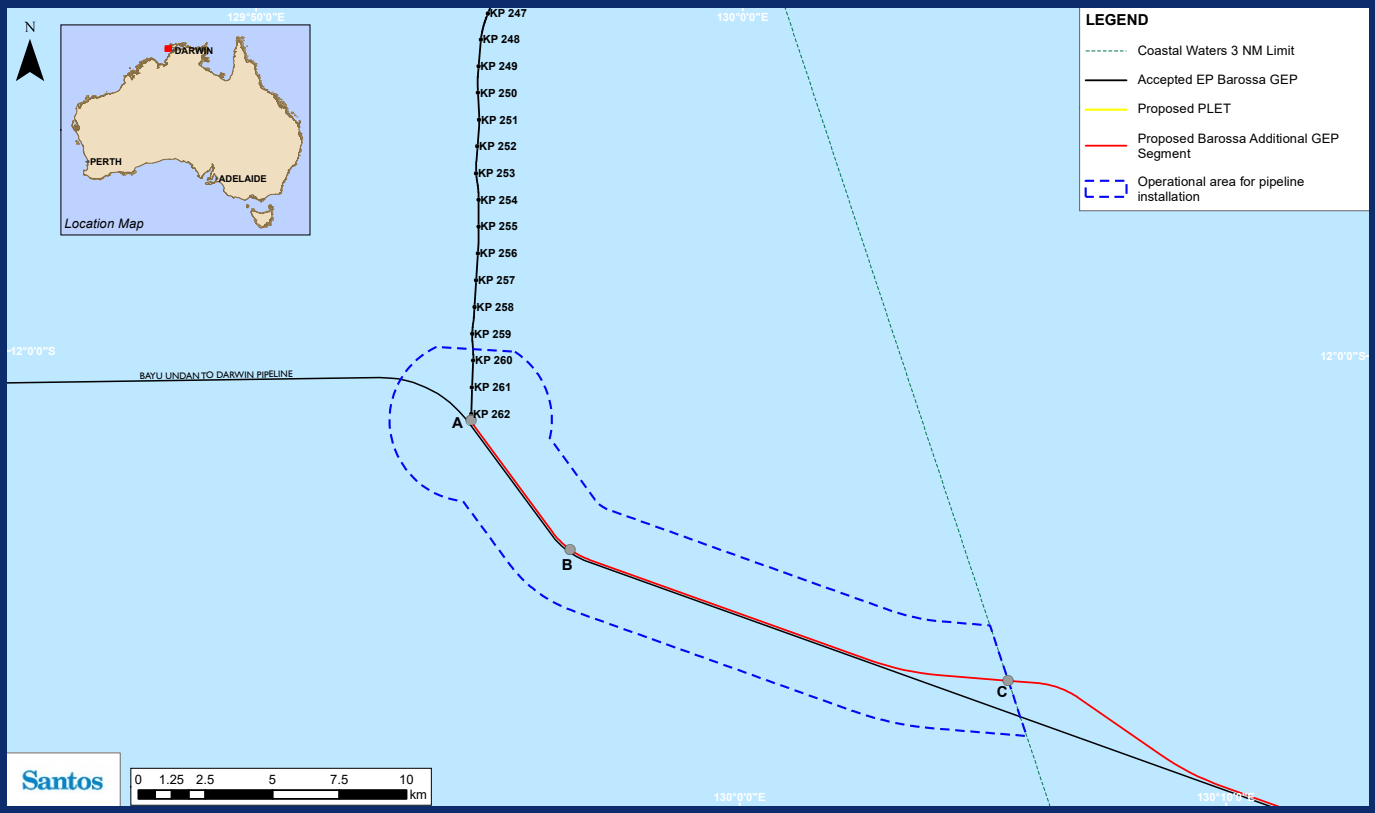


Figure 3: Operational Area for proposed Barossa Additional Gas Export Pipeline Segment in Commonwealth Waters



ADDITIONAL PIPELINE SEGMENT – KEY COORDINATES				
Point (as per Figure 1)	**Latitude**	**Longitude**	**Latitude**	**Longitude**
A	12° 1' 22.874"S	129° 54' 25.788" E	-12.023021	129.907163
B	12° 4' 12.197"S	129° 56' 56.133" E	-12.070055	129.948926
C	12° 6' 36.119" S	130° 5' 30.555" E	-12.110033	130.091821

Figure 4

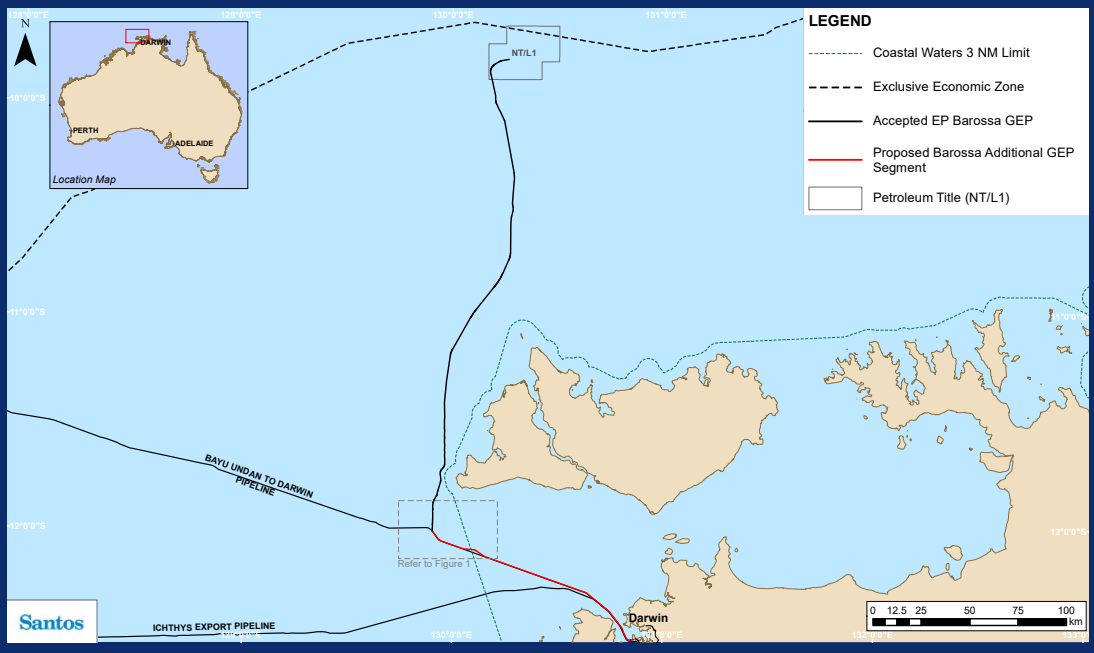


Table 3: Summary of Potential Impacts to Commercial Fisheries and Proposed Control Measures

POTENTIAL IMPACT	PROPOSED CONTROL MEASURES
Interference with commercial fishing activities and exclusion from fishing areas	• A communications plan will be implemented for engagement with licence holders active in the operational area. The plan will include notifications in advance of the pipeline installation activities. • Australian Hydrographic Service (AHS) Notice to Mariners and AMSA Maritime Safety Information (MSI) will be notified in advance of the pipeline installation activities. • A 500-metre radius Petroleum Safety Zone (PSZ) will be in place around the pipelay vessel while on location. • Santos will not restrict commercial fishing access, other than within the PSZ and is committed to concurrent operations where safety is not compromised. • Support vessels will avoid commercial vessels that are actively fishing. • The pipelay vessel will operates in a linear fashion moving slowly along the pipeline route (nominally 3 km/day) as it lays the pipe. • The construction vessel will work at locations along the pipeline route installing the PLETs and carrying out span rectifications. The time it will work at any one location will be no longer than a few days with the exception of pipeline hydrotesting activities (FCGT), which could take up to 14 days to complete • Supply vessels will transit to and from the pipelay and construction vessel. While servicing the pipelay and construction vessel, they will be within the 500 m exclusion zone. While in transit they will be subject to standard maritime rules.
Introduction of Invasive Marine Species (i.e., exotic marine pests)	• Vessels are managed to low risk in accordance with the Santos Invasive Marine Species Management Plan. • Pursuant to the Biosecurity Act 2015 and Australian Ballast Water Management Requirements 2020, pipelay and support vessel(s) carrying ballast water and engaged in international voyages shall manage ballast water so that marine pest species are not introduced. • Vessels will have a suitable anti-fouling coating in accordance with the Protection of the Sea (Harmful Anti-fouling Systems) Act 2006.
Vessel collision and refuelling incidents	• Pipelay vessel will use a dynamic positioning (DP) system, which allows it to maintain position while installing the pipeline (laying the pipe). The pipelay vessel will not anchor in the operational area unless in an emergency. • The pipelay vessel will have an Automatic Identification System (AIS) to aid in its detection at sea. • Support vessels will be equipped with an AIS and radar. • At least one support vessel will be available at all times to monitor the 500 m PSZ to identify approaching third-party vessels and communicate with the vessels. • Support vessels will be equipped and crewed in accordance with the Navigation Act 2012 and Marine Orders. • All vessels will have a dedicated Ship Oil Pollution Prevention Plan (SOPEP). • Diesel bunkering will be undertaken under a Permit-to-Work System and bunkering procedure to reduce the risk of a release to sea. • An Oil Pollution Emergency Plan (OPEP) will be prepared and implemented, if required.

Barossa Development

Pipeline to Shore Stakeholder Consultation

October 2021

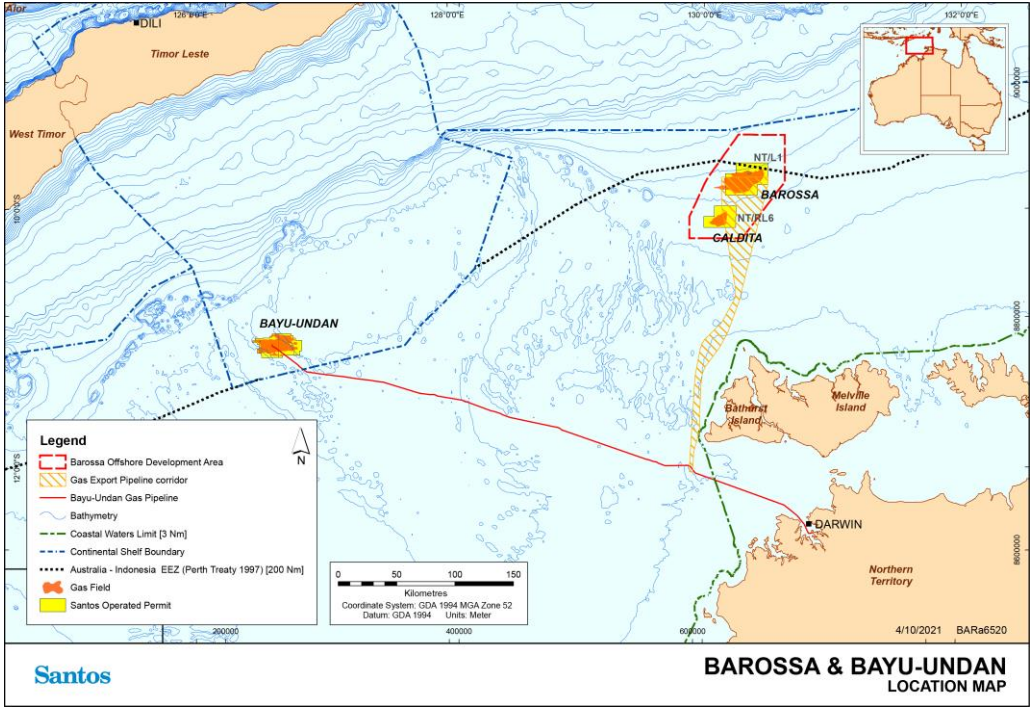
Santos

Barossa Development

Santos

Barossa is an approved offshore development with first gas production targeted first half of 2025

- Santos is the operator of the Barossa JV.
- Financial Investment Decision (FID) was taken March 2021 and development construction is well advanced.
- Barossa will backfill gas to Darwin LNG, extending the facility life for around 20 years.
- The Barossa development will comprise a Floating Production, Storage and Offloading (FPSO) vessel, subsea production wells, supporting subsea infrastructure and a gas export pipeline (GEP) tied into the existing Bayu-Undan to Darwin LNG pipeline.
- Upcoming offshore activities include pipeline route survey (Nov 21) followed by development drilling (May 22).



Overview

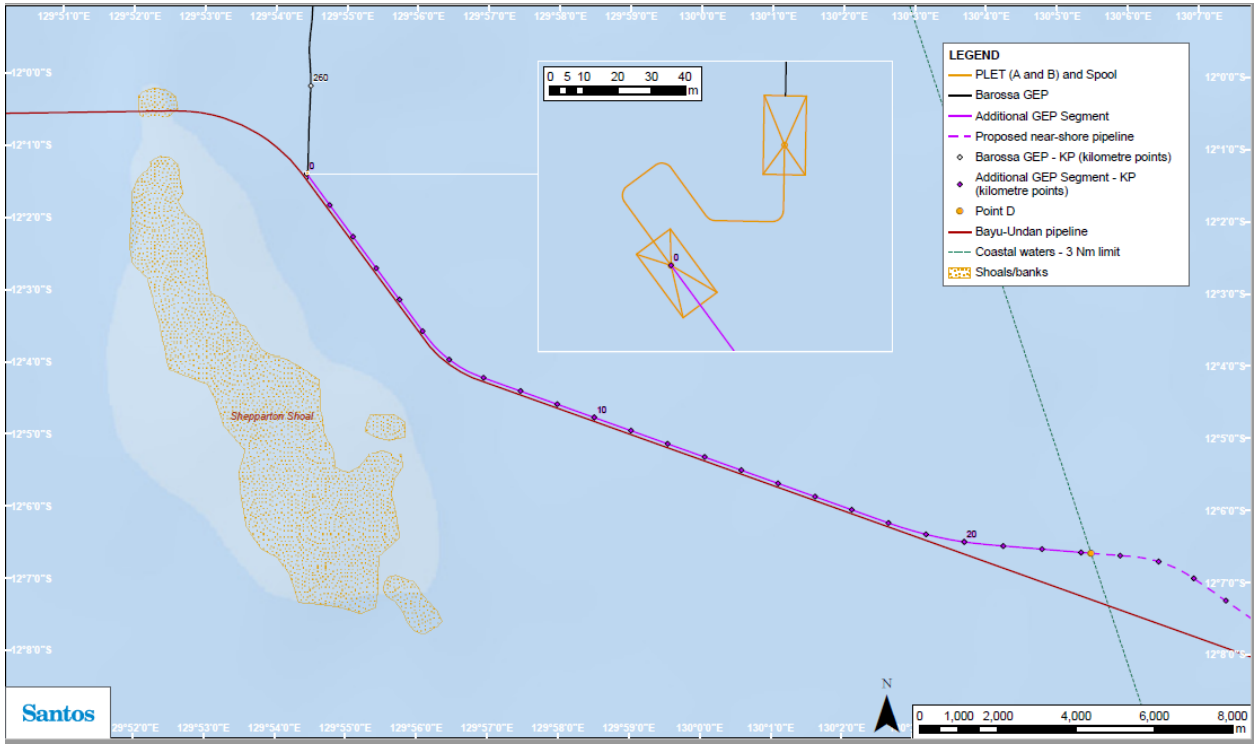
Santos is consulting on an alternative arrangement for the Barossa gas export pipeline (GEP) enabling a single uninterrupted pipeline to Darwin LNG

+ Development approvals already received enable the installation of the Barossa GEP from the Barossa field to a tie-in point at the existing Bayu-Undan to Darwin Pipeline.
+ This continues to be the ‘base case’ for the delivery of Barossa gas to DLNG and Santos continues to progress all regulatory approvals for this case.
+ An alternative now being considered by Santos is to extend the Barossa GEP all the way to DLNG, enabling the Bayu-Undan to Darwin Pipeline to be preserved for life extension and/or re-purposing opportunities.
+ One opportunity being assessed is the re-purposing of the Bayu-Undan to Darwin Pipeline to carry carbon dioxide for potential Carbon Capture and Storage (CCS) at Bayu-Undan in the Timor Sea.
+ To enable this opportunity the Barossa GEP would need to be extended by approx. 25 km in Commonwealth Waters, and 100 km in NT waters, laid adjacent to the Bayu-Undan to Darwin Pipeline.
+ Santos is also planning to progress all regulatory approvals for this alternative, referred to as Barossa Pipeline to Shore (PTS).

Additional GEP Segment (Commonwealth Waters)

The Cth waters segment requires:

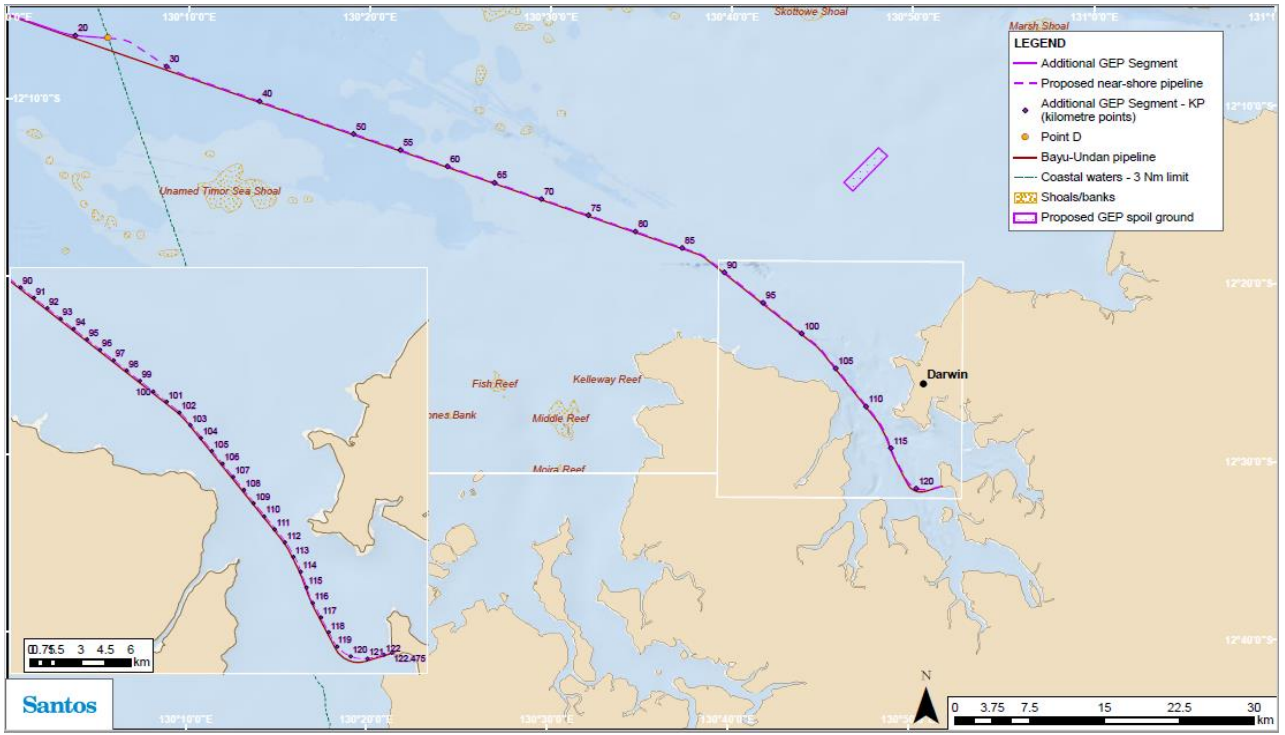
+ ~25 km of pipeline and a PLET (and foundation)
+ Potential additional span rectification
+ Additional inhibited fluid discharge at the tie-in location
+ Spool support mattress installation
+ Spool installation and leak testing
+ Surveys



Additional GEP Segment (NT Waters)

The NT waters segment required:

+ ~ 100 km of pipeline
+ Trenching and rock installation in some areas
+ Spoil management
+ Option to install an ILT at ~KP50 - 60
+ Surveys



Time Frames and Approvals

PTS investment decision Q1 2022 to align with Barossa first gas milestones; nearshore activities commencing in early 2023 extending through to end of 2024.

- Commonwealth approvals:
  - Environmental approvals: Revision to the NOPSEMA-accepted GEP Installation EP with submission late-November 2021; plus consideration of EPBC Act.
  - Pipeline licencing variation.
  - Safety cases.
- NT approvals
  - Environmental approval: Referral to the NT EPA with submission late-November 2021.
  - Pipeline licencing.
  - Waste discharge licence (spoil ground).
  - Amendment to DLNG Operating Licence.
  - Pipeline management plan.
  - Consent to construct.
  - Aboriginal heritage certificates.

Questions

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Santos

APPENDIX D– COMPARISON OF OFFSHORE PROJECT PROPOSAL AND THE ENVIRONMENT PLAN

The Barossa Development (including the original Barossa GEP stage) is described in the Barossa Area Development OPP (ConocoPhillips, 2018) which was accepted by NOPSEMA in March 2018.

Since the OPP was accepted, opportunities have been identified to extend the life and to re-purpose the Bayu-Undan Field, including CCS. To support any future opportunity to deliver gas via the Barossa GEP to the DLNG facility while preserving the Bayu-Undan pipeline for repurposing opportunities a new stage of the Barossa GEP is proposed. As discussed in **Section 1.1**, the proposed new stage of the Barossa GEP will extend the original Barossa GEP by approximately 23 km in Commonwealth waters, the inclusion of a PLET and a spool (the Additional Barossa GEP Segment) to the DLNG facility via the proposed Nearshore Barossa GEP. No significant changes to environmental impacts or risks have been identified as a result of front-end engineering design or footprint modifications are aligned with those presented in the OPP and have been reduced to levels that are acceptable and ALARP.

Furthermore, the OPP was developed in the early stages of the project before front end engineering design was complete. This EP has been developed based on more detailed engineering work and therefore includes more specifics than were included in the OPP. In addition, some of the project characteristics and methodology have been refined based on the additional knowledge gained through further studies and surveys. These changes and any implications on the consequence of impacts have been reviewed and are summarised in **Table G-1**. The Barossa GEP installation activities are consistent with overall activity description, risk assessment and conclusions presented in the OPP. Table G-2 provides a comparison of the EPOs presented in the OPP and this EP.

A more detailed description of the Barossa Development can be found in the Barossa OPP, which is available on the NOPSEMA website at https://docs.nopsema.gov.au/A598153.

Table G-1: Comparison of the project description in the Offshore Project Proposal to the differences identified in the activity description in this Environment Plan

Project Description in the Barossa OPP	Activity Description in this EP	Comparison between Barossa OPP and this EP
The new section of pipeline will have a length in the order of approximately 260-290 km with a tie-in to the existing Bayu-Undan to Darwin pipeline.	The Barossa GEP will have a length of approximately 285 km with PLET and spool in lieu of tie-in.	The Barossa GEP is within the distances described in the OPP.
The Barossa gas export pipeline corridor define the geographic extent of the project are that is applicable for planned activities.	The operational area has been defined as 2000 m either side of the GEP route and 3000 m radius around PLETs.	The spatial limits of the Barossa GEP installation activities defined in the EP have changed since the accepted OPP. This is due to the corridor refinement of the original Barossa GEP and the inclusion of the Additional Barossa GEP Segment. However, the new stage falls within the corridor previously considered in a draft revision of the OPP submitted to NOPSEMA.

Oil spill modelling (OPP Section 6.4.10.2) uses one location (west of Bathhurst Island; EP location 1 scenario) with 500 m^3 release of intermediate fuel oil (IF0-180), using a 96 hr time-step for entrained oil, from a vessel collision during pipelay activities.	The EP has four locations modelled with 700 m^3 release of MDO using a 1 hr time-step for entrained oil, from a vessel collision during pipelay activities. This modelling was used to determine the risk assessment MEVA.	The EP uses a more detailed and robust approach to determine a larger extent as a basis for the risk assessment. The Oil Spill Modelling Environmental Bulletin (NOPSEMA, 2019) for oil spill thresholds has been updated since the OPP was accepted. This has resulted in the oil spill modelling risk area being increased (entrained oil uses a 1 hr time-step instead of 96 hr time-step).
The area of influence was defined as the outer boundary of the environment that may be affected in the event of an unplanned release of hydrocarbons where no pill response measures are implemented.	The EMBA is defined as outermost boundary of the overlaid worst-case spatial extent that may be affected by hydrocarbon exposure (using low exposure values) in the unplanned and unlikely event of a marine diesel (hydrocarbon) release due to multiple vessel to vessel collision scenarios (Section 4.1.2).	The EP modelling used defined hydrocarbon exposure values based on available guidance (NOPSEMA, 2019) to determine the area that hydrocarbons might contact for the various hydrocarbon phases (**Table 4-1**) which has been updated since the OPP was accepted.
Discharge of Fluids + Total volumes of fluids (gas export pipeline and in-field flowlines) in the order of approximately 107,500 m^3 and 145,000 m^3 + Dewatering will include ~97,000 m^3 of treated seawater released subsea at the FPSO facility end of the gas export pipeline (e.g. within the Barossa offshore development area) + Hydrotest conducted to test structural integrity of the gas export pipeline, treated seawater ~1,300m^3 in one event up to a total of 3,000 m^3. Hydrotest water will be released at the sea surface at either the FPSO facility end of the export pipeline or at the Bayu-Undan pipeline tie-in end of the export pipeline.	Refer to **Table 3-7** for discharge volumes and locations.	The OPP stated that *'EPs will detail dewatering requirements, including locations and volumes'*. As per the OPP commitment dewatering (and other related discharges) requirements, including locations and volumes have been detailed in Section 3.5.10 and Section 0. There will be an additional 50,000 m^3 dewatering discharge at PLET C to the discharge at PLET A. There is an overall increase of approximately 16,000 m^3 total discharge volumes compared to the OPP. The increase volume to due to Additional Barossa GEP Segment and proposed Nearshore Barossa GEP (out of scope) volumes. There has been no change to the severity of the consequence level for this impact (**Section 5.2.7**).

Table G-2: Comparison of environmental performance outcomes in the Offshore Project Proposal and this Environment Plan

Environmental Impacts/Risks	Relevant EPOs from the Barossa OPP (Section/Table reference)	EPOs in this EP (Section reference)	Comparison between Barossa OPP and this EP
Interaction with other marine users	No vessel collisions or significant adverse interactions with other marine users (Table 6-9).	**EPO 1** - No substantial adverse effect on other marine users (**Section 5.2.1**).	Level of environment protection/outcome as included in the OPP EPO has been maintained for the EP.
Seabed disturbance	No permanent disturbance to benthic habitats beyond the physical footprint of offshore facilities/infrastructure within the Barossa offshore development area and gas export pipeline, as relevant to both direct and indirect sources of disturbance to seabed and associated benthic habitats (Table 6-15).	**EPO 2** - Direct impacts to benthic habitats will be restricted to the footprint of the pipeline and supporting structures. Beyond the footprint of the pipeline and supporting structures impact will be limited to localised, short-term disturbance associated with suspension and deposition of surface sediment (**Section 5.2.2**).	Wording of the EP EPO is consistent with the OPP EPO.
	No anchoring or mooring of the FPSO facility and MODU/vessels on shoals/banks, except in emergency conditions (Table 6-15).		This has been included as a control within the EP (**C2.6**).
	The gas export pipeline route will be designed to minimise, where practicable, impacts to areas of seabed that are associated with the seafloor features/values of KEFs and shoals/banks (Table 6-15).		Barossa GEP route selection has been detailed in the risk assessment and is not considered an EPO for the EP.
	To minimise impact to representative species, assemblages and associated values of the Oceanic Shoals marine park, further studies will be used to inform final pipeline routing so the pipeline will not be installed on those representative species, assemblages and associated values if they have not been found in the marine park outside the pipeline corridor (Table 6-15).		

Environmental Impacts/Risks	Relevant EPOs from the Barossa OPP (Section/Table reference)	EPOs in this EP (Section reference)	Comparison between Barossa OPP and this EP
	No significant impacts to turtle or dugong populations from impacts (direct or indirect) associated with installation of the gas export pipeline (Table 6-15).		As detailed in the impact assessment no significant impacts are expected from the activity.
Underwater noise	No significant impacts to turtle populations from noise generated during installation of the gas export pipeline (Table 6-26).	**EPO 3** - No significant impacts to marine fauna from noise generated during the Barossa GEP installation campaign (**Section 5.2.3**).	EPO in the EP is consistent with the OPP and has been expanded to include all marine fauna, resulting in a better level of environment outcome than the OPP.
Light emissions	Light spill from the MODUs/drill ships, FPSO facility and project vessels will be limited to that required for safe operations and working requirements (Table 6-31).	**EPO 4** - No significant impacts from light emissions to marine fauna (**Section 5.2.4**).	This has not been included as an EPO in the EP because it is a legislative requirement related to health and safety risks.
	No significant impacts to turtle populations from installation of the gas export pipeline (Table 6-31).		EPO in the EP is consistent with the OPP and has been expanded to include all marine fauna, resulting in a better level of environment outcome than the OPP.
Atmospheric emissions	Atmospheric emissions associated with the project will meet all regulatory source emission standards (Table 6-28).	**EPO 5** - No substantial change in air quality from the Barossa GEP installation campaign that may adversely impact biodiversity, ecological integrity, social amenity or human health (**Section 5.2.5**).	EPO in the EP is consistent with the OPP and has been further refined for the activity, resulting in the same level of environmental protection outcome as the OPP.
	Combustion engines and flaring equipment will be maintained according to vendor specifications to achieve optimal performance (Table 6-28).		This is not an EPO and is achieved through the vessel vetting procedure which is detailed in the implementation strategy.

Environmental Impacts/Risks	Relevant EPOs from the Barossa OPP (Section/Table reference)	EPOs in this EP (Section reference)	Comparison between Barossa OPP and this EP
Planned discharges: treated seawater	Dewatering discharges will not extend beyond the Barossa offshore development area and will not impact areas of seabed that are associated with the seafloor features/values of KEFs or the nearest shoals/banks of Lynedoch Bank, Tassie Shoal or Evans Shoal (Table 6-39).	**EPO 7** - No substantial change in water quality during the Barossa GEP installation campaign that may adversely impact biodiversity, ecological integrity, social amenity or human health (**Section 5.2.6**).	Has not been included as an EPO however the impact assessment and modelling impacts demonstrate that this will be achieved.
	Reduce impacts to the marine environment from planned discharges through the application of a chemical assessment process, which includes an environment risk assessment (Table 6-39).		Has not been included as an EPO in the EP however it has been incorporated as a control for the risk.
Dropped object	Minimise disturbance beyond the physical footprint by preventing the loss of significant equipment/cargo overboard from the MODU/drill ship, FPSO facility or vessels (Table 6-15).	**EPO 8** - No loss of equipment/cargo overboard from vessels resulting in a Consequence Severity greater than Minor (**Section 5.3.1**).	Wording is consistent with the intent of the EPO meeting the level of environmental protection as provided in the OPP.
IMS	Prevent the displacement of native marine species as a result of the introduction and establishment of IMS via project-related activities, facilities and vessels (Table 6-17).	**EPO 9** - Prevent the displacement of native marine species as a result of the introduction and establishment of IMS via activity vessels (**Section 5.3.2**).	Wording is consistent with the intent of the EPO meeting the level of environmental protection as provided in the OPP.
Collision with marine fauna	Vessel speeds restricted in defined operational areas within the project area, to reduce the risk of physical interactions between cetaceans/marine reptiles and project vessels (Table 6-12).	**EPO 10** - Zero incidents of injury or mortality of cetaceans and marine reptiles from collision with activity vessels operating within the Operational Area (**Section 5.3.3**).	This is a control to achieve the EPO and has been included.
	Zero incidents of injury/mortality of cetaceans/marine reptiles from collision with project vessels operating within the project area (Table 6-12).		EPO has been adopted for the activity.

Environmental Impacts/Risks	Relevant EPOs from the Barossa OPP (Section/Table reference)	EPOs in this EP (Section reference)	Comparison between Barossa OPP and this EP
Unplanned subsea release: treated seawater	Reduce impacts to the marine environment from planned discharges through the application of a chemical assessment process, which includes an environment risk assessment (Table 6-39).	**EPO 11** - Zero unplanned discharge of chemicals to the marine environment as a result of contingency dewatering. (**Section 5.3.3**).	This has been included as a control to minimise any impacts; however, the adopted EPO results in a better environmental outcome than that presented in the OPP.
Deck and minor subsea spills	Zero unplanned discharge of hydrocarbons or chemicals to the marine environment as a result of project activities (Table 6-48).	**EPO 12** - Zero unplanned discharge of hydrocarbons or chemicals to the marine environment as a result of Barossa GEP installation activities (**Section 5.3.5**).	EPO has been adopted for the activity.
Loss of hazardous and non-hazardous waste	Zero unplanned discharge of hazardous and non-hazardous wastes into the marine environment as a result of project activities (Table 6-42).	**EP0 13** - Zero unplanned discharge of hazardous and non-hazardous wastes into the marine environment as a result of project activities (**Section 5.3.6**).	EPO has been adopted for the activity.
	Hazardous waste will be transported onshore for treatment and/or disposal at licenced treatment and disposal facilities (Table 6-42).		EPO has not explicitly been adopted as Activities outside the operational area are out of the scope of this EP.
Vessel diesel spill	Zero unplanned discharge of hydrocarbons or chemicals to the marine environment as a result of project activities (Table 6-48).	**EP0 14** - Zero unplanned discharge of hydrocarbons or chemicals to the marine environment as a result of a vessel collision (**Section 5.3.7**).	EPO has been adopted for the activity.
	An activity specific OPEP that demonstrates adequate arrangements for responding to and monitoring oil pollution, in the event of a major unplanned release, will be accepted by NOPSEMA prior to commencing the activity (Table 6-48).		This has been included as a control to minimise impacts.
Bunkering diesel spill	Zero unplanned discharge of hydrocarbons or chemicals to the marine environment as a result of project activities (Table 6-48).	**EP0 15** - Zero unplanned discharge of hydrocarbons or chemicals to the marine environment as a result of bunkering (**Section 5.3.8**).	EPO has been adopted for the activity.

Key management controls included in the OPP	OPP Section Reference	How the Barossa OPP controls are addressed in the EP	EP Section Reference
Gas Export Pipeline Route			
The project will be undertaken in accordance with ConocoPhillips' CPMS, which provides the framework to achieve acceptable health, safety and environment outcomes such as: + design planning throughout concept select phase to avoid placement of facilities/infrastructure within the Barossa offshore development area in areas of regional environmental importance (e.g. shoals/banks, coral reefs, islands, and known regionally important feeding and breeding/nesting biologically important areas for marine mammals and marine reptiles) + use of gas export pipeline selection route surveys to inform route optimisation and reduce environmental impact.	6.4.2 6.4.3 6.4.5	A number of additional studies were undertaken to better understand the bathymetry and natural environment along the pipeline route (see **Section 4.4**). This information was used to inform route optimisation and reduce environmental impacts as described in **Section 5.2.2**.	**Section 4.4** and **5.2.2**
Pre-lay surveys of the gas export pipeline installation route will be used to identify areas of seabed that are associated with the seafloor features/values of the shelf break and slope of the Arafura Shelf and carbonate bank and terrace system of the Van Diemen Rise KEFs, seabed related conservation values associated with the Oceanic Shoals marine park or nearby shoals and banks (including Goodrich Bank, Marie Shoal and Shepparton Shoal). The outcomes of the pre-lay surveys will be used to inform route optimisation and reduce environmental impacts.	6.4.3		
Further surveys within the pipeline corridor will be used to supplement existing knowledge from habitat assessments to date, to support an evaluation of the representativeness of species and species assemblages found within the portion of the gas export pipeline corridor that intersects the Oceanic Shoals marine park, with other areas of the marine park.	6.4.3		
Planned discharges			
All planned discharges from vessels will comply with relevant MARPOL 73/78 and Australian Marine Order requirements (as appropriate for vessel classification).	6.4.8.7	The following controls have been included: + All wastes managed in accordance with vessel waste management plan (**C 13.1**) + Implement MARPOL requirements for vessel discharges (**C 6.1**).	**Section 5.2.6** and **5.2.7**
Oily bilge water from machinery space drainage is treated to a maximum concentration of 15 ppm OIW prior to discharge from vessels, as specified in MARPOL 73/78 (Annex I).	6.4.8.7		
Offshore discharge of sewage from vessels will be in accordance with MARPOL 73/78 (Annex IV) and Marine Order 96.	6.4.8.7		

Key management controls included in the OPP	OPP Section Reference	How the Barossa OPP controls are addressed in the EP	EP Section Reference
Food wastes from vessels will be macerated to <25 mm diameter prior to discharge, in accordance with MARPOL 73/78 (Annex V) and Marine Order 95.	6.4.8.7		
All wastes generated offshore will be managed in accordance with relevant legal requirements, including MARPOL 73/78 and Australian Marine Order requirements (as appropriate for vessel classification).	6.4.9		
Detailed performance criteria for planned discharges will be defined in the activity-specific EPs.	6.4.8.7	See **Section 5.3.6** and **5.3.7** for detailed EPSs for planned discharges.	**Section 5.2.6** and **5.2.7**
The location of the dewatering discharge will be selected to minimise impact on areas of regional environmental importance (e.g. shoals, banks, coral reefs, islands, etc) to the extent practicable.	6.4.8.7	**C 7.3** Contractor FCGT procedures.	**Section 5.2.7** **Table 6-1**
The dewatering of flooding fluid will be detailed in the relevant activity-specific EPs developed during the detailed engineering and design studies for the project. The EPs will detail dewatering requirements, including definition of discharge characteristics (i.e. chemical additives and concentrations), discharge location and volumes, methodology and species thresholds.	6.4.8.7	The details on dewatering are provided in **Section 5.2.7.**	**Section 5.2.7**
Products that meet at least one of the following environmental criteria are considered suitable by ConocoPhillips for use and controlled discharged to the marine environment is permitted: + rated as Gold or Silver under OCNS CHARM model + if not rated under the CHARM model, have an OCNS group rating of D or E (i.e. are considered inherently biodegradable and non-bioaccumulative). The use of products that do not meet these criteria will only be considered following assessment and approval through a chemical assessment process, as outlined above. The assessment will also be informed by an environmental risk assessment which will help ensure that any potential environmental impacts resulting from chemical use and discharge are minimised.	6.4.8.7	All chemicals planned to be discharged to the marine environment will be assessed through the chemical selection procedure. **C 7.1** – Chemical selection procedure for all chemicals planned to be release to the marine environment.	**Section 5.2.7** **Table 6-1**

Key management controls included in the OPP	OPP Section Reference	How the Barossa OPP controls are addressed in the EP	EP Section Reference
Flooding fluid chemicals (e.g. biocide, oxygen scavengers and dye) will be selected for environmental performance (i.e. low toxicity chemicals), whilst maintaining technical performance requirements, and follow the chemical assessment process (as detailed above).	6.4.8.7		
Subsea infrastructure and pipelines will be clearly marked on Australian nautical charts published by the AHO.	6.4.1	The following has been included in the EP: + Subsea infrastructure and GEP will be clearly marked on Australian nautical charts published by the AHO. (**EPS 1.2.3**)	**Section 5.2.1** **Table 6-1**
Project-vessels operating within the Barossa offshore development area and gas export pipeline corridor will comply with maritime standards such as COLREGS, Chapter V of SOLAS, Marine Order 21 (Safety of Navigational and Emergency Procedures) and Marine Order 30 (Prevention of collisions) (as appropriate to vessel class).	6.4.1	The following controls have been included: + Activity vessels equipped and crewed in accordance with Australian Maritime requirements (**C 1.1**)	**Section 5.2.1** **Table 6-1**
The interaction of the vessels associated with the project with listed cetacean species will be consistent with the EPBC Regulations - Part 8 Division 8.1 Interacting with cetaceans (except in emergency conditions or when manoeuvring is not possible, such as in the case of pipelay activities), which include: + vessels will not knowingly travel >6 knots within 300 m of a whale + vessels will not knowingly approach closer than 100 m to a whale + vessels will not knowingly restrict the path of cetaceans.	6.4.2	The suggested control has been included in the EP (**C 10.1**)	**Section 5.3.3** **Table 6-1**
Vessel speed restrictions will be implemented within the defined operational area of the gas export pipeline route, except where necessary to preserve the safety of human life at sea. This will be reinforced through training of selected vessel crew to sight and manage interactions with turtles.	6.4.2	These controls have been adopted in the EP: + Vessel speed restrictions within the Operational Area (**C 10.3**) + HSE inductions which will include environmental requirements (**C 10.2**)	**Section 5.3.3** **Table 6-1**
Personnel associated with vessel activities will be subject to project inductions which will address the requirements for vessel operators in relation to interactions with marine fauna.	6.4.2		
No pipeline installation activities will occur within the internesting BIA for Olive Ridley turtles at any time, including peak nesting and hatchling emergence periods.	6.4.2	This control has been adopted in the EP (**C 2.8**)	**Section 5.2.2**, **5.2.3**, **5.2.4**

Key management controls included in the OPP	OPP Section Reference	How the Barossa OPP controls are addressed in the EP	EP Section Reference
No pipeline installation activities will occur within the internesting BIA for Olive Ridley turtles at any time, including peak nesting and hatchling emergence periods.	6.4.3	The Barossa GEP route will not occur within the BIA for Olive Ridley turtles at any time. Sequencing of activities minimizes time of pipelay and associated activities with controls adopted in the EP (**C 2.10**)	**Table 6-1**
Installation schedule of the gas export pipeline will take into consideration seasonal presence/activity of marine turtles to prevent significant adverse impacts during peak seasonal internesting period for flatback (June to September) and Olive Ridley turtles (April to August) in proximity to the Tiwi Islands. Should pipeline installation activities be required to be undertaken during this period, within proximity (60 km) of the Tiwi Islands, the following process will be undertaken to identify how the pipeline will be installed to reduce impacts to ALARP and acceptable levels: 1. Identify the pipeline installation methods that can achieve the technical requirements of the project and use this to define the operational area within which all pipeline installation activities will be undertaken and within which all environmental impacts and risks relating to pipeline installation will be assessed and managed to achieve the EPOs. 2. Update of latest knowledge on marine turtle density and seasonal movements within the internesting habitat critical to the survival of flatback and Olive Ridley turtles, drawing on latest literature, any field observations from future pipeline survey work and advice from discipline experts – building on the information presented in this OPP. 3. Combine the outputs from items 1 and 2 above with understanding of the existing environment to identify key environmental values/sensitivities at risk from pipeline installation activities with consideration of any seasonal presence. 4. Undertake an additional impact assessment that builds on the assessment presented in this OPP and incorporates the information from items 1, 2 and 3 above to evaluate the environmental impacts and risks and verify the impact assessment conclusions are consistent with those presented in this OPP. Note: if required, additional controls and/or mitigation measures will be identified to demonstrate consistency with the impact assessment presented in this OPP.	6.4.2	The timing of the campaign is dependent on a number of factors, including the availability of vessels, contracting and mobilisation process, project approvals. Therefore, the actual timing of the campaign is still subject to a planning process (**C 2.10**)	

Key management controls included in the OPP	OPP Section Reference	How the Barossa OPP controls are addressed in the EP	EP Section Reference
As part of the development and implementation of the gas export pipeline installation EP, measures will be defined including no anchoring on shoals/banks, definition of speed limits that will be enforced during pipeline installation, and implementation of practical controls for key aspects (e.g. sedimentation/turbidity, underwater noise emissions and light emissions).	6.4.3	The following controls have adopted in the EP: + No planned anchoring in the Habitat Protection Zone (IUCN IV) – Zone 2 of the Oceanic Shoals Marine Park or on named shoals and banks, unless it is required in an emergency (**C 2.7**) + Vessel speed restrictions within the Operational Area (**C 10.3**) + See **Section 5.2.3** and **5.2.4** for controls around noise and light emissions	**Sections 5.2.2** and **5.2.4** **Table 6-1**
The location of subsea infrastructure within the Barossa offshore development area will be informed by pre-installation surveys/studies that identify and avoid areas of seabed that are associated with the seafloor features/values of the shelf break and slope of the Arafura Shelf KEF (i.e. patch reefs and hard substrate pinnacles).	6.4.3	The following controls have been adopted in the EP: + Confirmation of gas export pipeline route prior to and during installation (**C 2.2**) + Placement of initiation structure for pipelay initiation to avoid sensitive benthic habitats and mitigate initiation structure dragging (**C 2.6**)	**Section 5.2.2** **Table 6-1**
A Vessel Anchoring Plan will be prepared which will take into consideration anchoring locations and will confirm no anchoring on shoals/banks.	6.4.3	The following controls have been adopted in the EP: + Placement of initiation structure for pipelay initiation to avoid sensitive benthic habitats and mitigate initiation structure dragging (**C 2.6**) + No planned anchoring in the Habitat Protection Zone (IUCN IV) – Zone 2 of the Oceanic Shoals Marine Park or on named shoals and banks, unless it is required in an emergency (**C 2.7**)	**Section 5.2.2** **Table 6-1**

Key management controls included in the OPP	OPP Section Reference	How the Barossa OPP controls are addressed in the EP	EP Section Reference
Dredging/trenching activities for the gas export pipeline installation (if required) will occur outside the peak flatback (June to September) and Olive Ridley (April to August) turtle internesting period when within the internesting habitat critical to the survival of these species.	6.4.3	Not applicable – the pipeline route remains within the Oceanic Shoals marine park and therefore there is no requirement for dredging or trenching	NA
If trenching/dredging activities for the gas export pipeline installation are required, i.e. if the pipeline has to remain outside the Oceanic Shoals marine park in the shallow water area of the pipeline corridor, they will occur outside the peak flatback (June to September) and Olive Ridley (April to August) turtle internesting period. The following process will be used to identify how the pipeline in the section to be trenched/dredged will be installed to reduce impacts and risks to ALARP and acceptable levels: 1. Undertake numerical modelling to predict the extent, intensity and persistence of sediment plumes arising from trenching/dredging activity. 2. Use the outputs of the numerical modelling to identify key environmental values/sensitivities at risk from trenching/dredging activities with consideration of background/baseline conditions and any seasonal presence. 3. Update of latest knowledge of how aspects arising from trenching/dredging activities can impact the marine environment, including marine turtles and benthic communities. 4. Undertake an additional impact assessment that builds on the assessment presented in this OPP and incorporates the information from items 1, 2 and 3 above with the understanding of the environment (e.g. benthic habitat maps) to evaluate the environmental impacts and risks and verify the impact assessment conclusions are consistent with those presented in this OPP, i.e. confirm impacts from trenching/dredging will be temporary and localised. Note: if required, additional controls and/or mitigation measures will be identified to demonstrate consistency with the impact assessment presented in this OPP. 5. Develop a dredge management plan that: – details how trenching/dredging will be undertaken (which will be informed by the information derived from items 1 to 4 above) – identifies the control and mitigations measures, environmental performance outcomes, environmental performance standards and measurement criteria that	6.4.3		

Key management controls included in the OPP	OPP Section Reference	How the Barossa OPP controls are addressed in the EP	EP Section Reference
demonstrate the environmental impacts and risks can be reduced to ALARP and acceptable levels – includes an adaptive management strategy for how trenching/dredging activity will be managed, including what information and/or data will be used to provide early warning of adverse trends and trigger adaptive management before environmental performance outcomes are compromised			
A Quarantine Management Plan will be developed and implemented, which will include as a minimum: + compliance with all relevant Australian legislation and current regulatory guidance + outline of when an IMS risk assessment is required and the associated inspection, cleaning and certification requirements + implementation of management measures commensurate with the level of risk (based on the outcomes of the IMS risk assessment), such as inspections and movement restrictions + anti-fouling prevention measures including details on maintenance and inspection of anti- fouling coatings.	6.4.4	Has been included as **C 9.3**	**Section 5.3.2** **Table 6-1**
Ballast water exchange operations will comply with the IMO International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004 – MARPOL 73/78 (as appropriate to vessel class), Australian Ballast Water Management Requirements (DoAWR, 2017) and *Biosecurity Act 2015* (Cth), including: + all ballast water exchanges conducted >12 nm from land and in >200 m water depth + vessel Ballast Water Management Plan stipulating that ballast water exchange records will be maintained + completion of DoAWR Ballast Water Management Summary sheet for any ballast water discharge in Australian waters.	6.4.4	**C 9.2** Vessels undertake ballast water management or treatment to achieve low-risk ballast water.	**Section 5.3.2** **Table 6-1**
The International Convention on the Control of Harmful Anti-fouling Systems on Ships will be complied with, including vessels (of appropriate class) having a valid IAFS Certificate.	6.4.4	**C 9.1** Vessels equipped with effective anti-fouling coatings.	**Section 5.3.2** **Table 6-1**

Key management controls included in the OPP	OPP Section Reference	How the Barossa OPP controls are addressed in the EP	EP Section Reference
Key noise-generating equipment will be maintained in accordance with the manufacturer's specifications, facility planned maintenance system and/or regulatory requirements.	6.4.5	This is achieved through the implementation strategy and the marine vetting and auditing process	**Section 7**
All MODUs/drill ships and vessels (as appropriate to vessel class) will comply with Marine Order 97 (Marine pollution prevention – air pollution), which requires vessels to have a valid IAPP Certificate (for vessels >400 tonnage) and use of low sulphur diesel fuel, when possible.	6.4.6	**C 5.1** requires all atmospheric emissions form combustion engines to be in accordance with standard maritime practice	**Section 5.2.5** **Table 6-1**
The sulphur content of fuel used by project vessels will comply with Regulation 14 of MARPOL Annex VI (appropriate to vessel class) in order to control SOx and particulate matter emissions.	6.4.6	**C 5.1** requires all atmospheric emissions form combustion engines to be in accordance with standard maritime practice	**Section 5.2.5** **Table 6-1**
A preventative maintenance system will be implemented, which includes regular inspections and maintenance of engines and key emission sources and emissions control equipment in accordance with the vendor specifications.	6.4.6	This is achieved the implementation strategy and the marine vetting and auditing process	**Section 7**
All vessels in Australian waters adhere to the navigation safety requirements contained within COLREGS, Chapter 5 of SOLAS, the *Navigation Act 2012* (Cth) and subordinate Marine Order 30 (Prevention of Collisions) (as appropriate to vessel class) with respect to navigation and workplace safety equipment (including lighting).	6.4.7	**C 1.1** requires all activity vessels equipped and crewed in accordance with Australian maritime requirements	**Table 6-1**
A project Waste Management Plan will be developed and implemented, and will include details of: + the types of waste that will be generated by the project and will require containment, transport to, and disposal at, a licenced facility onshore + management protocols for the handling, segregation and responsible disposal of wastes. For example, non-hazardous and hazardous solid and liquid wastes will be transported safely to shore and disposed onshore at licenced treatment and disposal facilities. + measurable performance criteria + competency and training + audits, reporting and review, including compliance checks via waste manifests.	6.4.9	A waste management plan has been adopted as a control in the EP (**C 13.1**)	**Section 5.3.6** **Table 6-1**

Key management controls included in the OPP	OPP Section Reference	How the Barossa OPP controls are addressed in the EP	EP Section Reference
Hydrocarbon and chemical storage and handling procedures will be implemented, including: + secure storage of bulk hydrocarbons and chemicals in areas with secondary containment + storage of hydrocarbon and chemical residues in appropriate containers + stocks of SOPEP spill response kits readily available to respond to deck spills of hazardous liquids and personnel trained to use them + planned maintenance system including maintenance of key equipment used to store and handle hydrocarbons/chemicals (e.g. bulk transfer hoses, bunding) + MSDS available on board for all hazardous substances.	6.4.9 6.4.10.13	**C 12.1** requires chemical and hydrocarbon storage areas designed to contain leaks and spills	**Table 6-1**
Non-hazardous and hazardous wastes will be managed, handled and stored in accordance with their MSDS, and tracked from source to their final destination at an appropriately licenced waste facility.	6.4.9	**C 13.1** requires All wastes managed in accordance with vessel waste management plan	**Table 6-1**
Bunkering procedures will be implemented, which include: + use of bulk hoses that have dry break couplings, weak link break-away connections, vacuum breakers and floats + correct valve line-up + defined roles and responsibilities – bunkering to be undertaken by trained staff + visual inspection of hose prior to bunkering to confirm they are in good condition + testing emergency shutdown mechanism on the transfer pumps + assessment of weather/sea state + maintenance of radio contact with vessel during bunkering operations.	6.4.10.13	**C 13.2** HSE inductions – cover requirements; e.g. label and cover waste skips and bins	**Table 6-1**
Vessel specific controls will align with MARPOL 73/78 and Australian Marine Orders (as appropriate for vessel classification), which includes managing spills aboard, emergency drills and waste management requirements.	6.4.10.13	All relevant Marine Orders have been adopted as controls in the EP	**Section 5.3.5**

Key management controls included in the OPP	OPP Section Reference	How the Barossa OPP controls are addressed in the EP	EP Section Reference
Vessel movements will comply with maritime standards such as COLREGS and Chapter V of SOLAS.	6.4.10.13	The following controls have been included: Activity vessels equipped and crewed in accordance with Australian Maritime requirements (**C 1.1**)	**Section 5.2.1** **Table 6-1**
All marine contracted vessels will undergo the ConocoPhillips Global Marine vetting process, which involves inspection, audit and a review assessment for acceptability for use, prior to working on the project.	6.4.10.13	Included in the implementation strategy in **Section 7**	**Section 7.3.2**
Vessel selection criteria will make considerations for designs and operations which reduce the likelihood of hydrocarbon spills to the marine environment as a result of a vessel collision.	6.4.10.13	Included in the implementation strategy in **Section 7**	**Section 7.3.2**
All vessels involved in the project will have a valid SOPEP or SMPEP (as appropriate for vessel classification).	6.4.10.13	This control has been adopted in the EP (**C 14.1**)	**Section 5.3.7** **Table 6-1**
Spill response in the event of a hydrocarbon or chemical spill will be implemented safely and be commensurate with the type, nature, scale and risks of the spill to key values and sensitivities, as defined in activity-specific OPEPs.	6.4.10.13	A tiered response will be implemented in the event of a spill (**C 14.2**)	**Section 5.3.7** **Table 6-1**
A Crisis Management Plan will be implemented in the event of a spill, which includes: + emergency response planning + emergency management structure + incident notification + emergency response responsibilities and support providers.	6.4.10.13	Details of incident (including spills) management is provided in the implementation strategy	**Section 7**
An OSMP will be initiated and implemented as appropriate to the nature and scale of the spill and the existing environment, as informed by a net environmental benefit assessment.	6.4.10.13	OPEP (**Appendix E**)	**Appendix E**

Key management controls included in the OPP	OPP Section Reference	How the Barossa OPP controls are addressed in the EP	EP Section Reference
The Stakeholder Engagement Plan will include consultation with commercial fisheries, shipping, Australian Hydrographic Office (AHO) and other stakeholders operating in the Barossa offshore development and gas export pipeline to inform them of the proposed project. Ongoing consultation will also be undertaken throughout the life of the project.	6.4.1	**Section 8** details the relevant and interested persons consultation undertaken for the Barossa Gas Export Pipeline Installation EP	**Section 8**

APPENDIX E – OIL POLLUTION EMERGENCY PLAN

(Refer to BAA-100 0330)

Barossa Gas Export Pipeline Installation Oil Pollution Emergency Plan

PROJECT / FACILITY	Barossa Gas Export Pipeline
REVIEW INTERVAL	No Review Required
SAFETY CRITICAL DOCUMENT	NO

Rev	Owner	Reviewer/s Managerial/Technical/Site	Approver
3	Crisis, Emergency Response and Security Manager	Senior Oil Spill Response Coordinator	Barossa Project Director
Signed			

Any hard copy of this document, other than those identified above, are uncontrolled. Please refer to the Santos Offshore Document Management System for the latest revision.

REV No	DATE	REVISION
0	25/07/2019	Issued for use
1	30/10/2019	Issued for use
1A	01/08/2021	Internal Review
1B	08/09/2021	Internal Review
2	16/09/2021	Internal Revision – updating OPEP to cover transition from ConocoPhillips format and management systems across to Santos. Covered by MoC 245 (Doc ID BAA-100 0400)
2A	11/11/2021	Internal Review
3	07/12/2021	Revision for submission to NOPSEMA – updating OPEP to incorporate changes associated with new stage of GEP (additional ~23 km segment in Commonwealth waters)

Distribution	Oil Pollution Emergency Plan	
	Electronic	Hardcopy
Intranet – Emergency Preparedness	link only	
Manager – HSE Offshore Division	link only	
Drilling Superintendent	link only	
Drilling Supervisor	link only	
Senior Oil Spill Response Coordinator	link only	
Santos Company Site Representative (CSR)	link only	
IMT Room – Perth office		● x 4
AMOSC	●	
DEWPS	●	
AMSA	●	
OSRL	●	

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List of Acronyms

Abbreviation	Description
AIS	automatic identification system
ALARP	as low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre Pty Ltd
AMP	Australian Marine Park
AMSA	Australian Marine Safety Authority
APASA	Asia-Pacific Applied Sciences Associates
API	American Petroleum Institute
APPEA	Australian Petroleum Production & Exploration Association
BAOAC	Bonn Agreement Oil Appearance Codes
CMT	Crisis Management Team
CSR	company site representative
DEPWS	Department of Environment, Parks and Water Security
DFAT	Department of Foreign Affairs and Trade
DISER	Department of Industry, Science, Energy and Resources
DoE	(Australian) Department of the Environment (now Department of the Environment and Energy)
DPIRD	Department of Primary Industries and Regional Development
EMBA	environment that may be affected
EP	Environment Plan
ER	emergency response
GDA	Geodetic Datum of Australia
GIS	geographic information system
GPS	global positioning system
HMA	Hazard Management Agency
IAP	Incident Action Plan
ICC	incident command centre
IMT	Incident Management Team
MARPOL	International Convention for the Prevention of Pollution from Ships
MGA	Map Grid of Australia
MNES	matters of national environmental significance
MoU	Memorandum of Understanding
MP	marine park
MSA	Master Services Agreement
MSP	monitoring service providers
N	north

Abbreviation	Description
NEBA	net environmental benefit analysis
NOPSEMA	National Offshore Petroleum Safety and Environment Management Authority
NT	Northern Territory
NT IC	Northern Territory Incident Controller
OPEP	Oil Pollution Emergency Plan
OPGGS(E) Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
OSC	on-scene commander
OSRL	Oil Spill Response Limited
OSTM	oil spill trajectory modelling
OWR	oiled wildlife response
SIMA	spill impact mitigation assessment
SMP	Scientific Monitoring Plans
SMPEP	Shipboard Marine Pollution Emergency Plan
SOPEP	Shipboard Oil Pollution Emergency Plans
TMPC	Territory Marine Pollution Coordinator
VOC	volatile organic compound
VOO	vessels of opportunity
VPO	Vice President Offshore Upstream WA
W	west
WSP	waste service provider

1 Quick reference information

Parameter	Description			Further Information
Petroleum Activity	Barossa Gas Export Pipeline (GEP) – installation and commissioning phases only			Section 3 - Barossa GEP Environment Plan (EP) (BAA-100 0329)
Location	Pipeline running from the pipeline end termination (PLET) in the Barossa development area (Easting MGA52: 638539; Northing: 8914135) along the west coast of Bathurst Island to additional Barossa GEP Segment ~KP23) (Easting: 614607; Northing: 8666193)			Section 3.3 - Barossa GEP Environment Plan (EP) (BAA-100 0329)
Petroleum Title/s (Blocks)	NT/L1 (Production Licence)			N/A
Facilities/Vessels	Pipelay vessel (classified as a facility when laying pipeline; classified as a vessel when not laying pipeline) Support vessels			
Water Depth	Approximately 36 to 265 m			N/A
Worst-case Spill Scenarios	+ Marine Diesel Oil (MDO) released from a vessel collision + MDO released from a bunkering incident.			
Hydrocarbon Type, International Tanker Owners Pollution Federation (ITOPF) Grouping, Worst Case Volume		**Hydrocarbon type (ITOPF Group)**	**Worst case volume**	**Appendix A: Hydrocarbon Characteristics and Behaviour**
	Vessel collision	MDO (Group II)	700 m^3	
	Bunkering incident	MDO (Group II)	10 m^3	
Hydrocarbon Properties	MDO: Density at 25 °C = 829 kg/m^3 Dynamic viscosity = 4 cP @ 25° C API Gravity = 37.6° Wax content = 1% Pour point = -14 °C Oil property classification = Persistent (medium)			**Appendix A: Hydrocarbon Characteristics and Behaviour**
Weathering Potential	MDO is a mixture of volatile and persistent hydrocarbons with low viscosity. It will spread quickly and thin out to low thickness levels, thereby increasing the rate of evaporation. Up to 60% will generally evaporate over the first two days. Approximately 5% is considered “persistent”, which are unlikely to evaporate and will decay over time.			**Appendix A: Hydrocarbon Characteristics and Behaviour**

Parameter	Description	Further Information
Protection Priorities	Vernon Islands are surrounded by coral reefs and extensive coralline algal terraces, and contain extensive mangrove forests that are vulnerable to pollution. The Tiwi Islands and Cox-Finniss (NT mainland) shorelines contain a range of shoreline types that are vulnerable to pollution, including nesting beaches for flatback turtles, olive ridley turtles and crested terns, and cultural heritage sites. The Oceanic Shoals Australian Marine Park contains significant habitats, species and ecological communities, including four key ecological features, two of which occur within the oil spill environment that may be affected (EMBA).	

2 First strike response actions

The initial response actions to major oil spill incidents will be undertaken by the relevant Vessel Master.

Following those initial actions to ensure the safety of personnel on the vessel and to control the source of the spill, the Santos Company Site Representative will assess the situation based on:

- What has caused the spill?
- Is the source under control?
- What type of hydrocarbon has been spilled?
- How much has been spilled?

For spills from support vessels, initial response actions to major incidents are under the direction of the Vessel Master and in accordance with vessel-specific procedures (e.g., Shipboard Oil Pollution Emergency Plans (SOPEPS)).

Response information contained within this Oil Pollution Emergency Plan (OPEP)) is concerned primarily with a large scale (Level 2/3) hydrocarbon spill where the Perth-based Incident Management Team (IMT) and Santos Crisis Management Team (CMT) are engaged for support and implementation of response strategies. Level 1 spills are managed through on-site response and IMT is available to assist with regulatory requirements/notifications and support as required. Therefore, the immediate response actions listed in **Table 2-1** are relevant for any spill. Once sufficient information is known about the spill, the Incident Commander will classify the level of the spill. If the spill is classified as a Level 1 spill, then the actions related to Level 2/3 spills do not apply, unless specified by the Incident Commander.

Table 2-1: First strike activations

When (indicative)	Activations		Who
	Objective	Action	
All spills			
Immediate	Manage the safety of personnel	Implement site incident response procedures or vessel-specific procedures, as applicable	On-Scene Commander/Vessel Master
Immediate	Control the source using site resources, where possible	Control the source using available onsite resources (vessel) Refer to vessel SOPEP	On-Scene Commander/Vessel Master
30 minutes of incident being identified	Notify Santos Offshore Duty Manager / Incident Commander	Verbal communication to Offshore Duty Manager / Incident Commander's duty phone	On-Scene Commander via Company Site Representative
As soon as practicable	Obtain as much information about the spill as possible	Provide as much information to the IMT (Incident Commander or delegate) as soon as possible	On-Scene Commander via Company Site Representative
60 minutes	Gain situational awareness and begin onsite spill surveillance	If spill reaches marine waters gain further situational awareness by undertaking surveillance of the spill from vessel Refer to Monitor and Evaluate Plan – **Section 9**	On-Scene Commander via Company Site Representative Incident Commander
Refer timeframes Go to **Section 6**	Make regulatory notifications within regulatory timeframes	Activate the External Notifications and Reporting Procedures – **Section 6**	Initial notifications by Environment Unit Leader / Safety Officer Oil Spill Response Organisations (Australian Marine Oil Spill Centre [AMOSC] and Oil Spill Response Ltd [OSRL]) activation by designated call-out authorities (Incident Commanders/Duty Managers)
Level 2/3 spills (in addition to actions above)			
Immediately once notified of spill (to Incident Commander)	Activate IMT, if required	Notify IMT	Offshore Duty Manager/ Incident Commander

When (indicative)	Activations		Who
	Objective	Action	
IMT actions (0 to 48 hours)			
Within 90 minutes from IMT callout	Set-up IMT room	Refer to IMT tools and checklists for room and incident log set-up	Incident Commander Data Manager
	Gain situational awareness and set incident objectives, strategies and tasks	Begin reactive Incident Action Planning process Go to **Section 5.2** Review First Strike Activations (this table)	Incident Commander Planning Section Chief
Refer timeframes **Section 6**	Make regulatory notifications as required Notify and mobilise/put on standby external oil spill response organisations and support organisations, as required	Go to **Section 6**	Initial notifications by Environment Unit Leader/ Safety Officer Oil Spill Response Organisations (Australian Marine Oil Spill Centre [AMOSC] and Oil Spill Response Ltd [OSRL]) activation by designated call-out authorities (Incident Commanders/Duty Managers)
Refer timeframes **Section 9**	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making	Activate Monitor and Evaluate Strategy Go to **Section 9**	Operations Section Chief Logistics Section Chief /Supply Officer Environment Unit Leader
Day 1	Identify environmental sensitivities at risk and conduct Net Environmental Benefit Analysis (NEBA)	Review situational awareness and spill trajectory modelling Review applicable response strategies and begin operational NEBA (**Section 7.3**)	Environment Unit Leader
Day 1	Ensure the health and safety of spill responders	Identify relevant hazards controls and develop hazard register Begin preparation Site Health and Safety Management requirements Refer Oil Spill Response Health and Safety Management Manual (SO-91-RF-10016)	Safety Officer

When (indicative)	Activations		Who
	Objective	Action	
If/when initiated Refer **Section 12**	Prevent or reduce impacts to wildlife	Activate the Oiled Wildlife Response Plan Go to **Section 12**	Environment Unit Leader Operations Section Chief Logistics Section Chief / Supply Unit Leader
If/when initiated Refer **Section 13**	Safely transfer, transport and dispose of waste collected from response activities.	Activate the Waste Management Plan. Go to **Section 13**	Operations Section Chief Logistics Section Chief / Supply Unit Leaders
If/when initiated Refer **Section 14**	Assess and monitor impacts from spill and response	Activate the Scientific Monitoring Plan Go to **Section 14**	Environment Unit Leader Logistics Section Chief / Supply Unit Leader Operations Section Chief
IMT Actions (48+ hours)			
Ongoing	+ For ongoing incident management – indicatively 48 + hours – a formal incident action planning process is to be adopted to continue with spill response strategies identified above. An Incident Action Plan (IAP) is to be developed for each successive operational period. + Santos will maintain control for those activities for which it is the designated Control Agency/Lead IMT. + Depending on the specifics of the spill, Australian Maritime Safety Authority (AMSA), and/or the Northern Territory (NT) IMT may be relevant Control Agencies (refer **Section 4.2**). + Where another Control Agency has taken control of aspects of the response, Santos will provide support to that Control Agency. Santos' support to the NT IMT (for a spill that impacts the NT shoreline) is detailed in **Section 4.5.**		Control Agency IMT Santos to provide support to the NT IMT, as requested.

3 Introduction

3.1 Purpose

This Oil Pollution Emergency Plan (OPEP) outlines the emergency management arrangements and oil spill response options for activities associated with the Barossa GEP Installation.

This OPEP addresses the requirements of the Offshore Petroleum and Greenhouse Gas Storage (Environmental) Regulations 2009 (OPGGS (E) Regulations)) and forms a supporting document to the Barossa GEP Installation Environment Plan (EP) (BAA-100 0329). It is also consistent with the National Plan for Maritime Environmental Emergencies (AMSA 2020), and the NT Oil Spill Contingency Plan (NT DoT, 2014).

This OPEP covers the response to oil spill incidents associated with Barossa GEP installation activities. This OPEP aids the IMT in planning and decision-making from when the IMT is first notified of the incident. Credible spills associated with Barossa GEP installation activities are listed in **Section 7.1.**

The location of the activity covered by this OPEP is shown in **Figure 3-1** and includes Commonwealth waters. While there are no activities for the Barossa GEP installation within NT waters, a spill within Commonwealth waters may enter NT waters.

3.2 Objectives

The aim of this OPEP is to provide detailed guidance to Santos' IMT, so that it will direct its response effort with the aim of preventing long term significant environmental impacts by safely limiting the adverse environmental effects from an unplanned release of hydrocarbons to the marine environment to a level that is ALARP. This will be achieved through the implementation of the various strategies and spill response mechanisms presented throughout this OPEP. Through their implementation, Santos will:

+ initiate spill response immediately following a spill
+ establish source control as soon as reasonably practicable to minimise the amount of oil being spilt into the environment
+ assess the spill characteristics and understand its fate in order to be able to make informed and clear response decisions
+ monitor the spill to identify the primary marine and coastal resources requiring protection
+ remove as much oil as possible from the marine environment while keeping environmental impacts from the removal methods to ALARP
+ reduce the impacts of the remaining floating and stranded oil to ALARP
+ respond to the spill using efficient response strategies that do not damage the environment themselves
+ comply with all relevant environmental legislation when implementing this OPEP

- conduct all responses safely without causing harm to participants
- monitor the impacts from a spill until impacted habitats have returned to baseline conditions
- remain in a state of 'Readiness' at all times for implementation of this OPEP by keeping resources ready for deployment, staff fully trained and completing response exercises as scheduled
- keep stakeholders informed of the status of the hydrocarbon spill response to aid in the reduction of social and economic impacts.

3.3 Interface with internal documents

In addition to this OPEP, a number of other Santos documents provide guidance and instruction relevant to spill response, including:

- Incident Command & Management Manual (SO-00-ZF-00025)
- Barossa GEP Installation EP (BAA-100 0329)
- Incident Response Telephone Directory (SO-00-ZF-00025.020)
- Refuelling and Chemical Management Standard (QE-91-IQ-00098)
- Oil Pollution Waste Management Plan (QE-91-IF-10053)
- Oil Spill Response Health and Safety Management Manual (SO-91-RF-10016)
- Santos Oiled Wildlife Framework Plan (SO-91-BI-20014)
- Oil Spill Scientific Monitoring Plan (EA-00-RI-10099)
- Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162)
- Oil Spill Scientific Monitoring Baseline Data Review (QE-00-BI-20001)
- Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (SO-92-HG-10001).
- Santos Offshore Division Oil Spill Response Readiness Guideline (SO-91-OI-20001)

Details of the training, exercises, drills and audits that will be undertaken to provide preparedness and capability for delivery of this OPEP in the event of a spill are outlined in the Barossa GEP Installation EP (BAA-100 0329) (Implementation Strategy -Section 7).

3.4 Interface with external documents

Information from the following external documents have been used or referred to within this Plan:

- AMOSPlan – Australian Industry Cooperative Spill Response Arrangements:
  - Details the cooperative arrangements for response to oil spills by Australian oil and associated industries.

- Offshore Petroleum Incident Coordination Framework – provides overarching guidance on the Commonwealth Government's role and responsibilities in the event of an offshore petroleum incident in Commonwealth waters.
- National Plan for Maritime Environmental Emergencies and National Marine Oil Spill Contingency Plan:
  - Sets out national arrangements, policies and principles for the management of maritime environmental emergencies. The plan provides for a comprehensive response to maritime environmental emergencies regardless of how costs might be attributed or ultimately recovered.
- Territory Emergency Plan:
  - Describes the NT approach to emergency and recovery operations, the governance and coordination arrangements, and roles and responsibilities of agencies (available online: https://pfes.nt.gov.au/sites/default/files/uploads/files/2021/NTES_Territory_Emergency_Plan_2021.pdf
- Northern Territory (NT) Oil Spill Contingency Plan
  - Outlines the approach to management of marine oil pollution that are the responsibility of the NT Government.
- NT Oiled Wildlife Response Plan (NTOWRP)
  - An industry prepared plan, which is designed to ensure timely mobilisation of appropriate resources (equipment and personnel) in the event of an incident affecting wildlife in NT waters.
- Shipboard Oil Pollution Emergency Plans:
  - Under International Convention for the Prevention of Pollution from Ships (MARPOL) Annex I requirements, all vessels of over 400 gross tonnage are required to have a current SOPEP. The SOPEP includes actions to be taken by the crew in the event of an oil spill including steps taken to contain the source with equipment available onboard the vessel.
- OSRL Associate Agreement:
  - Defines the activation and mobilisation methods of OSRL spill response personnel and equipment allocated under contract.
- Australian Government Coordination Arrangements for Maritime Environmental Emergencies:
  - Provides a framework for the coordination of Australian Government departments and agencies in response to maritime environmental emergencies.

3.5 Document review

In line with regulatory requirements, this document shall be reviewed, updated and submitted to NOPSEMA every five years from date of acceptance.

The document may be reviewed and revised more frequently, if required, in accordance with the Santos Management of Change Procedure (EA-91-IQ-10001). This could include changes required in response to one or more of:

- when major changes have occurred that affect oil spill response coordination or capabilities
- changes to the Environment Plan that affect oil spill response coordination or capabilities (e.g., a significant increase in spill risk)
- following routine testing of the OPEP if improvements or corrections are identified
- after a Level 2/3 spill incident.

The extent of changes made to the OPEP and resultant requirements for regulatory resubmission will be informed by the relevant Commonwealth regulations; i.e., the OPGGS (E) Regulations.

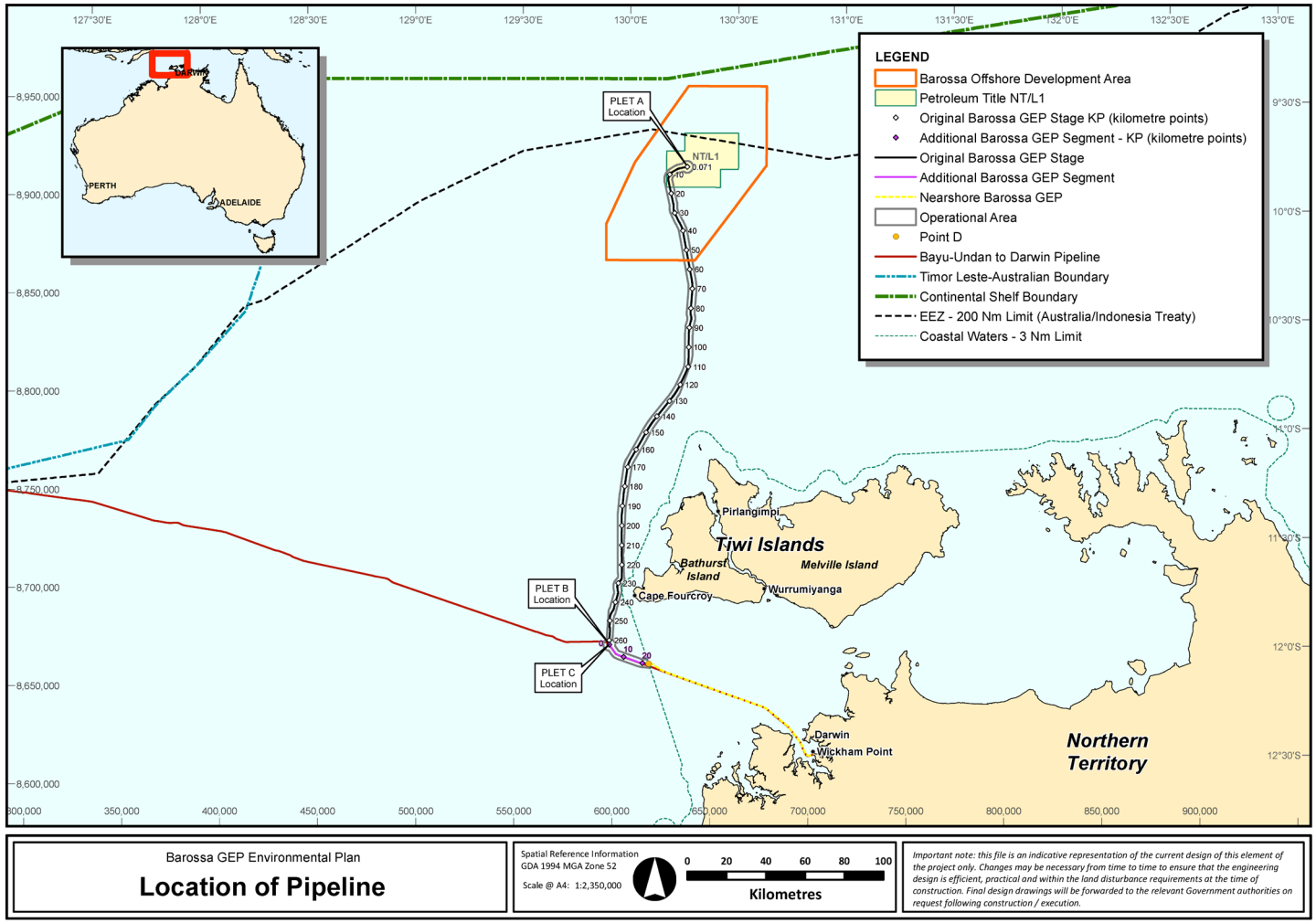


Figure 3-1: Barossa field and gas export proposed pipeline route location

4 Spill management arrangements

4.1 Response levels and escalation criteria

Santos uses a tiered system of three incident response levels consistent with the National Plan for Maritime Environmental Emergencies (National Plan) (AMSA 2020). Spill Response Levels help to identify the severity of an oil spill incident and the level of response required to manage the incident and mitigate environmental impacts. Incident response levels are outlined within the Santos Incident Command and Management Manual (SO-00-ZF-00025) and further detailed in **Table 4-1** for hydrocarbon spills.

Table 4-1: Santos oil spill response levels

Level 1	
An incident which will not have an adverse effect on the public or the environment which can be controlled by the use of resources normally available onsite without the need to mobilise the Santos IMT or other external assistance.	
Oil is contained within the incident site. Spill occurs within immediate site proximity. Discharge in excess of permitted oil in water (OIW) content (15 ppm). Incident can be managed by the On-site Incident Response Team (IRT) and its resources.	Source of spill has been contained. Oil is evaporating quickly and no danger of explosive vapours. Spill likely to naturally dissipate. No media interest/not have an adverse effect on the public.
Level 2	
An incident that cannot be controlled by the use of onsite resources alone and requires external support and resources to combat the situation; or **An incident that can be controlled onsite but which may have an adverse effect on the public or the environment.**	
Danger of fire or explosion. Possible continuous release. Concentrated oil accumulating in close proximity to the site or vessel. Potential to impact other installations.	Level 1 resources overwhelmed, requiring additional regional resources. Potential impact to sensitive areas and/or local communities. Local/national media attention/may adversely affect the public or the environment.
Level 3	
An incident which has a wide ranging impact on Santos and may require the mobilisation of external state/territory, national or international resources to bring the situation under control.	
Loss of well integrity. Actual or potentially serious threat to life, property, industry. Major spill beyond site vicinity. Significant shoreline environmental impact.	Level 2 resources overwhelmed, requiring international assistance. Level 3 resources to be mobilised. Significant impact on local communities. International media attention.

4.2 Jurisdictional authorities and control agencies

The responsibility for an oil spill is dependent on location and spill origin. The National Plan for Maritime Environmental Emergencies (AMSA, 2020) sets out the divisions of responsibility for an oil spill response. Definitions of Jurisdictional Authority and Control Agency are as follows:

- Jurisdictional Authority: the agency 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.
- Control Agencies: the organisation assigned by legislation, administrative arrangements or within the relevant contingency plan, to control response activities to a maritime environmental emergency. Control Agencies have the operational responsibility of response activities but may have arrangements in place with other parties to provide response assistance under their direction.

Table 4-2 provides guidance on the designated Control Agency and Jurisdictional Authority for Commonwealth and State/Territory waters and for vessel and facility spills.

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 to which the *Navigation Act 2012* applies. Defined by Australian Government Coordination Arrangements for Maritime Environmental Emergencies (AMSA, 2017) as a seismic vessel, supply or support vessel, or offtake tanker.
- A petroleum activity including a fixed platform, FPSO/FSO, MODU, subsea infrastructure, or a construction, decommissioning and pipelaying vessel. As defined by Schedule 3, Part 1, Clause 4 and & Volume 2, Part 6.8, Section 640 of the OPGGSA 2006.

Table 4-2: Jurisdictional and Control Agencies for Hydrocarbon Spills

Jurisdictional boundary	Spill source	Jurisdictional authority	Control agency		Relevant documentation
			Level 1	Level 2/3	
Commonwealth waters (three to 200 nautical miles from territorial/state sea baseline)	Vessel	AMSA	AMSA		Vessel SOPEP National Plan
	Petroleum activities	NOPSEMA	Titleholder		Barossa GEP Installation OPEP (this document)
Northern Territory (NT) waters (territorial sea baseline to three nautical miles and some areas around offshore atolls and islands)	Vessel	Department of Environment, Parks and Water Security (DEPWS)	Vessel owner	NT IMT[1]	Vessel SOPEP Barossa GEP Installation OPEP (this document) NT Oil Spill Contingency Plan (2014)
	Petroleum activities	DEPWS	Titleholder[2]		Barossa GEP Installation OPEP (this document) NT Oil Spill Contingency Plan (2014)
NT shorelines	Vessel	DEPWS	Vessel owner	NT IMT[1]	Barossa GEP Installation OPEP (this document) NT Oil Spill Contingency Plan (2014)
	Petroleum activities	DEPWS	Titleholder	NT IMT[1]	Barossa GEP Installation OPEP (this document) NT Oil Spill Contingency Plan (2014)

[1] NT IMT will be the Control Agency but will be supported by the Titleholder (additional support from AMOSC if required)
[2] Titleholder will be the Control Agency but will request approval of IAPs from the NT IC.

Jurisdictional boundary	Spill source	Jurisdictional authority	Control agency		Relevant documentation
			Level 1	Level 2/3	
International waters	Petroleum activities	Relevant foreign authority	Santos will liaise with the Australian Government Department of Foreign Affairs and Trade (DFAT) in the event that an oil spill may enter international waters. Santos will work with DFAT and the respective governments to support response operations.		
	Vessel				

4.3 Petroleum activity spill in Commonwealth waters

For an offshore petroleum activity spill in Commonwealth waters, the Jurisdictional Authority is National Offshore Petroleum Safety and Environment Management Authority (NOPSEMA). NOPSEMA is responsible for the oversight of response actions to pollution events from offshore Petroleum Activities, in areas of Commonwealth jurisdiction. During a spill incident, NOPSEMA's role will be to implement regulatory processes to monitor and secure compliance with the *OPGGS Act 2006* and *OPGGS (E) Regulations*, including the issuing of directions as required, and investigate accidents, occurrences and circumstances involving deficiencies in environment management.

Under the *OPGGS (E) Regulations* and the *OPGGS Act 2006*, the Petroleum Titleholder (i.e. Santos) is responsible for responding to an oil spill incident as the Control Agency in Commonwealth waters, in accordance with its OPEP.

Santos is responsible as Control Agency unless NOPSEMA identifies a requirement to delegate control. In this situation, Control Agency responsibility may be delegated to AMSA who will assume control of the incident and respond in accordance with AMSA's National Plan. In such an occurrence, Santos would assume a Support Agency role and make available all necessary resources to support AMSA in AMSA's performance of their Control Agency responsibilities.

4.4 Vessel spills

AMSA manages the National Plan for Maritime Environmental Emergencies (AMSA, 2020) and is the Control Agency for all vessel-based spills in the Commonwealth jurisdiction. This includes supply or support vessels and the pipelay vessel when it is not laying the pipeline, regardless of whether they are in the Operational Area or not.

The Northern Territory Government's Incident Management Team (IMT) would assume the Control Agency role for Level 2/3 vessel-based spills in NT waters. In all circumstances, the Vessel Master is responsible for implementing source control arrangements detailed in the vessel specific SOPEP.

Once initial notifications to the Control Agency are made, Santos shall maintain direct contact with the Control Agency and act as a Supporting Agency throughout the response. This includes providing essential services, personnel, material or advice in support of the Control Agency. In addition, Santos will be required to implement monitoring activities as outlined in the Monitor and Evaluate Plan (**Section 9**) and Scientific Monitoring Plan (**Section 14**).

4.5 Spills Entering Northern Territory Waters

If a Level 2/3 spill arises which has potential to enter Territory waters, Santos must notify the Regional Harbourmaster and the NT Pollution Response Hotline (DEPWS) which will provide the communication link to the Territory Marine Pollution Coordinator (TMPC), who will establish an NT Incident Controller (NT IC) as the ongoing point of contact.

Notification to the TMPC and Regional Harbourmaster is to be completed as soon as practicable (within the first 24 hours of spill occurring or sooner) which will allow sufficient time to accurately determine the predicted time of any potential shoreline impact. The TMPC will appoint an NT IC.

Santos will commence coordination with the NT IC, mobilising resources and personnel into Darwin.

For Level 2/3 vessel spills that cross from Commonwealth waters into Territory waters, AMSA will remain Control Agency for Commonwealth waters and the NT Government (via NT Incident Management Team (IMT)) will be Control Agency for NT waters.

The NT IMT with advice from NT Environment, Scientific and Technical advisors will work with AMSA (and support from Santos, if requested) to confirm protection priorities and undertake an operational NEBA to determine the most appropriate response in Territory waters.

If a Level 2/3 facility spill reaches the Northern Territory shoreline, the NT IMT will be the Control Agency for the shoreline.

The NT IMT will be established in Darwin and consist of staff from across NT Government. The NT IMT will be supported by existing NT emergency response arrangements[3] and Santos, as Supporting Agency. Additional support, if required, will be provided under the provisions of the *NT Emergency Management Act 2013*, through the Territory Emergency Management Council and the NT Government Functional Groups.

At the request of the TMPC, Santos will be required to provide all necessary resources, including personnel and equipment, to assist the NT IMT in performing duties as the Control Agency. This may include the provision of personnel to work within the NT IMT located in Darwin, to assist response activities such as shoreline protection, with the required numbers to be determined based on the nature and scale of the spill and response requirements at the time.

The Territory Emergency Management Council will delegate responsibilities associated with wildlife and activities in National parks, reserves and Territory marine parks. Direct coordination will be managed through the designated NT Government Functional Group.

4.6 Cross-jurisdictional vessel spills

If a Level 2/3 vessel spill crosses jurisdictions between Commonwealth and Territory/State waters, two Jurisdictional Authorities will exist (AMSA for Commonwealth waters; and NT IMT for Territory Waters). Control Agency responsibilities will be determined by NT Government and AMSA, with Santos providing all necessary resources (including personnel and equipment) as a Supporting Agency, as detailed in **Section 4.4.**

4.7 Oiled Wildlife Response

Relevant guidance to support an oiled wildlife response in the event of an oil spill is outlined in the Northern Territory Oiled Wildlife Response Plan (NTOWRP) (AMOSC, 2019) (**Section 12**), the plan is designed to ensure timely mobilisation of appropriate resources (equipment and personnel) in the event of an incident affecting wildlife in NT waters.

5 Santos incident management arrangements

5.1 Incident management structure

The Santos IMT (Perth) and CMT will be activated in the event of a level 2/3 hydrocarbon spill regardless of the type of spill or jurisdiction. Santos maintains internal resources (trained personnel and equipment) across its activities that provide first strike response capability and to also support an ongoing response. Should an incident occur, the IMT Duty Manager would be notified immediately. This rostered role is on-call, filled by trained Incident Commanders and available 24 hours/day and 7 days/week. The IMT Duty Manager would then activate the IMT via an automated call-out system.

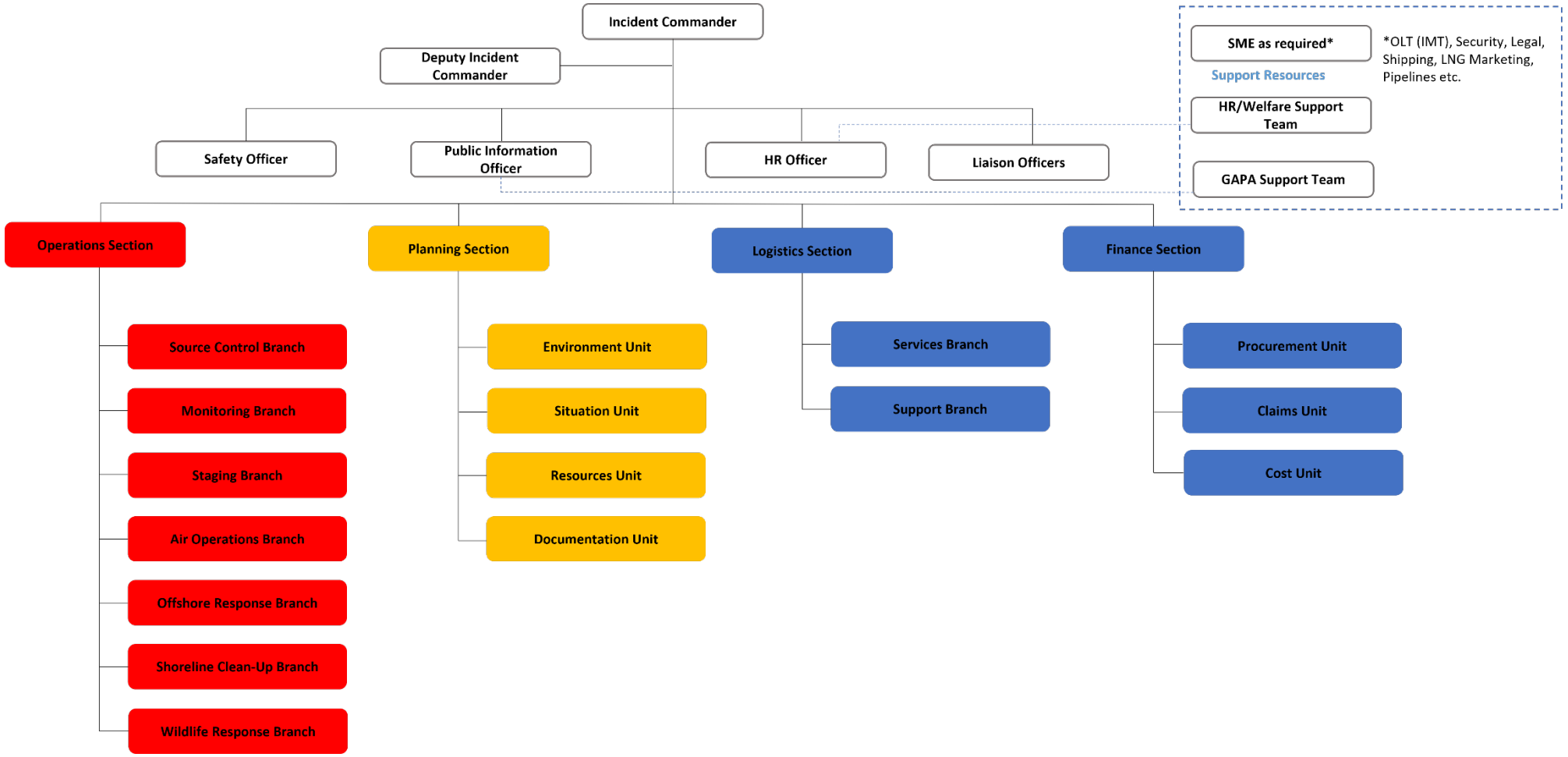
The Santos IMT (Perth) and CMT will be activated in the event of a Level 2/3 hydrocarbon spill regardless of the type of spill or jurisdiction. As outlined in **Section 4** control of the response may be taken over by the relevant Control Agency as the incident progresses. The Santos response structure to a major emergency incident is detailed in the Santos Incident Command and Management Manual (SO-00-ZF-00025). The Incident Command and Management Manual describes response planning and incident management that would operate under emergency conditions – describing how the Santos IMT operates and interfaces with the CMT and external parties.

The first priority of an escalating oil spill response to a Level 2/3 spill is the formation of an IMT and establishment of an incident command centre (ICC). The ongoing involvement of the IMT and CMT will be dependent on the severity and type of spill and the obligations of Santos and other agencies/authorities in the coordinated spill response.

Santos' incident response structure relevant to a Barossa GEP Installation incident includes:

+ Santos IMT – Perth-based to coordinate and execute responses to an oil spill incident
+ Santos Crisis Management Team (CMT) – to coordinate and manage threats to the company's reputation and to handle Santos' corporate requirements in conjunction with the Perth-based Santos – Vice President Offshore (VPO) Upstream WA
+ Other field-based command, response and monitoring teams for implementing strategies outlined within the OPEP.

The Santos incident response organisational structure is defined in the Incident Command and Management Manual (SO-00-ZF-00025) and in **Figure 5-1** for reference. The Santos IMT roles and field-based teams are scalable; roles can be activated and mobilised according to the nature and scale of the incident response. Additional detail on roles and responsibilities is presented in Section 7.11.4 of the EP.



Note: Due to the nature of activity, the Source Control Branch is not expected to be activated.

Figure 5-1: Santos incident management team organisational structure

5.2 Incident action plan

The incident action planning process is built on the following phases:

1. Understand the situation.
2. Establish incident priorities, objectives and tasks.
3. Develop a plan (IAP).
4. Prepare and disseminate the plan.
5. Execute, evaluate and revise the plan for the next operational period.

The Santos IMT will use the IAP process to determine and document the appropriate response priorities, objectives, strategies and tasks to guide the incident response which are reviewed and updated as more information becomes available. The IMT will use an IAP for each operational period following the initial first-strike assessments, notifications, and activations undertaken.

When acting as the Support Agency, Santos may be requested by the Control Agency to develop or support the development of an IAP to help guide the incident response.

The Santos IAP process is built on the phases described in **Figure 5-2**.

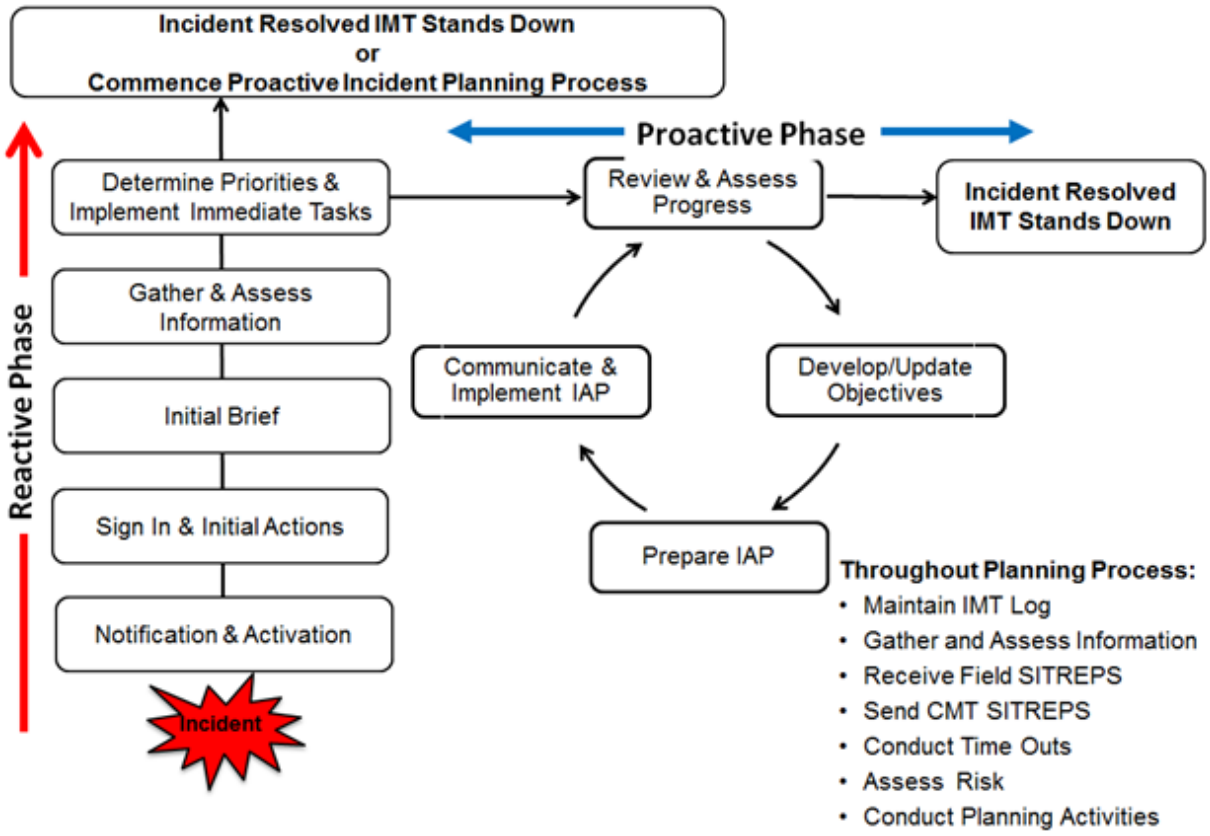


Figure 5-2: Incident Action Plan process

5.2.2 Reactive phase planning

The initial phase of the incident action planning process can be considered a reactive phase (indicatively lasting up to 48 hours) where information on the incident is being progressively established through reports coming in from the field. During this phase there is no formal Incident Action Plan to follow (given the incident has just begun and details are still being established) however the OPEP (this document) has been prepared to contain all first strike oil spill response actions required to be followed during this phase in lieu of a formal IAP.

First strike response actions are summarised in **Section 2** and provide links to relevant oil spill strategy sections within the OPEP which contain a more detailed list of implementation actions and considerations as well as statements of performance (performances standards) that must be followed to ensure the initial response meets regulatory requirements and environmental performance outcomes.

For each credible oil spill scenario covered by this OPEP the first strike response actions, have been informed by a pre-assessment of applicable oil spill response strategies, priority response locations and a strategic NEBA (also referred to as a SIMA) (**Section 7**). During the reactive phase the strategic NEBA is to be reviewed and, using the specific information gathered from the spill, operationalised into an operational NEBA. This assessment helps verify that the response strategies pre-selected for each spill scenario are providing the best environmental outcome for the incident response.

5.2.3 Developing an Incident Action Plan

At the end of the reactive phase where the incident specifics have been determined, a more formal phase of spill response is entered whereby a documented IAP is developed to guide the incident response activities for the next operational period. An operational period is defined as the period scheduled for execution of actions specified in the IAP. The next operational period is nominally a daily period but for long running incidents may be extended further where the pace of the incident response has settled, and the level of new information has decreased.

As IAPs and response strategies are implemented their performance is monitored. The performance measurement results are fed back into the IMT to provide the IMT with greater situational awareness to enable the effective formulation of following IAPs. Those response strategies that are effective are continued or increased, while those strategies that are ineffective are scaled back or ceased.

The performance against the objectives of the IAP must be documented in the Incident Log by the IMT. This provides the IMT with information required to assist in formulating the following IAP and provides evidence of Santos' response to the incident for regulatory and legal investigations that will follow the termination of the incident.

IAP performance is monitored through IMT communication with in-field response personnel both verbally and through logs/reports/photos sent throughout the response (e.g. surveillance personnel, team leaders, laboratory chemists) who report on the effectiveness of the response strategies.

IAP forms and processes are documented in the *Incident Command and Management Manual* (SO-00-ZF-00025) and in the 'Emergency Response' folder sets at *L:\Resource\Emergency*

Response\Incident-Exercise Number-Name. Begin the response by copying and saving *Incident-Exercise Number-Name* folder set with a unique incident name and Id number on the lead folder; this is the Incident Log. Access subfolders to display all forms required to conduct incident action planning. Each functional position within the IMT and CMT has subfolders carrying forms and processes unique to the functional position.

5.3 Environmental performance

Table 5-1 lists the Environmental Performance Standards and Measurement Criteria for incident action planning.

Table 5-1: Environmental performance – incident action planning

Environmental Performance Outcome	Performance Standard	Measurement Criteria
Response Implementation		
Manage incident via a systematic planning process	IMT to complete status boards during the initial phase of the incident, followed by an IAP for each operational period	Records demonstrate status boards completed ICS during the initial phase of the incident, followed by an IAP for each operational period
	IMT to monitor effectiveness of tactics being implemented and use information in the development of IAPs	Records demonstrate IMT used information on effectiveness of tactics in the development of IAPs
Maintain contracts with support agencies to obtain additional support or technical expertise to monitor and/or respond to a spill	Service Level Agreement maintained with OSRL, Master Services Contract maintained with AMOSC and agreement maintained with RPS Group for the duration of the activity	Records demonstrate that Service Level Agreement maintained with OSRL, Master Services Contract maintained with AMOSC and agreement maintained with RPS Group for the duration of the activity

6 External notifications and reporting requirements

For oil spill incidents, the OSC (Company Site Representative) will notify the Perth-based IMT for delegation of further notifications to relevant Regulatory Authorities and for further spill response assistance for Level 2/3 spills.

6.1 Regulatory notification and reporting

The Incident Commander (IC) is to delegate the following regulatory reporting requirements. Typical delegated parties will be the Safety Officer and the Environmental Unit Leader.

Contact details for the Regulatory agencies outlined in **Table 6-1** are provided within the Incident Response Telephone Directory (SO-00-ZF-00025.020).

Table 6-1 outlines the external regulatory reporting requirements specifically for oil spill incidents outlined within this OPEP in Commonwealth, State and Territory jurisdictions, noting that regulatory reporting may apply to smaller Level 1 spills that can be responded to using onsite resources as well as larger Level 2/3 spills. There are also additional requirements for Vessel Masters to report oil spills from their vessels under relevant marine oil pollution legislation (e.g., MARPOL). This includes, where relevant, reporting oil spills to AMSA (Rescue Coordination Centre) and the NT Government.

Notifications to NT Regional Habourmaster/ DEPWS will apply to spills in Territory waters or spills originating in Commonwealth waters and moving to Territory waters.

The Incident Response Telephone Directory (SO-00-ZF-00025.02) contains a more detailed list and contact details for incident response support and is updated every 6 months with up-to-date revisions available within the IMT room and online (intranet procedures and emergency response pages).

6.2 Activation of external oil spill response organisations and support agencies

Table 6-2 outlines notifications that should be made to supporting agencies to assist with spill response activities outlined within this plan. This list contains key oil spill response organisations that have pre-established roles in assisting Santos in an oil spill response. It is not an exhaustive list of all providers that Santos may use for assisting an oil spill response.

The Incident Response Telephone Directory (SO-00-ZF-00025.02) contains a more detailed list and contact details for incident response support and is updated every six months with up-to-date revisions available within the IMT room and online (intranet procedures and emergency response pages).

Table 6-1: External notification and reporting requirements (commonwealth, state/territory and international waters)

Agency or Authority	Type of Notification/ Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
NOPSEMA Reporting Requirements for Commonwealth water spills					
NOPSEMA (Incident Notification Office)	Verbal notification within two hours Written report as soon as practicable, but no later than three days	*Petroleum and Greenhouse Gas Storage Act 2006* Offshore Petroleum Greenhouse Gas Storage (Environment) Regulations 2009 (as amended 2020)	A spill associated with the activity in Commonwealth waters that has the potential to cause moderate to significant environmental damage[4]	Notification by Environment Unit Leader (or delegate)	Incident reporting requirements: https://www.nopsema.gov.au/environmental-management/notification-and-reporting/
National Offshore Petroleum Titles Administrator (NOPTA) (Titles Administrator)	Written report to NOPTA within seven days of the initial report being submitted to NOPSEMA	Guidance Note (N-03000-GN0926) Notification and Reporting of Environmental Incidents	Spill in Commonwealth waters that is reportable to NOPSEMA	Notification by Environment Unit Leader (or delegate)	Provide same written report as provided to NOPSEMA
AMSA Rescue Coordination Centre (RCC)[2]	Verbal notification within two hours of incident Written POLREP form, within 24 hours on request from AMSA	Under the MoU between Santos and AMSA	Santos to notify AMSA of any marine pollution incident[5]	Notification by Environment Unit Leader (or delegate)	Not applicable
Commonwealth Department of Agriculture, Water and the Environment (DAWE) (Director of monitoring and audit section)	Email notification as soon as practicable	*Environment Protection and Biodiversity Conservation Act 1999*	If Matters of National Environmental Significance (MNES) are considered at risk from a spill or response strategy, or where there is death or injury to a protected species	Notification by Environment Unit Leader (or delegate)	Not applicable

[4] *For clarity and consistency across Santos' regulatory reporting requirements, Santos will meet the requirement of reporting a marine oil pollution incident to NOPSEMA by reporting oil spills assessed to have an environmental consequence of moderate or higher in accordance with Santos' environmental impact and risk assessment process outlined in* ***Section 5*** *of the Barossa Gas Export Pipeline Installation EP (BAA-100-0329).*

[5] *Santos reporting requirements only listed. For oil spills from vessels, Vessel Masters also have obligations to report spills from their vessels to AMSA Rescue Coordination Centre (RCC)*

Agency or Authority	Type of Notification/ Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
Parks Australia (24-hour Marine Compliance Duty Officer)	Verbal notification as soon as practicable	*Environment Protection and Biodiversity Conservation Act 1999*	An oil spill which occurs within a marine park or are likely to impact on an Australian Marine Park	Notification by Environment Unit Leader (or delegate)	Not applicable, but the following information should be provided: + 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
Australian Fisheries Management Authority (AFMA)	Verbal phone call notification within 24 hours of incident	For consistency with DPIRD Fisheries notification	Reporting of marine oil pollution[1] Fisheries within the environment that may be affected (EMBA) Consider a courtesy call if not in exposure zone	Notification by Environment Unit Leader (or delegate)	Not applicable

Agency or Authority	Type of Notification/ Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
If spill is heading towards NT waters					
NT Regional Harbourmaster	Verbal notification Follow up with POLREP as soon as practicable after verbal notification	Northern Territory Oil Spill Contingency Plan. As per Territory legislation (i.e. Marine Pollution Act 1999)	All actual or impending spills in NT waters, regardless of source or quantity Notify if spill has the potential to impact wildlife in Territory waters (to activate the Oiled Wildlife Coordinator)	Notification by Environment Unit Leader (or delegate)	POLREPs to be emailed to rhm@nt.gov.au (Regional Harbourmaster) Instructions for submitting POLREPs (including a POLREP Template) are provided on the NT Government webpage https://nt.gov.au/marine/marine-safety/report-marine-pollution
NT Department of Environment, Parks and Water Security (DEPWS) (Pollution Response Hotline; Environmental Operations)	Verbal notification as soon as practicable Written report to be provided as soon as practicable after the incident, unless otherwise specified by the Minister	Northern Territory Oil Spill Contingency Plan. As per State legislation (i.e. Marine Pollution Act 1999)	All actual or impending spills in NT waters	Notification by Environment Unit Leader (or delegate)	Marine Pollution Reports (POLREPs) are to be emailed to pollution@nt.gov.au (Environmental Operations) Instructions for submitting POLREPs (including a POLREP Template) are provided on the NT Government webpage https://nt.gov.au/marine/marine-safety/report-marine-pollution

Agency or Authority	Type of Notification/ Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
NT Department of Primary Industry and Fisheries (DPIF)	Verbal notification, timing not specified	Not applicable	Fisheries within the EMBA Consider a courtesy call if not in exposure zone	Notification by Environment Unit Leader (or delegate)	Not applicable

Table 6-2: List of spill response support notifications

Organisation	Indicative Timeframe	Type of Communication	Resources Available	Activation instructions	Santos person responsible for activating
AMOSC Duty Manager	As soon as possible but within two hours of incident having been identified	Verbal Service Contract	Santos is a Participating Company in AMOSC and can call upon AMOSC personnel and equipment (including oiled wildlife). Under the AMOSPlan, Santos can also call upon mutual aid from other trained industry company personnel and response equipment AMOSC's stockpiles of equipment include dispersant, containment, recovery, cleaning, absorbent, oiled wildlife and communications equipment. Equipment is located in Geelong, Fremantle, Exmouth and Broome	**Step 1.** Obtain approval from Incident Commander to mobilise AMOSC. **Step 2.** Notify AMOSC that a spill has occurred. Put on standby as required – activate if spill response escalates in order to mobilise spill response resources consistent with the AMOSPlan. **Step 3.** E-mail confirmation and a telephone call to AMOSC will be required for mobilisation of response personnel and equipment, and callout authorities will be required to supply their credentials to AMOSC. A signed service contract must also be completed by a call out authority and returned to AMOSC prior to mobilisation.	Environment Unit Leader (or delegate) will notify AMOSC (upon approval from Incident Commander)
Aviation Service Provider - Helicopters	Within two hours of incident having been identified	Verbal	Helicopters/pilots available for aerial surveillance. Contract in place	Phone call.	Logistics Section Chief (or delegate)

Organisation	Indicative Timeframe	Type of Communication	Resources Available	Activation instructions	Santos person responsible for activating
Duty Officers/ Incident Commanders (Woodside, BHP, Chevron)	Within two hours of incident having been identified	Verbal	Mutual aid resources (through AMOSC mutual Aid Arrangement)	Phone call.	Incident Commander (or delegate)
Freight & Logistics Provider	Within two hours of incident having been identified	Verbal	Assistance with mobilising equipment and loading vessels	Phone call.	Logistics Section Chief (or delegate)
Waste Service Provider	As required for offshore and shoreline clean-up activities	Verbal	Santos has contract arrangements in place to take overall responsibility to transport and dispose of waste material generated through clean-up activities	Phone call to the Primary Contact Person. In the event the Primary Contact Person is not available, the Secondary Contact Person will be contacted.	Logistics Section Chief (or delegate)
Monitoring Service Provider (Currently Astron)	Scientific Monitoring Plan initiation criteria are met (**Appendix E: Scientific Monitoring Plans**)	Verbal and written	Astron has been contracted by Santos to provide Standby Services for Scientific Monitoring Plans (SMPs) 1 to 11. This includes provision of personnel and equipment. Astron annually reviews the SMPs for continual improvement	**Step 1.** Obtain approval from Incident Commander to activate Astron for Scientific Monitoring. **Step 2.** Verbally notify Astron followed by the submission of an Activation Form (Environment Unit Leader Folder) via email. **Step 3.** Provide additional details as requested by the Astron Monitoring Coordinator on call-back. **Step 4**. Astron initiates Scientific Monitoring Activation and Response Process.	Environment Unit Leader (or delegate)
Intertek Geotech (WA) Environmental	When characterisation of oil is activated (**Section 8**)	Verbal	Oil analysis including gas chromatography/mass spectrometry fingerprinting	Phone call.	Environment Unit Leader (or delegate)

Organisation	Indicative Timeframe	Type of Communication	Resources Available	Activation instructions	Santos person responsible for activating
Services and Ecotoxicology					
Oil Spill Response Limited, OSRL Duty Manager	Within two hours of incident having been identified	Verbal OSRL Mobilisation Authorisation Form	Santos has a Service Level Agreement with OSRL, which includes the provision of support functions, equipment and personnel to meet a wide range of scenarios At minimum OSRL will provide technical support to the IMT and place resources on standby Further details available on the OSRL webpage.	**Step 1**. Contact OSRL Duty Manager in Singapore and request assistance from OSRL. **Step 2**. Send notification to OSRL as soon as possible after verbal notification. **Step 3**. Upon completion of the OSRL incident notification form, OSRL will plan and place resources on standby.	Designated call-out authorities (including Incident Commanders)
RPS Group (spill modelling)	As soon as possible but within two hours of incident having been identified	Verbal and written	Santos has an agreement in place with RPS Group to allow rapid marine hydrocarbon spill modelling capability to be activated at any time during activities, which will be undertaken for any spill greater than Level 1. AMOSC can also run modelling on behalf of Santos, if required, as part of contracting arrangements with RPS Group	Contact RPS Group Duty Officer.	Environment Unit Leader (or delegate)

7 Response strategy selection

7.1 Spill Scenarios

There are two worst-case credible spill scenarios associated with marine vessel operations during pipeline installation activities, which could occur at any location along the GEP route. These scenarios are outlined in **Table 7-1.** Additional detail on hydrocarbon characteristics and weathering data are included in **Appendix A**.

Table 7-1: Barossa GEP Installation Spill Scenario Summary (RPS, 2019; RPS, 2021)

Worst Case Credible Spill Scenario	Hydrocarbon Type	Maximum Credible Volume Released (m3)	EMBA for Surface Hydrocarbons	Estimated Minimum Time and Volumes for Shoreline Contact
Scenario 1: Pipelay vessel collision – fuel tank rupture	MDO (Group II)	700 m^3 surface release over a 6-hour period	Location 1 (closest to Bathurst Island): Moderate exposure threshold (10 - 25 g/m^2) at the sea surface up to approximately 41.3 km from release location (Winter)	Location 1 (closest to Bathurst Island): Estimated minimum time for contact with Bathurst Island is 6 hours (20% probability of contact). Maximum volume ashore: 224.5 m^3
			Location 2 (closest to Melville Island): Moderate exposure threshold at the sea surface up to approximately 77.7 km from release location (Transitional).	Location 2 (closest to Melville Island): Estimated minimum time for contact with Melville Island is 3.2 days (1% probability of contact). Maximum volume ashore: 20 m^3
			Location 3 (GEP KP0 - offshore development area): Moderate exposure threshold at the sea surface up to approximately 92.2 km from release location (Transitional).	Location 3 (KP0 offshore development area): No shoreline contact predicted.
			Location 4: Additional GEP Segment KP23 - location closest to NT mainland): Moderate exposure threshold at the sea surface up to approximately 39.8 km from release location (Summer).	Location 4 (Additional GEP Segment KP23 - location closest to NT mainland): Estimated minimum time to contact above the moderate exposure threshold is 15.5 days with Bathurst Island (5% probability of contact). Maximum volume ashore: 16.6 m^3 (Bathurst Island – Winter)
Scenario 2: Bunkering incident. Note: no bunkering within 20 km of Tiwi Islands shorelines	MDO (Group II)	10 m^3 instantaneous surface release	Above moderate exposure threshold (10 g/m^2) up to approximately 9.5 km from release location (Summer)	No shoreline contact predicted.

7.2 Priority Protection Areas

Results from 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. Sensitive receptors within the EMBA with shortest potential timeframes to contact above the following moderate impact thresholds were identified:

- Floating oil: 10 g/m^2;
- Shoreline accumulation: 100 g/m^2.

More information on the development of the moderate impact thresholds is provided in Section 5.3.7 of the EP.

Table 7-2 outlines the list of priority protection areas in the event of a spill associated with the pipeline installation activities. Depending on the spill scenario (i.e. volume and location), the priority protection areas could be impacted by surface hydrocarbons at or above moderate threshold concentrations.

Implementation of operational and scientific monitoring may focus on Priority Protection Areas relative to other areas due to their high environmental value (**Appendix F: Scientific Monitoring Capability**).

Table 7-2: Priority protection areas in the EMBA

Priority protection area	Description
Vernon Islands	Located in the Clarence Strait in the Northern Territory, between the Australian mainland and Melville Island. Contains a range of shoreline types and species that are vulnerable to oil pollution, including: • Mangroves; • Coral reefs and extensive coralline algal terraces; • Sandy beaches; • Mudflats; • Dugongs; and • Turtles. Contains sites of socioeconomic and cultural importance, including: • Culturally significant heritage sites for Tiwi, Larrakia and Wulna people; • Important diving sites ('Blue Holes'); and • Shipwrecks.

Priority protection area	Description
Cox-Finniss	Located south west of Darwin on the Northern Territory mainland. Contains a range of shoreline types and species, including; • Mangroves • Sandy beaches; • Delta river mouths; • Tidal flats; and • Turtle nesting beaches.
Tiwi Island shorelines (Bathurst and Melville Islands)	Contains a range of shoreline types and species that are vulnerable to oil pollution, including: • Mangroves; • Sandy beaches; • Exposed rocky shores; • Wavecut platforms; • Tidal flats; • Turtle nesting beaches (flatback and olive ridley turtles); and • Nesting beaches for crested terns Contains cultural heritage sites, including: • Culturally significant heritage sites for Tiwi Islanders.
Oceanic Shoals Marine Park	The Oceanic Shoals Marine Park is protected under the EPBC Act. The Oceanic Shoals Marine Park is significant because it contains habitats, species and ecological communities associated with the Northwest Shelf Transition. It contains four key ecological features: carbonate bank and terrace systems of the Van Diemen Rise; carbonate bank and terrace systems of the Sahul Shelf; pinnacles of the Bonaparte Basin; and shelf break and slope of the Arafura Shelf (all valued as unique seafloor features with ecological properties of regional significance).

7.3 Net Environmental Benefit Analysis

A pre-spill net environmental benefit analysis (NEBA) was completed to identify the potential net environmental benefit to key sensitive receptors associated with the implementation of potential spill response options (Appendix C of the Barossa GEP Installation EP (BAA-100 0329). **Table 7-3** presents a summary of the outcomes of the NEBA process and outlines response options which may result in a net environmental benefit based on the credible hydrocarbon spill scenarios defined in **Table 7-1**.

The pre-spill NEBA identified primary response options recommended to be used during the response. Primary response options are the principal methods that have been assessed to have a net environmental benefit of managing the spill. Additional secondary (contingency) response options are those that may either be used to supplement the primary response option, or which may be appropriate under specific circumstances.

Response option selection requires an evaluation of trade-offs associated with each response option (e.g. health and safety, feasibility, flexibility etc.), in addition to geographic/environmental conditions and the fate and weathering characteristics of the spill. As a result of this evaluation, mechanical physical dispersion, chemical dispersion and containment and recovery were not selected as suitable response options. The pre-spill NEBA identified shoreline protection and deflection, and shoreline clean-up, as secondary responses that could be implemented for priority protection areas, if it was safe and practical to do so (Refer to **Table 7-3**).

During a response, the EUL in the IMT is responsible for ensuring a spill response (operational) NEBA is conducted, to determine if output from the pre-spill NEBA is still appropriate. The spill response (operational) NEBA should incorporate post-spill modelling data, surveillance and operational monitoring data and should be incorporated into the IAP. The spill response (operational) NEBA will also be used to inform decision making around the initiation and termination of response options. Environmental Performance Outcomes, Standards and Measurement Criteria are listed in **Table 7-4**.

Table 7-3: NEBA summary of response options

Response Option	Scenario 1 – Pipelay Vessel Collision – Fuel Tank Rupture (700 m^3 MDO)	Scenario 2 – Bunkering Incident (10 m^3 MDO)	NEBA Summary
Monitor and evaluate	Primary response option	Primary response option	The requirement for situational awareness is critical to implementing an effective spill response and to understand the impacts that may result from a spill. Therefore, the benefits of undertaking this response are considered to significantly outweigh the potential environmental risks/impacts for both worst-case credible spill scenarios.
Oiled wildlife response	Primary response option	N/A	Wildlife surveillance/reconnaissance is a critical component of an oiled wildlife response and should be undertaken in consultation with the planning for monitor and evaluate activities. Wildlife surveillance provides the situational awareness to ascertain the level of impact to wildlife in order to determine what other oiled wildlife response strategies may be required. The benefits of undertaking this response are considered to significantly outweigh the potential environmental risk/impacts for scenario 1.
(Mechanical) physical dispersion	N/A	N/A	Mechanical dispersion may assist natural dispersion (e.g. prop wash or use of fire monitor sprays from vessels) to remove MDO from the sea surface. However, MDO is expected to weather rapidly at the sea surface and the benefits of undertaking this response are not considered to significantly outweigh the potential risk to human health. The volatile components in MDO have the potential to cause human health issues such as difficulty breathing, and also present a fire / explosion risk. As such mechanical dispersion is not considered a suitable response for these scenarios
Chemical dispersion – surface application	N/A	N/A	MDO is not a persistent hydrocarbon and has high natural spreading, dispersion and evaporation rates in the marine environment. Dispersant application has a low probability of being effective in increasing the dispersal rate of MDO and

Response Option	Scenario 1 – Pipelay Vessel Collision – Fuel Tank Rupture (700 m^3 MDO)	Scenario 2 – Bunkering Incident (10 m^3 MDO)	NEBA Summary
			would introduce more chemicals to the marine environment. The benefits of applying chemical dispersant do not significantly outweigh the potential environmental risks/ impacts and therefore this response option is not considered suitable.
Containment and recovery	N/A	N/A	Containment and recovery is unlikely to be effective in either scenario. This is due to the hydrocarbon type and the scenarios being in open ocean where MDO forms a thin film and weathers rapidly making recovery via skimmers difficult and ineffective.
Protection and deflection	Secondary	N/A	Considered if operational monitoring shows or predicts contact with sensitive shorelines. <u>Scenario 1 – 700 m^3 MDO vessel spill</u> Shoreline protection and deflection activities can result in physical disturbance to intertidal and shoreline habitats and the remote environments of Northern mainland Australia and the Tiwi Islands also present a range of safety challenges, such as • Remote working location; • Exposure to elements – tropical environment; • Dangerous wildlife – feral pigs, saltwater crocodiles and Irukandji jellyfish; and • Lack of transport infrastructure – very difficult to access sites by land. Given the relatively small volumes predicted to come ashore, and the high rates of natural biodegradation of marine diesel, it would be better to focus on priority areas for protection. This strategy is considered to be a secondary response strategy where it is safe and practical to implement and where priority protection areas are at risk of impact from marine diesel.

Response Option	Scenario 1 – Pipelay Vessel Collision – Fuel Tank Rupture (700 m^3 MDO)	Scenario 2 – Bunkering Incident (10 m^3 MDO)	NEBA Summary
			Scenario 2 – 10 m^3 MDO vessel spill Modelling indicates no shoreline contact above moderate shoreline accumulation thresholds (>100 g/m^2).
Shoreline clean-up	Secondary	N/A	Considered if operational monitoring shows or predicts contact with sensitive shorelines. Scenario 1 – 700 m^3 MDO vessel spill Shoreline clean-up activities can result in physical disturbance to shoreline habitats and the remote environments of Northern mainland Australia and the Tiwi Islands also present a range of safety challenges, such as • Remote working location; • Exposure to elements – tropical environment; • Dangerous wildlife – feral pigs, saltwater crocodiles and Irukandji jellyfish; and • Lack of transport infrastructure – very difficult to access sites by land. Given the high rates of natural biodegradation of marine diesel, it would be better to focus on priority areas for protection. This strategy is considered to be a secondary response strategy where it is safe and practical to implement and where priority protection areas are at risk of impact from marine diesel. Scenario 2 – 10 m^3 MDO vessel spill Modelling indicates no shoreline contact above moderate shoreline accumulation thresholds (>100 g/m^2).
Scientific monitoring	Primary	N/A	Monitoring activities include: + water and sediment quality

Response Option	Scenario 1 – Pipelay Vessel Collision – Fuel Tank Rupture (700 m^3 MDO)	Scenario 2 – Bunkering Incident (10 m^3 MDO)	NEBA Summary
			+ biota of shorelines (sandy beaches, rocky shores and intertidal mudflats) + mangrove monitoring + benthic habitat monitoring (seagrass, algae, corals, non-coral benthic filter feeders) + seabirds and shorebirds + marine megafauna (incl. whale sharks and mammals) + marine reptiles (incl. turtles) + seafood quality + fish, fisheries and aquaculture The type and extent of scientific monitoring will depend upon the nature and scale of oil contact to sensitive receptor locations as determined through operational monitoring. Pre-defined initiation criteria exist for scientific monitoring plans associated with marine and coastal sensitivities.

7.4 Environmental performance

Table 7-4 lists the Environmental Performance Standards and Measurement Criteria for response strategy selection.

Table 7-4: Environmental performance – response strategy selection

Environmental Performance Outcome	Performance Standard	Measurement Criteria
Response Implementation		
Implement emergency response options that result in net environmental benefit.	IMT to undertake spill response (operational) NEBA to determine initiation and termination of response options.	Records demonstrate spill response (operational) NEBA undertaken during OPEP implementation.
	IMT to undertake an operational NEBA during the preparation and review of IAPs.	Records demonstrate IMT completed an operational NEBA during the preparation and review of IAPs.

8 Source control

The initial and highest priority response to an oil spill incident following the health and safety of on-site personnel is to prevent or limit further loss of hydrocarbons to the environment.

For vessels with a SOPEP, the SOPEP will provide the relevant initial actions to control the source of the spill.

The section below provides an outline of source control activities noting that the Vessel SOPEP, will provide a higher level of detail for specific incidents.

8.1 Vessel collision – fuel tank rupture

Table 8-1 provides the environmental performance outcome, initiation criteria and termination criteria for source control response to a fuel tank rupture. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 8-1: Vessel collision – source control environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine environment	
Initiation criteria	Notification of a spill	
Applicable hydrocarbons	**MDO**	**Crude**
	✓	✗
Termination criteria	Release of oil to the marine environment has ceased and the workplace environment is deemed environmentally safe and free of hydrocarbons	

8.1.1 Implementation guidance

Implementation guidance is summarised in **Table 8-2.** In the event MDO is released from a vessel due to a tank rupture, the relevant vessel-specific procedures will be applied. For support vessel collisions, the vessel's SOPEP will be followed to control the source, reduce the loss of hydrocarbons and prevent escalation of the incident. **Table 8-3** lists the environmental performance standards and measurement criteria for this strategy.

Table 8-2: Implementation guidance – fuel tank rupture

Responsibility	Task	Consideration	Complete
Vessel Master	The vessel's SOPEP, as applicable under MARPOL, or procedure for responding to a ruptured tank will be followed, as applicable.	Notwithstanding vessel-specific procedures for source control, the following activities would be evaluated immediately for implementation, providing it is safe to do so: + Reduce the head of fuel by dropping or pumping the tank contents into an empty or slack tank. + Consider pumping water into the leaking tank to create a water cushion to prevent further fuel inventory loss. + If the affected tank is not easily identified, reduce the level of the fuel in the tanks in the vicinity of the suspected area if stability of the vessel will not be compromised. + Evaluate the transfer of fuel to other vessels. + Trim or lighten the vessel to avoid further damage to intact tanks. + Attempt repair and plugging of hole or rupture.	❑

8.2 Environmental performance

Table 8-3 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 8-3: Environmental performance – source control

Environmental Performance Outcome	Performance Standard	Measurement Criteria
Response preparedness		
Implementation of source control methods to stop the release of hydrocarbons into the marine environment.	Support vessels have a SOPEP or shipboard marine pollution emergency plan (SMPEP) that outlines steps taken to combat spills	Audit records Inspection records
	Spill exercises on support vessels are conducted as per the vessels SOPEP or SMPEP	Spill exercise close out reports
Response Implementation		
Implementation of source control methods to stop the release of hydrocarbons into the marine environment.	Actions to control spill associated with a vessel incident followed in accordance with SOPEP	Vessel logs

9 Monitor and evaluate

Monitor and evaluate involves the collection and evaluation of information to provide and maintain situational awareness in the event of a spill. This response option includes fate and weathering modelling, trajectory modelling, satellite surveillance and spill tracking via use of buoys and field observations.

Monitor and evaluate activities should be conducted throughout the spill response, as it provides the IMT with ongoing information on sensitive receptors at risk of impact from the spill and the effectiveness of spill response operations. This information should be used by the IMT when updating response (operational) NEBAs and in the development of IAPs.

Monitor and evaluate can include one or more of the following tactics:

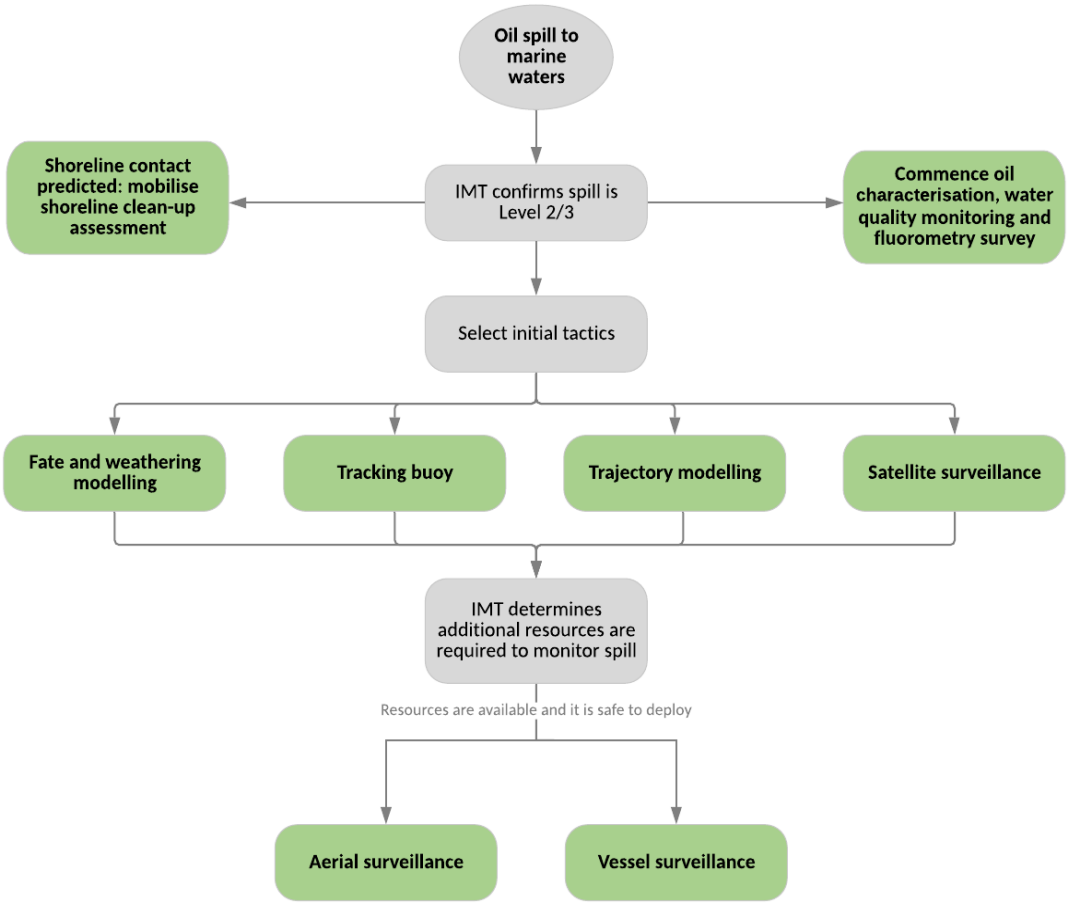
+ Deployment of tracking buoy(s) – requires a buoy to be deployed to the water at the leading edge of the spill to track the movement of the spill
+ Fate and weathering modelling – uses computer modelling to estimate the weathering of an oil spill
+ Oil spill trajectory modelling – uses computer modelling (e.g. SIMAP) to estimate the movement, fate and weathering of spills
+ Visual observation (via aerial and/or vessel surveillance) – requires trained observers to identify and characterise spills. Survey platforms typically include aircraft and/or vessels. Is also used to ground truth oil spill trajectory modelling and monitor the effectiveness of response options
+ Satellite surveillance and data capture – uses satellite technology to identify and track oil spills
+ Initial oil characterisation - sampling and analysis of the released hydrocarbon to provide the most accurate information on the hydrocarbon properties at the time of release
+ Operational water quality monitoring - sampling of oil and oil in water undertaken at discrete locations, providing visual observations, real time fluorometry/ dissolved oxygen readings and providing oil and water samples for laboratory analysis. The intent of this sampling is to confirm the distribution and concentration of oil, validating spill trajectory modelling and providing and informing the selection and implementation of other response strategies, including scientific monitoring. This monitoring is complimentary to scientific water quality monitoring (SMP1) delivered through the Oil Spill SMP in terms of methodology and required skillset and can be provided through Santos' Scientific Monitoring Provider (**Section 14**).
+ Continuous fluorometry survey - may be run across the expected slick/plume extent, as well as vertically through the water column. This allows a far greater area of coverage than discrete sampling, aiding in the mapping of entrained and dissolved oil movement
+ Shoreline clean-up assessment - requires trained personnel to establish shoreline segments, establish protection priorities and identify site-specific protection tactics.

The process for selecting which tactic to apply is shown in **Figure 9-1** (excluding initial oil characterisation, water quality monitoring and fluorometry survey as these would be initiated when

a Level 2/3 spill occurs). **Table 9-1** provides guidance on tasks and responsibilities that should be considered when implementing this response option.

Note: these are provided as a guide only. The On-Scene Commander and Incident Commander are ultimately responsible for the implementation of the response and may therefore determine that some tasks be varied, should not be undertaken or should be reassigned.

Information on resources, implementation times and termination criteria for this option are shown in **Table 9-2.** Environmental Performance Outcomes, Standards and Measurement Criteria are listed in **Table 9-3.**



Limitation/s: *Surveillance activities should not be deployed in areas where the hydrocarbon release potentially poses a safety hazard to response personnel (e.g. VOCs associated with diesel).*

Termination criteria: *The response will be terminated when either a silvery-grey sheen (as defined by Bonn Agreement Oil Appearance Code 1- Sheen) is no longer evident to observers from the release area or when the spill response is terminated. This decision will be made by the control agency.*

Figure 9-1: Decision guide for monitor and evaluate

Table 9-1: Monitor and Evaluate Implementation Guide

Responsibility	Task	Consideration/s	Complete
Fate and Weathering Modelling (if selected)			
IMT	Conduct hydrocarbon distribution, fate and weathering assessment using information available on oil type in **Appendix A: Hydrocarbon Characteristics and Behaviour** of this OPEP	-	❑
Tracking Buoy (if selected)			
IRT	Use available support vessel to deploy tracking buoy as close as possible to spill location (vessel safety is priority)	Tracking buoy available on the support vessel	❑
IMT	Inform IMT that tracking buoys have been deployed and provide deployment details. Monitor movement of tracking buoys.	Refer login details of tracking buoy monitoring website on Santos ER intranet site.	❑
IMT	Use tracking buoy data to maintain Common Operating Picture.	Data tracked online.	❑
IMT	Relay information to spill fate modelling supplier for calibration of trajectory modelling.	-	❑
Trajectory Modelling (if selected)			
IMT	Initiate oil spill trajectory modelling (OSTM) by submission of an oil spill trajectory modelling request form (Santos Procedure Index). Request for three-day forecast trajectory modelling.	Modelling to be undertaken within 3 hours of the request sent to RPS, then every operational day during the spill response or, if additional response options are employed, to identify possible changes to trajectory etc.	❑
IMT	Determine requirement for gas/VOC modelling and request initiation.	Hydrocarbon releases have human health and safety considerations for responders (volatile gases and organic compounds). This to be considered for any tactics that monitor/recover oil – especially at close proximity to release site.	❑
IMT	Operational surveillance data (aerial, vessel, tracker buoys) to be provided to modelling provider to verify	-	❑

Responsibility	Task	Consideration/s	Complete
	and adjust fate predictions of the spill and improve predictive accuracy.		
IMT	Login to the RPS Group data sharing website and maintain connection. Download modelling results.	Data should be stored digitally and backed up on to independent digital storage media. All datasets should be accompanied by a metadata summary and documented quality assurance and control procedures.	❑
IMT	Place RPS Group modelling data into GIS/Common Operating Picture.	RPS Group is to provide at least daily updates to the IMT of trajectory model outputs to inform response planning. More frequent updates can be provided if weather conditions are highly variable or change suddenly.	❑
IMT	Identify location and sensitivities at risk based on the trajectory modelling and inform IMT. Conduct operational NEBA on proposed response strategies.	-	❑
IMT	Request spill trajectory modelling be provided daily throughout the duration of the response and integrate data into Common Operating Picture.	-	❑
IMT	Use results from other monitor and evaluate activities, and/or data derived from hydrocarbon assays of the source hydrocarbon or from other reservoirs in the region (that may be available) as input data (if or when available) to improve model accuracy.	-	❑
Satellite Surveillance (if selected)			
IMT	Assess requirement for satellite imagery.	-	❑
IMT	Notify AMOSC and OSRL Duty Officer to request initiation of satellite services	Formal written activation of resources from AMOSC by designated call-out authorities (Santos Duty Managers/Incident Commanders) is required.	❑
IMT	Assess suitability and order imagery.	-	❑
IMT	Integrate satellite imagery into Common Operating Picture and provide to trajectory modelling provider for model validation.	-	❑
IMT	Review surveillance information to validate spill fate and trajectory.	-	❑

Responsibility	Task	Consideration/s	Complete
IMT	Use monitor and evaluate data to periodically reassess the spill and modify the response (through the IAP), as required.	Use surveillance data when updating the Common Operating Picture.	❑
Aerial Surveillance (if selected)			
IMT	Contact contracted aviation provider – provide details of incident and request mobilisation to spill site for initial surveillance.	If aviation asset available at spill location, utilise where possible to gather as much information about the spill. If aviation asset not available at spill location IMT is to seek available resources through existing contractual arrangements. It is possible that the initial surveillance flight will not include a trained aerial surveillance observer. Initial flights can be conducted using a standard crew and initial surveillance should not be delayed waiting for trained personnel. Ensure all safety requirements are met before deployment. There should be an attempt to obtain the following data during initial surveillance: + name of observer, date, time, aircraft type, speed and altitude of aircraft + location of slick or plume (global positioning system [GPS] positions, if possible) + spill source + size of the spill, including approximate length and width of the slick or plume + visual appearance of the slick (e.g. colour) + edge description (clear or blurred) + general description (windrows, patches etc.) + wildlife, habitat or other sensitive receptors observed + basic metocean conditions (e.g. sea state, wind, current) + photographic/video images.	❑

Responsibility	Task	Consideration/s	Complete
IMT	Source available Santos Aerial Observers, arrange accommodation/logistics and deploy to Forward Operations/Air base location.	Santos Aerial Observer list available from First-strike Resources on Santos Offshore ER Intranet page.	❑
IMT	Develop flight plan (frequency and flight path) to meet IMT expectations and considering other aviation ops. Expected that two overpasses per day of the spill area are completed.	Flight plan to confirm with OSC that aircraft are permitted in the vicinity of the spill. Flights are only to occur during daylight and in weather conditions that do not pose significant safety risks.	❑
IMT	Pre-flight briefing.	-	❑
IRT	Aerial Observers to commence surveillance	Consider procedure for interacting with marine fauna.	❑
IRT	Determine spill extent by completing Aerial Surveillance Log **(Appendix B: Aerial Surveillance Observer Log)** . Take still and/or video images of the slick.	Thickness estimates are to be based on the Bonn Agreement Oil Appearance Code.	❑
IRT	Record presence and type of fauna by completing the Aerial Surveillance Marine Fauna Sighting Record Sheet (**Appendix H: Aerial surveillance marine fauna sighting record**).	-	❑
IRT	Relay all surveillance records: logs, forms, photographic images, video footage to the IMT	Where possible, a verbal report via radio/telephone en-route providing relevant information should be considered if the aircraft has long transits from the spill location to base	❑
IMT	Update flight schedule for ongoing aerial surveillance as part of broader Aviation Subplan of IAP	Frequency of flights should consider information needs of IMT to help maintain the Common Operating Picture and determine ongoing response operations	❑
IMT	Mobilise additional aircraft and trained observers to the spill location to undertake ongoing surveillance activities	-	❑
IMT	Update Common Operating Picture with surveillance information and provide updates to spill trajectory modelling provider	-	❑

Responsibility	Task	Consideration/s	Complete
Vessel Surveillance (if selected)			
IRT	Vessel Master of support vessel to provide IMT initial report on estimated spill volumes and movement based on visual observation (if possible)	Preliminary observations are intended to provide initial projections of spill trajectory and scale prior to more detailed modelling and surveillance. These observations should be immediately verified by more detailed surveillance. The following data should be obtained during surveillance activities: + name of observer, date, time, vessel type, speed of vessel + location of slick or plume (GPS positions) + spill source and access + visual appearance of the slick (e.g. colour, emulsification) + quantity of hydrocarbons on surface and how this was calculated + wildlife, habitat or other sensitive receptors observed + information on any response activities observed + basic metocean conditions (e.g. sea state, wind, current) + photographic/video images Initial reports to the IMT may be verbal (followed by written transmission) if the vessel is out of range or has no facilities for transmitting forms.	❑
IMT	Source additional contracted vessels if required for assistance.	-	❑
IRT	Continue to relay surveillance information (spill location, weather conditions, marine fauna sightings and visual appearance of the slick) to the IMT within 60 minutes of completing vessel surveillance.	-	❑
IMT	Review surveillance information to validate spill fate and trajectory.	-	❑
IMT	Use available data to conduct operational NEBA and confirm that pre-identified response options are appropriate.	-	❑

Responsibility	Task	Consideration/s	Complete
IMT	Use monitor and evaluate data to periodically reassess the spill and modify the response (through the IAP), as required	Surveillance data is useful in updating the Common Operating Picture	❑
Initial Oil Characterisation			
IMT	Source available vessels (on hire or VOO) for oil sampling.	Can be multi-tasked – e.g., for vessel surveillance or tracking buoy deployment.	❑
IMT	Source sampling equipment. Confirm sampling methodology. Confirm laboratory for sample analysis. Develop health and safety requirements/controls.	Appendix A and D of CSIRO oil spill monitoring handbook (CSIRO, 2016) provides a suitable procedure.	❑
IRT	Vessel directed to sampling location.	Sampling of oil at thickest part of slick – typically leading edge.	❑
IRT/IMT	Vessel crew to undertake sampling and delivery of samples to Darwin for dispatch to laboratory. Environment Unit Leader to confirm analysis of oil with lab.	Logistics personnel to assist with logistics of sending oil samples to laboratory for analysis.	❑
IRT	Continue sample collection post release where oil is available.	Initial monitoring by crew of available vessels – Once mobilised to site Santos scientific monitoring provider to continue sampling of oil in conjunction with operational water quality monitoring.	❑
Operational water quality sampling and analysis			
IMT	Activate Santos Monitoring Service Provider for Operational Water Quality Monitoring.	-	❑
IMT	Obtain spill trajectory modelling and provide to Monitoring Service Provider.	-	❑
IMT	Develop Monitoring Action Plan (Including Sampling and Analysis Plan) for operational water quality monitoring.	Sites to be selected using oil spill trajectory modelling and distribution of oil from surveillance tactics. Refer **Appendix C: Operational Water Quality Sampling and Analysis Plan considerations** for considerations for Sampling and Analysis Plan.	❑

Responsibility	Task	Consideration/s	Complete
	Plan to also consider oil characterisation sampling - Monitoring Service Provider to take over this sampling once mobilised.		
IMT	Develop health and safety plan including potential exposure to volatile gases/VOCs.	Refer Santos Oil Spill Response HSE Management Manual (SO-91-RF-10016).	❑
IMT	Monitoring Service Provider to assemble team/s and water quality monitoring equipment.	-	❑
IMT	Organise vessels, accommodation and transport requirements to mobilise monitoring team/s to site.	Monitoring Service provider to outline requirements in resource request form.	❑
IRT	Sampling and analysis undertaken. Daily communication and confirmation of sampling plan with OSC and IMT. Daily activity/data reports provided to IMT. Oil/water samples dispatched to nominated laboratories for analysis.	-	❑
IRT	Monitoring results to be conveyed to IMT through Common Operating Picture and provided to spill trajectory modeller to validate predictions.	-	❑
Continuous fluorometry surveys			
IMT	Activate Monitoring Service Provider and engage to provide towed fluorometry services (personnel and equipment) as part of Operational Water Sampling and Analysis	-	❑
IMT	Activate OSRL monitoring and determine availability of subsea gliders and towed fluorometry equipment.	OSRL can provide specialist technical advice on operation of towed fluorometers. Consider: Engaging OSRL for review and input into monitoring action plan for towed fluorometry.	❑
IMT	Determine suitability of subsea gliders for monitoring.	Sub surface gliders containing fluorometers built into the body of the glider may be used for this monitoring and would be preferential for monitoring a continuous subsea release (well leak scenario).	❑

Responsibility	Task	Consideration/s	Complete
IMT	If gliders and pilot/s available and suitable for incident, engage provider to develop Monitoring Action Plan.	Arrange joint meeting with spill modelling provider and OSRL/glider operator to develop monitoring design and ongoing data transfer protocols to meet objective of model validation.	❑
IMT	Source vessels and other logistics to support monitoring.	-	❑
IRT	Conduct monitoring as per monitoring action plan with deployment area guided by other operational monitoring studies.	The scope of monitoring will be dictated by the response strategies being employed.	❑
IRT	Provide daily data reports and spatial outputs IMT.	-	❑
IMT	Monitoring results to be incorporated into Common Operating Picture.	-	❑
Shoreline clean-up assessment			
IMT	Ensure initial notifications to NT DEPWS have been made.	Refer to **Section 6** for reporting requirements.	❑
IMT	Collect and provide spill trajectory modelling, other operational monitoring data and existing sensitivity information/mapping to Control Agency for assistance in identification of priority protection areas and Operational NEBA.	Existing shoreline sensitivity mapping information for potential oil contacted locations is available on the Santos ER intranet site.	❑
IMT	Mobilise the AMOSC core group responders as required for industry support to Control Agency.	Refer to **Table 9-2** Unmanned Aerial Vehicles (UAVs) may be necessary for some sensitive environments and where personnel safety is at risk (dangerous fauna in remote locations).	❑
IRT	Conduct assessment of shoreline character, habitats and fauna.	Refer to **Appendix G: Shoreline Clean-up Assessment Implementation Considerations** Refer to the **WA DoT Shoreline Assessment Form** for guidance	❑
IRT	Conduct assessment of shoreline oiling (if present).	Refer to **Appendix G: Shoreline Clean-up Assessment Implementation Considerations**	❑

Responsibility	Task	Consideration/s	Complete
IRT	Develop recommendations for clean-up activities and clean-up end points and communicate recommendations and SCAT forms back to IMT at the end of each operating period.	Refer to **Appendix G: Shoreline Clean-up Assessment Implementation Considerations**	❑
General			
IRT	Record relevant data e.g. equipment used, time deployed, weather conditions, Job Safety Analysis (JSA) for all tasks	-	❑
IRT	Hold pre-mobilisation survey team meeting, including communication of field survey schedules (provision for field personnel rotation)	-	❑
IMT	Obtain weather and tidal information from the Bureau of Metrology and on-scene observers	-	❑
IMT	Assemble competent field team(s) (if required), including required personal protective equipment (PPE). Arrange any required inductions and/or permits	-	❑
IMT	Arrange transportation (e.g. flights, vehicles), accommodation and food/equipment for field teams	-	❑
IMT	Activate Geographic Information Systems (GIS) personnel to develop maps that can overlay surveillance data to enhance situational awareness of the spill	-	❑
IMT	Review fate and weathering, tracking buoy, oil spill modelling data and satellite data with field surveillance data (aerial and vessel surveillance) to validate spill fate and trajectory	Use available data to conduct response (operational) NEBA and confirm that pre-identified response options are appropriate	❑
IMT	Use monitor and evaluate data to periodically reassess the spill and modify the response (through the IAP), as required	-	❑

Responsibility	Task	Consideration/s	Complete
IMT	Review OSMP to determine which operational and/or scientific monitoring initiation criteria have been reached, and activate OSMP personnel to implement relevant monitoring programs	Situational awareness data will be used by the IMT to help determine response effectiveness; operational monitoring teams to direct monitoring; and by the scientific monitoring teams to prioritise the sampling areas for impact assessment	❑

Table 9-2: Monitor and evaluate resource capability

Tactic	Resources Available	Service Providers	Mobilisation Timeframe	Termination Criteria
Fate and weathering modelling	Programs installed on IMT computers	N/A	Within 2 hours of IMT activation	The response will be terminated when either a silvery-grey sheen (as defined by Bonn Agreement Oil Appearance Code 1- Sheen) is no longer evident to observers from the release area or when the spill response is terminated. This decision will be made by the control agency
Tracking buoy	Tracking buoys available onboard support vessel	AMOSC (additional buoys)	Immediately available in field onboard vessels. 48-72 hours for additional tracking buoys (if required) from AMOSC (Fremantle or Geelong)	
Trajectory modelling	Spill response modelling software provided by RPS Modelling staff provided by RPS	RPS under direct contract to Santos, also available through AMOSC	Within 2-4 hours of request being sent to RPS	
Satellite surveillance	Satellite data from supplier sourced through AMOSC subscription (OSRL subscription available as secondary option)	KSAT – activated through AMOSC MDA – activated through OSRL	AMOSC: one hour if satellite images available OSRL: Within 4 hours of satellite image acquisition (i.e. latest pass with no cloud)	

Tactic	Resources Available	Service Providers	Mobilisation Timeframe	Termination Criteria
Aerial surveillance	Santos contracted provider/s (primary provider currently Babcock) Santos aerial observers AMOSC Industry Mutual aid	Aircraft sourced through existing contracts with aviation service providers. Aerial surveillance observers using the following resources: 7 × Santos staff 9 × AMOSC staff AMOSC Core Group personnel available Additional trained industry mutual aid personnel	4 hours for aircraft to be ready for mobilisation 24-48 hours for national pool trained/experienced aerial observers	
Vessel surveillance	Support vessel Availability dependent upon Santos and Vessel Contractor activities	Santos Contracted Vessel Providers Vessels of opportunity identified through AIS Vessel Tracking.	Within 12 hours for vessels situated close to the spill source (if available)	
Initial oil characterisation	+ Oil sampling kits + Bulk oil sampling bottles + Santos Contracted Vessel Providers + National Association of Testing Authorities (NATA) accredited laboratory/ personnel for analysis	+ Santos + Intertek/Santos + Vessels of opportunity identified through AIS Vessel Tracking. + Intertek	+ Within 48 hours + Within 48 hours + Expected within 24 hours + 24-28 hours	+ Oil sample and analysis to terminate once enough data has been collected to profile the oil characteristics throughout weathering and to provide oil for toxicity testing, OR + As directed by the relevant Control Agency

Tactic	Resources Available	Service Providers	Mobilisation Timeframe	Termination Criteria
Operational water quality sampling and analysis	+ Water quality monitoring personnel and equipment + Contracted water quality monitoring vessels	+ Monitoring Service Provider (currently Astron/BMT) + Suitable vessels identified through AIS Vessel Tracking	+ 72 hours from approval of work + <72 hours	+ Operational water sampling and analysis will continue for 24 hours following control of the source provided oil is no longer detectable, OR + As directed by the relevant Control Agency, OR + Vessel surveillance will terminate if there are unacceptable safety risks associated with volatile hydrocarbons at the sea surface.
Continuous fluorometry surveys	+ Towed fluorometers + Glider mounted fluorometers + Water quality monitoring personnel to operate towed fluorometers + Glider (remote) pilot/s and deployment crew	+ OSRL + Monitoring Service Provider (currently Astron/BMT) + Monitoring Service Provider (currently Astron/BMT) + Third-party provider via OSRL	+ <72 hours + <120 hours + <120 hours + <72 hours	+ Continuous fluorometry surveys will continue for 24 hours following control of the source provided oil is no longer detectable, OR + As directed by the relevant Control Agency.
Shoreline clean-up assessment	Santos and industry AMOSC core group staff and responders (team leaders)	Santos Core Group (x 12) Industry Core Group (84 minimum), AMOSC staff (x 16)	<24 hours from time of shoreline contact prediction	+ As directed by the relevant Control Agency
	Shoreline assessment team members	Santos contracted Work Force Hire company (e.g. Dare)	Subject to availability (indicatively 72+ hours)	

Tactic	Resources Available	Service Providers	Mobilisation Timeframe	Termination Criteria
	Drones and pilots ** To assist shoreline and vessel-based surveillance	AMOSC OSRL – Third-Party UAV provider Local WA hire companies	<48 hours OSRL – depending on the port of departure, one to two days if within Australia	

9.1 Environmental performance

Table 9-3 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 9-3: Environmental performance – monitor and evaluate

Environmental Performance Outcome	Performance Standard	Measurement Criteria
Response preparedness		
Maintain contracts with support agencies to obtain additional support or technical expertise to monitor and/or respond to a spill	Service Level Agreement maintained with OSRL, Master Services Contract maintained with AMOSC and agreement maintained with RPS Group for the duration of the activity	Records demonstrate that Service Level Agreement maintained with OSRL, Master Services Contract maintained with AMOSC and agreement maintained with RPS Group for the duration of the activity
Response Implementation		
Maintain situational awareness and inform IMT decision making using monitor and evaluate tactics	IMT to undertake fate and weathering modelling to estimate the current and projected weathering of the spill	Records demonstrate fate and weathering modelling undertaken within 2 hours of IMT activation
	IMT to select appropriate monitor and evaluate tactics based on the nature and scale of the spill.	Records demonstrate monitor and evaluate response option decision-making by the IMT are appropriate for the nature and scale of the spill.
	Use monitor and evaluate data to periodically reassess the spill and modify the response, using the IAP	Records demonstrate monitor and evaluate data incorporated into the IAP

10 Shoreline protection and deflection

Protection and deflection tactics are used to divert hydrocarbons away from sensitive shoreline receptors and are more effective if they are deployed ahead of spill contact. They are typically used to protect smaller, high priority sections of shoreline.

The effectiveness of this response will be dependent on spill characteristics, hydrocarbon type, and the operating environment. Deployment is subject to safety constraints such as the potential grounding of vessels.

Protection and deflection is part of an integrated nearshore/shoreline response to be managed by the relevant Control Agency. Where Santos is not the Control Agency (refer to **Table 4-2**), it will undertake first-strike protection and deflection activities as required. In this circumstance, the relevant Control Agency will direct resources (equipment and personnel) provided by Santos for the purposes of shoreline protection. Santos will provide all relevant information on shoreline character and oiling collected as part of surveillance activities carried out under its control (refer **Section 4.2**).

In the event of a spill with the potential for shoreline contact where Santos is not the Control Agency, the ongoing response objectives, methodology, deployment locations and resource allocation will be controlled by the relevant Control Agency and therefore may differ from that included below.

Information gathered during operational monitoring including shoreline clean-up assessments and assessed through an Operational NEBA will guide the selection of protection and deflection locations and techniques.

Shoreline protection and deflection techniques include:

- nearshore booming, which can involve different booming arrangements, including:
  - exclusion booming: boom acts as a barrier to exclude the spill from areas requiring protection
  - diversion booming: booms divert the spill to a specific location where it may be removed (e.g. sandy beach)
  - deflection booming: booms deflect the spill away from an area requiring protection.
- berms, dams and dykes – uses sandbags or embankments to exclude oil from sensitive areas
- shoreside recovery – uses nearshore skimmers to collect oil corralled by nearshore booms (also used during shoreline clean-up)
- passive recovery – uses sorbent booms or pads to collect oil and remove it from the environment. This can be used as a pre-impact tactic where sorbents are laid ahead of the spill making contact with the shoreline
- non-oiled debris removal – removes debris from the shoreline before it is impacted to reduce overall waste volumes from shoreline clean-up.

The effectiveness of these techniques will be dependent on local bathymetry, sea state, currents/tides and wind conditions and the available resources.

Table 10-1 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. **Table 10-2** provides a list of resources that may be used to

implement this strategy. The Incident Commander of the Control Agency's IMT (once they assume control) is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 10-1: Implementation guidance – shoreline protection and deflection

Responsibility	Task	Consideration	Complete
IMT	Ensure initial notifications to the relevant Control Agency have been made.	Refer to **Section 6** for reporting requirements.	❑
IMT	Collect and provide spill trajectory modelling, other operational monitoring data and existing sensitivity information/mapping to Control Agency for confirmation of priority protection areas and NEBA.	-	❑
Actions below are indicative only and are at the final determination of the relevant Control Agency.			
IMT	Conduct Operational NEBA to determine if protection and deflection is likely to result in a net environmental benefit using information from shoreline clean-up assessments (**Section 9**).	-	❑
IMT	If NEBA indicates that there is an overall environmental benefit, develop a Shoreline Protection Plan (IAP Sub-Plan) for each deployment area.	Shoreline Protection Plan may include: + priority nearshore and shoreline areas for protection (liaise with Control Agency for direction on locations) + locations to deploy protection and deflection equipment + permits required (if applicable) + protection and deflection tactics to be employed for each location + list of resources (personnel and equipment) required + logistical arrangements (e.g. staging areas, accommodation, transport of personnel) + timeframes to undertake deployment + access locations from land or sea + frequency of equipment inspections and maintenance (noting tidal cycles) + waste management information, including logistical information on temporary storage areas, segregation, decontamination zones and disposal routes	❑

Responsibility	Task	Consideration	Complete
		+ no access and demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/roosting areas and turtle nesting habitat (use existing roads and tracks first) + shift rotation requirements	
IMT	If required identify vessels with relevant capabilities (e.g. shallow draft) for equipment deployment in consultation with Control Agency.	Ensure vessels have shallow draft and/or a suitable tender (with adequate towing capacity and tie-points) if they are required to access shorelines.	❑
IMT/IRT	Deploy shoreline protection response teams to each shoreline location selected and implement response.	If passive recovery and/or non-oiled debris removal has been selected as a tactic, ensure deployment activities prioritise their implementation prior to hydrocarbon contact.	❑
IMT	Conduct daily re-evaluation of NEBA to assess varying net benefits and impacts of continuing to conduct shoreline protection and deflection activities.	-	❑
IRT	Report to the Operations Section Chief on the effectiveness of the tactics employed.	-	❑
IRT	Response teams to conduct daily inspections and maintenance of equipment.	Shoreline protection efforts will be maintained through the forward operation(s) facilities set-up at mainland locations under direction of the Control Agency. Response crews will be rotated on a roster basis, with new personnel procured on an as needs basis from existing human resource suppliers.	❑

Table 10-2: Shoreline protection and deflection – resource capability

Equipment Type/ Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
AMSA nearshore boom/skimmer equipment	AMSA	Structurflex (9 x 20 m) Canadyne Inflatable (5 x 20 m) Versatech Zoom Inflatable (10 x 25 m) Skimmers: Nearshore oleophilic skimmers (x2) and towable waste storage bladders	Darwin	Access to National Plan equipment through AMOSC
AMOSC nearshore boom and skimming equipment'	AMOSC	Beach Guardian (98 × 25 m lengths) Zoom Boom (199 x 25 m lengths) HDB Boom (two 200 m lengths) Curtain Boom (58 x 30 m lengths) Skimmers: Passive Weir GT 185 Desmi 250 Weir Ro-skim Weir boom	Broome – 4; Exmouth – 20; Fremantle – 23; Geelong – 51 Broome – 8; Exmouth – 20; Fremantle – 30; Geelong – 141 Broome – 2 Fremantle – 18; Geelong – 40 Exmouth – 1; Fremantle – 1; Geelong – 1 Exmouth – 1; Geelong – 1 Geelong – 1 Geelong – 2	Response via duty officer within 15 minutes of first call; AMOSC personnel available within one hour of initial activation call. Equipment logistics varies according to stockpile location.
Santos owned nearshore boom/skimming equipment	Santos	Beach Guardian (8 x 25 m lengths) Zoom Boom (16 x 25 m lengths) 2 x Desmi DBD16 brush skimmer	Varanus Island (VI) VI One each: Dampier and VI	Within 12 hours for deployment by vessel from VI

Equipment Type/ Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Personnel (field responders) for OSR strategies	AMOSC Staff	16	Fremantle – 5 Geelong – 11	Response via duty officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel dependent on location of spill and transport to site
	AMOSC Core Group (Santos)	12	Perth/NW Australia facilities – 10 Port Bonython (South Australia) – 2	From 24 hours
	AMOSC Core Group (Industry)	As per monthly availability (minimum 84)	Office and facility location across Australia	Location dependent. Confirmed at time of activation

10.1 Environmental performance

Table 10-3 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 10-3: Environmental performance – shoreline protection and deflection

Environmental Performance Outcome	Performance Standard	Measurement Criteria
Response preparedness		
Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priorities	Maintenance of access to protection and deflection equipment and personnel through AMOSC, AMSA National Plan and OSRL throughout activity as per **Table 10-2.**	MoU for access to National Plan resources through AMSA
		AMOSC Participating Member Contract
		OSRL Associate Member Contract
	Maintenance of a list of small vessel providers for North West Region	List of small vessel providers
Response Implementation		
Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priorities	Santos IMT to confirm protection priorities in consultation with Control Agency	IAP/Incident Log
	Prepare operational NEBA to determine if shoreline protection and deflection activities are likely to result in a net environmental benefit	Records indicate operational NEBA completed prior to shoreline protection and deflection activities commencing
	IAP Shoreline Protection and Deflection Sub-plan developed to provide oversight and management of shoreline protection and deflection operation	Records indicate IAP Shoreline Protection and Deflection Sub-plan prepared prior to shoreline protection and deflection operations commencing
	NEBA undertaken each operational period by the relevant Control Agency to determine if response strategy is continuing to have a net environmental benefit. NEBA included in development of following period Incident Action Plan	IAP/Incident Log
	Ensure operational NEBA considers waste management, to ensure environmental benefit outweighs the environmental impact of strategy implementation which may include secondary contamination	Incident Log IAP
	A NEBA is undertaken for every operational period	Incident Log contains NEBA
	Shallow draft vessels are used for shoreline and nearshore operations, unless directed otherwise by the designated Control Agency	Vessel specification documentation contained in IAP.

Environmental Performance Outcome	Performance Standard	Measurement Criteria
	Unless directed otherwise by the designated Control Agency, a rapid shoreline/ nearshore habitat/ bathymetry assessment is conducted prior to nearshore activities	IAP records assessment records

11 Shoreline clean-up

Shoreline clean-up aims to remove hydrocarbons from shorelines and intertidal habitat to achieve a net environmental benefit. Removal of these hydrocarbons helps reduce remobilisation of hydrocarbons and contamination of wildlife, habitat and other sensitive receptors. Shoreline clean-up is often a lengthy and cyclical process, requiring regular shoreline clean-up assessments (**Section 9**) to monitor the effectiveness of clean-up activities and assess if they are resulting in any adverse impacts.

Shoreline clean-up is part of an integrated nearshore/ shoreline response to be managed by the relevant Control Agency. Where Santos is not the Control Agency (refer to **Table 4-2**), it will undertake first-strike activations as required. In this circumstance, the relevant Control Agency will direct resources (equipment and personnel) provided by Santos for the purposes of shoreline clean-up. The information obtained from Operational Monitoring (refer **Section 9**), will be used by the IMT in the development of the operational NEBA to inform the most effective clean-up tactics (if any) to apply to individual sites. Intrusive shoreline clean-up techniques have the potential to damage sensitive shorelines. The appropriateness of clean-up tactics will be assessed against natural attenuation for sensitive sites. Selection of shoreline clean-up methods and controls to prevent further damage from the clean-up activities are to be undertaken in consultation with the Control Agency and selected based on NEBA.

MDO is likely to be difficult to remove given its light nature and high weathering potential. It can be readily washed from sediments by wave and tidal flushing. The likely waste products from a diesel spill shoreline response would be contaminated sand and debris.

Shoreline clean-up techniques include:

- Shoreline Clean-up Assessment – uses assessment processes (refer to **Section 9**) to assess shoreline character, assess shoreline oiling and develop recommendations for response. Typically, this should be the first step in any shoreline clean-up response.
- Natural Recovery – oiled shorelines are left untreated and the oil naturally degrades over time.
- Manual and Mechanical Removal – removes oil and contaminated materials using machinery, hand tools, or a combination of both.
- Washing, Flooding and Flushing – uses water, steam, or sand to flush oil from impacted shoreline areas.
- Sediment Reworking and Surf Washing – uses various methods to accelerate natural degradation of oil by manipulating the sediment.

Table 11-1 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. **Table 11-2** provides a list of resources that may be used to implement this strategy. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 11-1: Shoreline clean-up implementation guide

Responsibility	Task	Consideration	Complete
Actions below are indicative only and are at the final determination of the relevant Control Agency.			
IMT	Initiate Shoreline Clean-up Assessment (if not already activated).	Refer to **Section 9** for additional information. Unmanned Aerial Vehicles (UAVs) may be necessary for some sensitive environments and where personnel safety is at risk (e.g. dangerous fauna in remote locations).	❑
IMT	Using results from Shoreline Clean-up Assessment, conduct Operational NEBA to assess shoreline clean-up suitability and recommended tactics for each shoreline location.	Shoreline Clean-up Assessment Teams are responsible for preparing field maps and forms detailing the area surveyed and make specific clean-up recommendations. The condition of affected shorelines will be constantly changing. Results of shoreline surveys should be reported as quickly as possible to the IMT to help inform real-time decision-making. Engage a Heritage Adviser if spill response activities overlap with potential areas of cultural significance.	❑

Responsibility	Task	Consideration	Complete
IMT	If operational NEBA supports shoreline clean-up, prepare a Shoreline Clean-up Plan for inclusion in the IAP.	Shoreline Clean-up Plan may include: + clean-up objectives + clean-up end points (may be derived from Shoreline Clean-up Assessment) + clean-up priorities (may be derived from Shoreline Clean-up Assessment) + assessment and location of staging areas and worksites (including health and safety constraints, zoning) + utility resource assessment and support (to be conducted if activity is of significant size in comparison to the size of the coastal community) + permits required (if applicable) + chain of command for on-site personnel + list of resources (personnel, equipment, personal protective equipment) required for selected clean-up tactics at each site + details of accommodation and transport management + security management + waste management information, including logistical information on temporary storage areas, segregation, decontamination zones and disposal routes + establish no access and demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/roosting areas and turtle nesting habitat (use existing roads and tracks first) + shift rotation requirements. Refer to IPIECA-IOGP (2015) for additional guidance on shoreline clean-up planning and implementation.	❑
IMT	In consultation with the Control Agency, procure and mobilise resources to a designated port location for deployment, or directly to location via road transport.	-	❑

Responsibility	Task	Consideration	Complete
IMT/IRT	Deploy shoreline clean-up response teams to each shoreline location to begin operations under direction of the Control Agency.	Each clean-up team to be led by a Shoreline Response Team Leader, who could be an AMOSC Core Group Member or trained member of the AMSA administered National Response Team (as per the MoU agreement between Santos and AMSA). Clean-up teams and equipment will be deployed and positioned as per those observations by the Shoreline Clean-up Assessment Teams in consultation with the Control Agency. Team members will verify the effectiveness of clean-up, modifying guidelines as needed if conditions change.	❑
IMT/IRT	Shoreline Response Team Leader shall communicate daily reports to the IMT Operations Section Chief to inform of effectiveness of existing tactics and any proposed tactics and required resources.	Where possible, maintain some consistency in personnel within Shoreline Response Teams. If the same personnel are involved in Shoreline Clean-up Assessment and clean-up, they will be better placed to adapt their recommendations as the clean-up progresses and judge when the agreed end points have been met.	❑
IMT	The IMT Operations Section Chief shall work with the Planning Section Chief to incorporate recommendations into the Incident Action Plans for the following operational period, and ensure all required resources are released and activated through the Supply Unit Leader and Logistics Section Chief.	-	❑
IMT/IRT	Monitor progress of clean-up efforts and report to the Control Agency.	-	❑

Table 11-2: Shoreline clean-up resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Manual clean-up tools (shovels, rakes, wheelbarrows, bags, etc)	AMOSC shoreline kits	Shoreline support kits first strike	Fremantle – 1 Geelong – 1	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call
	Hardware suppliers	As available	Darwin, Broome, Perth	
Shoreline flushing (pumps/hoses)	AMOSC	Shoreline flushing kit Shoreline impact lance kit	Fremantle –1; Geelong – 1 Geelong – 1	Response via duty officer within 15 mins of first call – AMOSC personnel available within one hour of initial activation call
Nearshore skimmers/hoses	AMOSC AMSA	Refer to Protection and Deflection (**Table 10-2**)		
Decontamination/staging site equipment	AMOSC	Decontamination station – 3	Fremantle –1; Exmouth –1; Geelong – 1	Response via duty officer within 15 mins of first call – AMOSC personnel available within one hour of initial activation call
	AMSA	Decontamination station – 4	Karratha –2; Fremantle – 2	Access to National Plan equipment through AMOSC
	Oil spill equipment provider (e.g., Global Spill., PPS)	As available	Perth	Subject to availability
Waste storage (including temporary storage and waste skips and tanks for transport)	AMOSC temporary storage	Fast tanks – (9,000 L & 3,000 L)) Vikotank (13,000 L) Lamor (11,400 L) IBCs (1 m3)	Broome –1; Geelong –4; Fremantle –2; Exmouth – 2 Broome – 1; Geelong – 1; Fremantle – 4; Geelong - 13	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
	AMSA temporary storage	Fast tanks – (10 m^3) Structureflex – (10 m^3) Vikoma – (10 m^3)	Darwin –2; Karratha –2; Fremantle – 4; Adelaide – 1; Brisbane – 2; Devonport – 2; Melbourne – 1; Sydney – 4; Townsville - 4 Brisbane – 1; Adelaide – 2; Darwin – 1; Adelaide – 1; Brisbane – 1; Devonport – 2; Fremantle – 4; Fremantle – 3; Melbourne – 2; Sydney – 2; Townsville - 4	Access to National Plan equipment through AMOSC
	Santos Waste Management Service Provider		Darwin, Broome, Perth	24+ hours
Personnel (field responders) for OSR strategies	AMOSC Staff	16	Fremantle – 5 Geelong – 11	Response via duty officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel dependent on location of spill and transport to site
	AMOSC Core Group (Santos)	12	Perth/NW Australia facilities – 10 Port Bonython (South Australia) – 6	12+ hours
	AMOSC Core Group (Industry)	As per monthly availability (minimum 84)	Office and facility location across Australia	Location dependent. Confirmed at time of activation
	Santos contracted Work Force Hire company (e.g., Dare)	As per availability (up to 2,000)	Australia-wide	Subject to availability (indicatively 72+ hours)

11.1 Environmental performance

Table 11-3 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 11-3: Environmental performance – shoreline clean-up

Environmental Performance Outcome	Performance Standard	Measurement Criteria
Response preparedness		
Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery	Maintenance of access to clean-up equipment and personnel through AMOSC, AMSA National Plan and OSRL throughout activity.	MoU for access to National Plan resources through AMSA
		AMOSC Participating Member Contract
		OSRL Associate Member Contract
	Santos maintains MSAs with multiple vessel providers	MSAs with multiple vessel providers
	Maintenance of vessel specification for resource transfer for offshore island response	Vessel specification
	Maintenance of contract with labour hire provider	Contract
Response Implementation		
Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priorities and facilitate habitat recovery	Santos IMT to confirm protection priorities in consultation with the Control Agency	IAP Incident Log
	Prepare operational NEBA to determine if shoreline clean-up activities are likely to result in a net environmental benefit	Records indicate operational NEBA completed prior to shoreline clean-up activities commencing
	Ensure operational NEBA considers waste management, to ensure environmental benefit outweighs the environmental impact of strategy implementation which may include secondary contamination	Incident Log IAP
	IAP Shoreline Clean-up Sub-plan developed to provide oversight and management of shoreline clean-up operation	Records indicate IAP Shoreline Clean-up Sub-plan prepared prior to shoreline clean-up operations commencing
	Clean-up strategies will be implemented under the direction of the Control Agency	Incident Log
	Santos will make available to the Control Agency Shoreline Supervisor/Specialist personnel from AMOSC/OSRL for shoreline clean-up team positions.	Incident Log

Environmental Performance Outcome	Performance Standard	Measurement Criteria
	Santos will make available to the Control Agency equipment from AMOSC and OSRL stockpiles	Incident Log
	NEBA undertaken every operational period by the relevant Control Agency to determine if response strategy is having a net environmental benefit. NEBA included in development of following period Incident Action Plan	IAP/Incident Log
	Unless directed otherwise by the designated Control Agency, access plans for shoreline operations will prioritise use of existing roads and tracks	IAP demonstrates requirement is met
	Unless directed otherwise by the designated Control Agency, a soil profile assessment is conducted prior to earthworks	Documented in IAP and Incident Log
	Vehicles and equipment provided by Santos are verified as clean and invasive species free prior to deployment to offshore islands	Documented in IAP and Incident Log
	Unless directed otherwise by the designated Control Agency, a Heritage Adviser is consulted if shoreline operations overlap with areas of cultural significance	Documented in IAP and Incident Log
	Any establishment of forward staging areas at shoreline areas done under direction or in consultation with the Control Agency	Documented in IAP and Incident Log
	OSR Team Leader assess/select vehicles appropriate to shoreline conditions	IAP demonstrates requirement is met
	Unless directed otherwise by the Control Agency, demarcation zones are mapped out in sensitive habitat areas	IAP demonstrates requirement is met
	Unless directed otherwise by the Control Agency, action plans for shoreline operations include operational restrictions on vehicle and personnel movement	IAP demonstrates requirement is met
	Consultation is undertaken with relevant stakeholders prior to deployment of resources to townships and marine/coastal areas	Consultation records

12 Oiled wildlife

Note: the NT IMT is the Control Agency, and the Department of Environment, Parks and Water Security (DEPWS) is the Jurisdictional Authority for oiled wildlife response within NT waters. Santos and AMSA are the Control Agencies for oiled wildlife response within Commonwealth waters from facility and vessel spills respectively.

Oiled wildlife response (OWR) includes wildlife surveillance/reconnaissance, wildlife hazing, pre-emptive capture and the capture, cleaning, treatment, and rehabilitation of animals that have been oiled. In addition, it includes the collection, post-mortem examination, and disposal of deceased animals. Long-term effects of a spill on wildlife may be associated with loss/degradation of habitat, impacts to food sources, and impacts to reproduction. An assessment of such impacts is covered under scientific monitoring (**Section 14**).

Santos has an Oiled Wildlife Framework Plan (SO-91-BI-20014) which aligns to the current Commonwealth and Territory arrangements for OWR and provides operational guidance to the IMT for the protection of wildlife during a hydrocarbon spill event. This Plan will be referred to for guidance for coordinating an OWR when Santos is the Control Agency, otherwise the relevant Territory OWR Plan will be referred to, as described below.

For Level 2/3 spills that contact NT shorelines the NT IC will assume the role of Control Agency with support from Santos. AMOSC on behalf of AMOSC Titleholder Members ConocoPhillips, Inpex and Shell Australia have developed a Northern Territory Oiled Wildlife Response Plan (NTOWRP), this plan also has application for other titleholders as it provides operational guidance to respond to injured and oiled wildlife along the NT coastline and island groups.

12.1 Wildlife response levels

To guide OWR resourcing requirements, **Table 12-1** has been adapted from the incident classification outlined in the National Plan (AMSA, 2020) in terms of wildlife at risk, incident duration and resourcing requirements.

The credible spill scenarios for Barossa GEP Installation activities show some shoreline contact with certain locations likely to have seasonal wildlife aggregations. There is therefore potential for some wildlife to be impacted by a spill requiring a level 2 wildlife response (**Table 12-1**).

Table 12-1: Wildlife Incident Level Guidance

Characteristic	Level 1	Level 2	Level 3
Wildlife	Individual fauna	Groups of fauna or threatened fauna	Large numbers of fauna
Duration	0-3 days	Days to weeks	Weeks to months
Establishment of a wildlife facility	Not required	Likely required	Required

Table 12-2 provides guidance to the IMT on the actions and responsibilities that should be considered when implementing an oiled wildlife first-strike plan. This will enable an initial

assessment of the OWR response level and initiation of a Wildlife Division for wildlife Level 2/3 spills where Santos is the control agency and as outlined in the Santos Oiled Wildlife Response Framework Plan (SO-91-BI-20014). Mobilisation times for the minimum resources that are required to commence initial oiled wildlife operations are listed in **Table 12-3.**

Wildlife surveillance/reconnaissance is a critical component of an OWR and provides the situational awareness used to determine which other OWR strategies will be required. Refer to the Santos Wildlife Framework Plan, Section 7.3 for a list of the wildlife reconnaissance aims and objectives, tactics, species and life-cycle stages to consider when developing a wildlife reconnaissance plan. Wildlife reconnaissance should be undertaken in close consultation with personnel undertaking relevant monitor and evaluate activities.

Table 12-2: Implementation guidance – oiled wildlife response

Responsibility	Task	Consideration/s	Complete
Initial wildlife assessment and notifications			
IRT	Vessel Master to report all wildlife sightings (including those contacted with hydrocarbons or at risk of contact) near the spill source to the IMT within 2 hours of detection	-	❑
IRT	Personnel conducting aerial surveillance activities (as part of monitor and evaluate and/or operational monitoring activities) shall report wildlife sightings in or near the spill trajectory (including those contacted with hydrocarbons or at risk of contact) and report them to the IMT within 2 hours of detection	Many species are not visible due to the lack of time they spend on the ocean surface. Record all reports of wildlife potentially impacted and impacted by spill. Record reports on: + location + access + number + species + condition of impacted animals (if available).	❑
IMT	If wildlife are sighted and are at risk of contact (or have been contacted), initiate wildlife response by notifying AMOSC Duty Manager; and if in Territory waters also notify DEPWS (Pollution Response Hotline; Environmental Operations)	Obtain approval from IC prior to activating AMOSC Oiled Wildlife Adviser. If a Level 2/3 facility spill reaches the Northern Territory shoreline, the NT IMT will be the Control Agency for the shoreline.	❑
IMT	Notify Department of Agriculture, Water and the Environment if there is a risk of death or injury to a protected species (including Matters of National Environmental Significance [MNES]).	Refer to **Table 6-1** for reporting requirements. A list of MNES is provided in the Existing Environment Section of the EP (Section 3).	❑
IMT	Review all wildlife reports from surveillance or opportunistic activities and contact personnel who made the reports (if possible) to confirm information collected.	-	❑

Responsibility	Task	Consideration/s	Complete
IMT	Use information from initial assessments to prepare an operational NEBA. Use this information to help determine: + initial OWR Response Level (1 to 3), refer to Table 12-3 + for level 2/3 wildlife incidents where Santos is the control Agency, a Wildlife Division should be established (refer to the Santos Oiled Wildlife Framework Plan [SO-91-BI-20014]) + if OWR activities are likely to result in a net environmental benefit + prepare a Wildlife Plan for inclusion in the IAP.	Oiled wildlife response activities such as hazing and pre-emptive capture can cause additional stress and mortality on individuals than oil pollution alone. The Environmental Team Leader and Wildlife Division Coordinator will determine via an operational NEBA whether strategies such as hazing/pre-emptive capture will result in a net environmental benefit. This may be done in consultation with the designated NT Government Functional Group and AMOSC Oiled Wildlife Advisers and any Subject Matter Experts as relevant (if available, but an operational NEBA should not be delayed if they are not immediately available).	❑
IMT	Prepare a Wildlife Plan for inclusion in the IAP	Refer to the Santos Oiled Wildlife Framework Plan (SO-91-BI-20014), Section 7.1	❑
Mobilisation of wildlife resources			
IMT	Determine resources required to undertake wildlife reconnaissance and provide list to Logistics Section.	Confirm best reconnaissance platform (e.g., vessel, aerial, shoreline). Consider ability to share resources (e.g., Monitor and Evaluate activities, Scientific Monitoring).	❑
IMT	Determine number of Oiled Wildlife Responders and IMT Wildlife related positions required based on the likely number of oiled wildlife and arrange access to resources via AMOSC, or DEPWS.	Consider need for veterinary care.	❑
IMT	Commence mobilisation of equipment (including adequate PPE) and personnel to required location/s.	-	❑
IMT	Contact OSRL to activate Sea Alarm if additional support is likely to be required to sustain an ongoing OWR.	-	❑
General			
IRT	Record relevant data e.g. equipment used, time deployed, weather conditions, Job Safety Analysis (JSA) for all tasks	-	❑

Responsibility	Task	Consideration/s	Complete
IRT	Hold pre-mobilisation survey team meeting, including communication of field survey schedules (provision for field personnel rotation)	-	❑
IMT	Assemble trained personnel (if required), including required personal protective equipment (PPE). Arrange any required inductions and/or permits	-	❑
IMT	Arrange transportation (e.g. flights, vehicles), accommodation and food/equipment for survey teams	-	❑
IMT	Prepare a communications plan for field personnel	-	❑

Table 12-3: Oiled wildlife response – first strike response timeline

Task	Time from oiled wildlife contact (predicted or observed)
IMT notifies regulatory authorities and AMOSC of oiled wildlife / potential for contact	<2 hours
Mobilise Santos personnel for oiled wildlife reconnaissance **this will be already occurring through Aerial Observer mobilisation**	<24 hours
Mobilisation of AMOSC oiled wildlife equipment and industry OWR team to forward staging area	<48 hours
Minimum Resource Requirements	
The requirements for oiled wildlife response will be situation specific and dependent upon reconnaissance reports. Indicative minimum resource requirements below align with personnel requirements for a scenario with low wildlife impact: + Six trained industry oiled wildlife response team personnel (AMOSC staff & contractors/ AMOSC Industry OWR group) + One AMOSC OWR treatment container + One AMOSC Oiled Wildlife Deterrence Kit	

12.2 Environmental performance

Table 12-4 indicates the environmental performance outcome, performance standards and measurement criteria for this response strategy.

Table 12-4: Environmental performance – wildlife response

Environmental Performance Outcome	Performance Standard	Measurement Criteria
Implement tactics in accordance with relevant Territory Oiled Wildlife Response Plan(s) (OWRP) to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife	**Response preparedness**	
	Maintenance of access to oiled wildlife response equipment and personnel through Santos, AMOSC, AMSA National Plan and OSRL throughout activity	MoU for access to National Plan resources through AMSA
		AMOSC Participating Member Contract.
		OSRL Associate Member Contract.
	Santos Oiled Wildlife Response Framework provides guidance for coordinating an OWR when Santos is the Control Agency and outlined Santos's response arrangements	Santos Wildlife Framework Plan
	Maintenance of contract with labour hire provider	Contract
	Development of onboarding procedure for oil spill response labour hire	Onboarding procedure
	Response implementation	

Environmental Performance Outcome	Performance Standard	Measurement Criteria
	Minimum requirements mobilised in accordance with **Table 12-3** unless directed otherwise by relevant Control Agency	Incident log
	Prepare operational NEBA to help classify OWR level and determine if OWR activities are likely to result in a net environmental benefit (particularly in relation to hazing/pre-emptive capture)	Records indicate operational NEBA completed prior to OWR operations commencing
	Wildlife Plan developed and included in the IAP to provide oversight and management of OWR operation	Records indicate IAP Wildlife Plan prepared prior to OWR operations commencing

13 Waste management

The implementation of some spill response options will collect and generate waste that will require management, storage, transport and disposal, and may consist of solid and liquid waste.

Waste management aims to ensure wastes are handled and disposed of safely and efficiently and prevent contamination of unaffected areas.

The type and amount of waste generated during a spill response will vary depending on the spill type/characteristics, volume released, and response options implemented. To account for this potential variability, waste management (including handling and capacity) needs to be scalable to allow a continuous response to be maintained.

The potential types and total volumes of waste anticipated for each response option are provided in **Table 13-1.**

Table 13-1: Waste Types and Volumes Anticipated During a Spill Response

Spill Response Option	Oily Liquid Waste	Solid Oily Waste	PPE and Consumables
Monitor and evaluate	None	None	< 1 m^3/day
Shoreline clean-up*	<1 m^3/day	<5 m^3/day	<12 m^3/day
Wildlife response	< 1 m^3/day	< 1 m^3/day	< 2 m^3/day

* Based on two small clean-up teams of 6 people in each team removing approximately 1 m^3/person/day

Table 13-2 summaries the waste storage, treatment and disposal options available to manage waste associated with the spill response options. The capacity is considered appropriate and acceptable to manage the maximum waste volumes that may be produced through implementation of the various response options.

Based on the credible spill scenarios modelled, Santos do not anticipate that large volumes of waste will be generated. As soon as the details of an actual spill are available, waste management arrangements to allow a continuous response to be maintained would be reviewed.

Where Santos is the Control Agency, or at the request of the designated Control Agency, Santos will engage its contracted Waste Service Provider (WSP) to provide sufficient waste receptacles to store collected waste and manage oily waste collection, transport and disposal associated with spill response activities. The WSP will arrange for all personnel, equipment and vehicles to carry out these activities from nominated collection points to licensed waste management facilities. All transport will be undertaken via controlled-waste-licensed vehicles and in accordance with the *Waste Management and Pollution Control Act* (NT). Santos' Oil Pollution Waste Management Plan (QE-91-IF-10053) provides detailed guidance to the WSP in the event of a spill.

Table 13-2: Spill Response Waste Storage, Treatment and Disposal Options

Waste Category	On-site Storage	Treatment/Disposal Option	End Disposal Destination
Solid waste – oiled organic matter, sand, PPE and consumables	Lined skips, oil drums, industrial waste bags, plastic rubbish bags	Recovery (e.g. thermal desorption or fixation process) and recycling Incineration Landfill	Waste management Provider
Liquid waste	Liquid waste barrels, IBCs	Recovery (e.g. thermal desorption or fixation process) and recycling	
Oiled wildlife response	Industrial waste bags, plastic rubbish bags	Incineration Landfill	

13.1 Environmental Performance

Table 13-3 indicates the environmental performance outcome, performance standards and measurement criteria for this response strategy.

Table 13-3: Environmental Performance – Waste Management

Environmental Performance Outcome	Performance Standard	Measurement Criteria
Collect, manage, transport and dispose of waste produced from response options to minimise secondary contamination of sensitive receptors	Implement Santos Oil Pollution Waste Management Plan (QE-91-IF-10053)	Incident Log
	Waste management, storage, transport and disposal will comply with relevant legislation, conventions and standards, including: + Relevant NT and Commonwealth Regulations, including: – Marine Order 91 (Marine pollution prevention – oil) (as appropriate for vessel class) – *Waste Management and Pollution Control Act 1998* (NT)	Records demonstrate waste generated during a hydrocarbon spill response is managed, stored, transported and disposed of in accordance with relevant legislations, conventions and legislation, including: + Marine Order 91 + *Waste Management and Pollution Control Act 1998* (NT)
	Santos to maintain contracts with third-party providers to provide access to suitably qualified and competent personnel and equipment to assist in the implementation of waste management activities	Records demonstrate that Santos maintains contracts with waste management service providers capable of handling the types and volumes of wastes generated.

14 Scientific monitoring

Oil spill scientific monitoring is the principal tool for detecting and quantifying environmental impact and recovery to sensitive receptors from an oil spill. Santos is required to have an oil spill SMP in place for Petroleum activities in Territory and Commonwealth waters.

Santos will activate and implement scientific monitoring in Territory and Commonwealth waters for hydrocarbon spills in line with its SMPs unless directed otherwise by the relevant Control Agency/s.

14.1 Objectives

The overarching objective of Santos' SMPs is to provide guidance to staff, consultants and contractors in developing monitoring a monitoring program for detecting impacts and recovery to environmentally sensitive receptors contacted by a spill.

Receptor-specific SMPs have different objectives as outlined in **Appendix D: Scientific Monitoring Plans.**

14.2 Scope

Santos will implement its SMPs, as applicable, for Barossa GEP Installation activity oil spills across both Territory and Commonwealth waters. For oil spills that contact NT shorelines, Santos will liaise directly with the NT IMT and provide all of the required support to implement scientific monitoring on NT shorelines. In the event that control of scientific monitoring in Territory waters is taken over by NT IMT under advice from the Territory Environmental Scientific Coordinator, Santos will follow the direction of NT IMT and provide all necessary resources (monitoring personnel, equipment and planning) to assist as a Supporting Agency.

14.3 Relationship to operational monitoring

Operational monitoring (**Section 9**) is monitoring undertaken to obtain information which will provide situational awareness and assist in the planning and execution of the oil spill response.

Scientific monitoring activities have different objectives to Operational Monitoring**,** which influences the monitoring methods likely to be used, the degree of scientific rigour required to meet the monitoring objectives, and the scope of studies. Scientific monitoring may occur in parallel to operational monitoring and is typically conducted over a wider study area, extending beyond the spill footprint. It is also typically conducted over a longer time period, extending beyond the spill response.

Scientific monitoring is designed to provide data for short term and longer-term environmental effects assessment. This is typically required to be quantitative in nature and appropriate for statistical analyses. However, these two types of monitoring are related, and Operational Monitoring outputs typically inform the final design of the related SMP.

14.4 Scientific monitoring plans

Owing to the diverse nature of sensitive receptors that could be contacted by an oil spill and the different techniques and skillsets required to monitor impact and recovery to these receptors, there are a number of Oil Spill Scientific Monitoring Plans relevant to Barossa GEP Installation activities

(**Table 14-1**). These are detailed further in **Appendix D: Scientific Monitoring Plans.** Each SMP has corresponding objectives, initiation/termination criteria, methodologies, baseline data sources and analysis and reporting requirements, noting that in a response controlled by NT IMT the methodology, termination criteria and analysis/reporting requirements may differ.

Table 14-1: Oil spill scientific monitoring plans relevant to Barossa GEP Installation activities

Study	Title
SMP1	Marine Water Quality
SMP2	Marine Sediment Quality
SMP3	Shorelines and Coastal Habitats – Sandy Beaches and Rocky Shores
SMP4	Shorelines and Coastal Habitats – Mangroves
SMP5	Shorelines and Coastal Habitats – Intertidal Mudflats
SMP6	Benthic Habitats
SMP7	Seabirds and Shorebirds
SMP8	Marine Megafauna (incl. whale sharks and mammals)
SMP9	Marine Reptiles
SMP10	Seafood Quality
SMP11	Fish, Fisheries and Aquaculture
SMP12	Whale Sharks

14.5 Baseline monitoring

Baseline monitoring provides information on the condition of ecological receptors prior to, or spatially independent of (e.g. if used in control chart analyses), a spill event and is used for comparison with the post-impact scientific monitoring where required. This is particularly important for scientific monitoring where the ability to detect changes between pre-impact and post-impact conditions is necessary.

In the event of a spill to marine or coastal waters, reactive pre-impact monitoring should, where practicable, be implemented to gather additional data on the current state of the environment.

Santos periodically review the status, availability and suitability of existing baseline data sources related to key environmental sensitivities in its areas of operations. **Appendix F: Scientific Monitoring Capability** provides further information on Santos baseline data reviews and outlines a baseline data assessment conducted on high priority areas for scientific monitoring in the event of a Barossa GEP Installation oil spill.

14.6 Monitoring service providers

Oil Spill Scientific Monitoring will be conducted on behalf of Santos by contracted monitoring service providers (MSPs) and applies to the implementation of SMPs 1 to 12 (**Table 14-1**). These services are provided by Astron Environmental Services (Astron) and primary sub-contractor (BMT).

The MSP for SMP12 is the Australian Institute of Marine Science (AIMS), noting that there are no whale shark BIAs within the EMBA.

As per the Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162), Santos' MSP provides the following scientific monitoring services to Santos:

- 24/7 monitoring support accessed through 24 hr call out number
- provision of a suitably trained Monitoring Coordination Team including a Monitoring Coordinator, Monitoring Operations Officer, Planning and Logistics Officer and Safety Officer
- provision of Technical Advisers and Field Teams (staff and contractors) for first strike deployments
- maintenance of standby monitoring equipment
- monthly personnel capability reports
- provision and review of Scientific Monitoring Sub-plans
- provision and review of Standby Service Manual (EA-00-RI-10162) and associated response activation forms
- participation in audits, workshops, drills and exercise to facilitate readiness.

Appendix F: Scientific Monitoring Capability provides an overview of Santos' processes in place to provide assurance that its oil spill scientific monitoring arrangements for SMPs 1-12 are fit for purpose to meet the worst case first-strike monitoring requirements associated with the Barossa GEP Installation activities.

14.7 Activation

The SMP Activation Process is outlined in **Appendix E: SMP Activation Process**. SMPs are activated as per the initiation criteria for each as outlined in **Appendix E: SMP Activation Process**. The SMP Activation Form is available on the Santos Procedures Index and Environment Unit Leader folder.

The Santos Environment Unit Leader (EUL) with support from Environment Unit members is responsible for activating the primary MSP. The Santos Environment Unit will assist the MSP Monitoring Coordination personnel and relevant Technical Advisors in defining the monitoring study design, monitoring locations and field methodologies based on Operational Monitoring information (e.g., spill modelling and aerial surveillance information), relative location of sensitive receptors to the spill and the timing of the spill with respect to seasonality of sensitive receptors.

This process will identify monitoring operational objectives and resourcing/ mobilisation requirements which the EUL will feed back to the IMT for approval. Mobilisation times for the minimum resources that are required to commence initial scientific monitoring operations are listed in **Table 14-2.**

In the event that a designated Control Agency takes command of scientific monitoring, Santos will follow the direction of the Control Agency providing planning and resourcing support through its MSPs as required.

Table 14-2: Scientific monitoring – first strike response timeline

Task	Time from activation of SMP
Santos IMT approve initial monitoring plan	<24 hours
Santos to mobilise sampling platforms to deployment location	<120 hours (72 hours from monitoring plan approval)
SMP teams and monitoring equipment mobilised to deployment locations	<120 hours (72 hours from monitoring plan approval)
Minimum Resource Requirements	
Initial resourcing requirements will be dependent upon the number of SMPs activated and the requirement for post spill baseline data to be collected. First strike personnel requirements for scientific monitoring field teams at Scientific Monitoring Priority Areas are presented in **Appendix F: Scientific Monitoring Capability** + Suitable vessels for on-water monitoring or transfer of personnel to remotes areas/islands + Vehicle/s as required + Helicopter for aerial surveys as required + Scientific monitoring personnel for first strike teams (refer **Appendix F: Scientific Monitoring Capability)** + Scientific monitoring equipment as detailed in the relevant SMP.	

14.8 Environmental performance

Table 14-3 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 14-3: Environmental performance – scientific monitoring

Environmental Performance Outcome	Performance Standard	Measurement Criteria
Implement monitoring programs to assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill	**Response preparedness**	
	Maintain access to specialist monitoring personnel and equipment by maintaining contract with Monitoring Service Provider throughout activity	Contract with monitoring service provider
	Obtain monthly capability reports from Monitoring Service Provider	Capability reports
	Regular review of baseline data	Baseline data review report
	Maintenance of vessel specification for water quality monitoring vessels	Vessel specification
	Oil sampling kits are located at Darwin, Exmouth, Dampier and Varanus Island	Evidence of deployment to site
	Response implementation	
	Initiation criteria of SMPs will be reviewed during the preparation of the initial IAP and subsequent IAPs; and if any criteria are met, relevant SMPs will be activated	Incident Action Plan and Incident Log
	If any SMPs are activated, the subsequent activation of MSP is to follow the process outlined in Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162)	Incident Log
	MSP shall commence activation process within 30 mins of initial notification form being received from Santos	Monitoring Service Provider records
	Santos personnel to support MSP through the provision of operational monitoring information and relative location of sensitive receptors to the spill	Incident Log and Monitoring Service Provider records
	Minimum requirements mobilised in accordance with **Table 14-2**	Incident log

15 Response termination

The decision to terminate the spill response is made in consultation with the relevant Control Agency/s, Jurisdictional Authorities and other Statutory Authorities that play an advisory role. This decision will be made with consideration of:

- the efficacy and benefit of current response options
- any potential for additional pollution
- any potential for additional environmental damage caused by further clean-up efforts
- an assessment of prevailing weather conditions that can increase risk to response teams or increase the efficacy in weathering hydrocarbon.

A NEBA will be conducted to inform the decision-making process. Termination criteria are defined within each section of contingency response activities defined within the OPEP.

Upon conclusion of the spill response activity, Santos will:

- prepare detailed reports and collate all documents
- report on the performance objectives of each individual spill response that was mobilised
- undertake an inventory of consumables and prepare accounts
- arrange for the return of equipment
- arrange for the refurbishment of consumed equipment
- conduct an investigation into the cause of the incident and report to relevant authorities
- assess long-term environmental monitoring requirements.

16 References

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Appendix A: Hydrocarbon Characteristics and Behaviour

Marine diesel

Marine diesel oil (MDO) (classified as Group 2 by ITOPF 2011) non-persistent fuel used in the maritime industry.

MDO is a mixture of volatile and persistent hydrocarbons with low viscosity. When released to the marine environment it will spread quickly and thin out to low thickness levels, thereby increasing the rate of evaporation. Physical characteristics of MDO are summarised in **Table A-1.** Due to its chemical composition, up to 60% will generally evaporate over the first two days depending upon the prevailing conditions and spill volume. Approximately 5% is considered "persistent hydrocarbons", which are unlikely to evaporate and will decay over time.

The MDO also has a strong tendency to entrain into the upper water column (0–10 m) (and consequently reduce evaporative loss) in the presence of moderate winds (> 10 knots) and breaking waves. However, MDO re-surfaces when the conditions calm. It does not emulsify.

Table A 1: Characteristics of MDO

Hydrocarbon	Initial density (kg/m³)	Viscosity (cP) @ 20°C	Component	Volatiles (%)	Semi-volatiles (%)	Low volatility (%)	Residual (%)
			Boiling Points (°C)	<180	180–265	265–380	>380
Diesel	829	4.0	% of total	6	35	54	5

Source: APASA (2013a)

Figure A-1 provides the predicted weathering and fates of surface MDO. The graph shows that MDO on the sea surface is expected to evaporate rapidly, with > 50% of the spilled hydrocarbon expected to evaporate within 2 days.

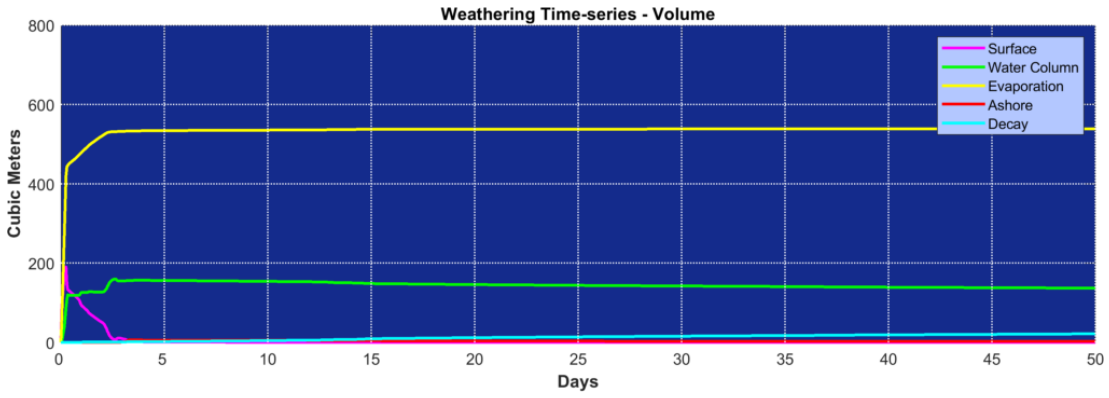

Figure A-1: Predicted weathering and fates of MDO for a 700 m³ spill

Appendix B: Aerial Surveillance Observer Log

Survey Details				
Date:	Start time:	End Time:	Observer/s:	
Incident:			Area of Survey:	
Aircraft type:	Call sign:		Average Altitude:	Remote sensing used:
Weather Conditions				
Wind speed (knots)			Wind direction	
Cloud base (feet)			Visibility	
Time high water			Current direction	
Time low water			Current speed (nM)	

Slick Details											
Slick grid parameters (lat/long)				Slick grid parameters (air speed)			Slick grid dimensions				
Length Axis		Width Axis		Length Axis			Width Axis	Length		nm	
Start Latitude		Start Latitude		Time (seconds)			Time (seconds)	Width		nm	
Start Longitude		Start Longitude						Length		nm	
End Latitude		End Latitude		Air Speed (knots)			Air Speed (knots)	Width		nm	
End Longitude		End Longitude						Grid area		km^2	
Code	**Colour**	**% cover observed**	**Total grid area**		**Area per oil code**		**Factor**	**Oil volume**	
1	Silver			km^2		km^2	40-300 L/ km^2		L
2	Iridescent (rainbow)			km^2		km^2	300-5,000 L/ km^2		L
3	Discontinuous true oil colour (Brown to black)			km^2		km^2	5,000-50,000L/ km^2		L
4	Continuous true oil colour (Brown to black)			km^2		km^2	50,000 – 200,000 L/ km^2		L
5	Brown / orange			km^2		km^2	>200,000 L/ km^2		L

Appendix C: Operational Water Quality Sampling and Analysis Plan considerations

Considerations for Operational Water Quality Sampling and Analysis	
Scope of work	The work scope for operational water quality monitoring will be driven by the IMT, confirming objectives for each operational period.
Survey design	The operational water sampling activities will be conducted by experienced environmental scientists and managed through the IMT Incident Action Planning process. The exact nature of the sampling activities will depend upon the objectives for each operational period; however, the sampling design and methodology will consider the following points: + Sampling locations will be moved with the slick and/or plume based on the observed or predicted location and movement of oil on water and subsea plumes. This will be informed by vessel/aerial surveillance, satellite tracking buoys and spill fate modelling. + At each discrete location, sampling will initially be conducted using a conductivity-temperature-depth (CTD) meter along a depth profile which captures the three-dimensional distribution of the oil. The CTD would require fluorometry and dissolved oxygen sensors as part of the sensor package to record the presence of oil (fluorometry) and the activity of hydrocarbon degrading bacteria (dissolved oxygen). Fluorometers appropriate to the hydrocarbon type will need to be selected. + Where surface oil is present in shallow water (<5 m) sampling should involve a depth profile from the seabed to surface waters. Profiles should ensure that the full gradient of oil in water concentration can be determined. + Oil and oil in water samples are to be collected using suitable pumping or sampling apparatus. For samples at depth a Niskin bottle(s) or similar device that allows remote closing and discrete sampling at depth is to be used. Alternatively, water samples can be pumped from defined depths using a hose suspended vertically using a suitable pump for water sampling (e.g., a peristaltic pump). + Samples are to be collected in clean, fully labelled glass jars, filled to the top and refrigerated/ kept cool and in darkness during storage and transport. Handling, storage and documentation requirements to be confirmed with laboratory but holding time <7 days is expected requirement. + Oil and oil in water samples will be replicated at each site to allow intra-site variability to be assessed and appropriate quality assurance and control samples incorporated into replicates. + Santos will coordinate transportation of samples from the sampling location to the laboratory. Samples will be accompanied with a completed Chain of Custody form. + Water samples also to be provided to an independent National Association of Testing Authorities-accredited laboratory in Perth for hydrocarbon suite analysis including polycyclic aromatic hydrocarbons.
Analysis and reporting	+ All data collected on oil properties provided in spreadsheets (including GPS location, depth of sampling, timing, on water observations, in-situ readings and water sample label details) to IMT on an ongoing basis during spill response operations. + Daily field reports of results provided to the IMT. + Analytical analysis of oil properties following laboratory evaluation. + Final report detailing all data collected on oil properties throughout the monitoring program including relevant interpretation.

Appendix D: Scientific Monitoring Plans

SMP1 – Marine Water Quality	
Rationale	The release of hydrocarbons at sea will pollute marine waters via floating, entrained or dissolved aromatic hydrocarbons. The water quality SMP may also be used in conjunction with OMP1 (Surveillance and Monitoring), to inform the sampling design of other SMPs where objectives are to evaluate impact to and recovery of sensitive receptors, in relation to hydrocarbon contamination.
Aim	To monitor changes in water quality following an oil spill and associated response activities for the purpose of detecting a potential impact and recovery and for informing other scientific monitoring studies.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, relevant available metadata will be reviewed for applicable marine water quality baseline data. In the absence of baseline data for hydrocarbons, data from appropriate reference sites will be used in place of the baseline values.
Initiation criteria	Upon notification of a Level 2 or 3 incident (a level 2 or 3 incident includes those which may have an adverse effect on the environment. This may be informed by operational water quality monitoring)
Termination criteria	Concentrations of hydrocarbon contaminants, attributable to the released hydrocarbon, are not significantly higher than baseline data or similar non-impacted sites data. In the absence of baseline or similar non-impact sites data, concentrations of hydrocarbon contaminants, attributable to the released hydrocarbon, are below the relevant hydrocarbon contaminant trigger level within the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Governments 2018), or the relevant regulatory site-specific trigger level (where these exist), if this is lower and values are not significantly different to reference sites. Forensic fingerprinting of the released hydrocarbon and water quality sample analysis by way of gas chromatography/mass spectrometry (GC/MS) may be used to determine the source of contaminants where this is not otherwise clear from operational monitoring.
Receptor impact	Impacts to specific receptors from hydrocarbons within marine waters are described in individual SMPs.
Methodological approach	Overall sampling design approach will be enacted according to the availability of baseline data guided by the structured decision-making process based on Gregory et al. (2012): 1. If sites are contacted in which long-term baseline data is available, a control chart (time-series) design will be applied; 2. If insufficient long-term baseline data is available, where appropriately matched baseline data sites are impacted and non-impacted, a before-after-control-impact (BACI) approach to monitoring will be applied; 3. Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied. See **Appendix B** and **Figure 1** for detailed description of these approaches. The selection of potentially impacted and non-impacted sites will be informed by Operational Monitoring, including operational water quality monitoring and spill trajectory modelling. Sampling frequency will be dictated by the spatial extent of the spill, the number and location of sampling sites and the philosophy of the sampling design.

SMP1 – Marine Water Quality	
	Water profiles SMP1 – Marine Water Quality A water quality probe will be used to measure conductivity (to derive salinity in PSU), temperature and depth (CTD), dissolved oxygen (% and mg/L), turbidity (FNU or NTU), and fluorometry along a depth profile. Sampling methods will be aligned with the recommended standard operating procedures for the use of sensors for oil spill monitoring found in Appendix F of the Oil Spill Monitoring Handbook (Hook et al. 2016). Water quality Water quality samples will be taken along a similar depth profile as the CTD measures using a Niskin bottle, Van Dorn water sampler, rosette sampler or equivalent instrument. The laboratory(ies) will inform and supply the appropriate sample containers, storage requirements, holding times, detection limits/limit of reporting for required analytes and the analysis required for each sample. Water samples shall be analysed for key contaminants of concern including polycyclic aromatic hydrocarbons (PAHs), monocyclic aromatic hydrocarbons (including benzene, toluene, ethylbenzene, xylene), and nutrients, metals and chlorophyll-a. At each site, replicate water samples (at least three samples) will be collected to allow appropriate statistical analyses to be made including samples for quality assurance and quality control (QA/QC) purposes (i.e. split sample, triplicate sample, field blanks, transport blanks). Water sample collection and handling will align with Standard operating procedures found in the Oil Spill Monitoring Handbook (Hook et al., 2016), specifically the following sections: + Appendix A & B hydrocarbon analysis; + Appendix C Volatile Organic Compounds Analysis; and + Appendix D Surface Oil Analysis. Environmental DNA (eDNA) will also be collected to detect for the presence of marine species in the water column. Water samples will be collected in Nalgene bottles and sent to an appropriate laboratory for analysis. Sample processing will depend on holding times required (<8 hours ideal) and may involve filtering and freezing of each sample (Grochowsi and Stat 2017).
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP having been activated.
Resources	+ Marine scientist with experience in water quality sampling + Geographic Information Systems (GIS) personnel + National Association of Testing Authorities (NATA) accredited laboratories for water sample analysis + Vessel and tender in operation + Refuelling facilities + Sample containers and preservative + Sampling equipment + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider able to mobilise within 72 hours of the SoW following approval by Santos (this time allows for costing, preparation of equipment and disposables and travel time to site).
Analysis and reporting	Chemical analysis will be carried out by NATA-accredited laboratories. A government endorsed laboratory for forensic fingerprinting (GS/MS) will be used. Data will be entered to spatially explicit database.

SMP1 – Marine Water Quality	
	Data will be analysed appropriately in order to determine if there was a statistical difference in water quality before and after a hydrocarbon impact. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP2 – Sediment Quality	
Rationale	Hydrocarbons released during a spill scenario may contact, settle and/or accumulate in marine sediments. Toxic substances found in accumulated hydrocarbons may lead to impacts to ecosystem processes associated with this primary producer habitat. Sediments and marine infauna will be sampled concurrently in order to establish potential correlations amongst the two parameters.
Aim	To monitor the fate and persistence of hydrocarbons in marine sediments following an oil spill and associated response activities. To monitor marine benthic infauna assemblages as an indicator of sediment quality, in relation to an oil spill and associated response activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, relevant available databases will be reviewed for applicable marine baseline sediment quality and infauna data. In the absence of baseline sediment quality data, hydrocarbon contaminant trigger values for marine sediments as listed in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Governments 2018) will be used as a proxy for baseline levels. Where other regulatory site-specific trigger levels exist, the lower of these levels and the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Governments 2018) levels will be used as proxy baseline levels.
Initiation criteria	Operational Monitoring or SMP1 indicates that contacted sediment or sediment predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Concentrations of hydrocarbons in marine benthic and shoreline sediments, attributable to the released hydrocarbon, are not significantly higher than baseline or similar non-impact sites. In the absence of baseline or similar non-impact sites data, concentrations are below marine sediment quality interim guideline levels within the ANZG (2018), or the relevant regulatory site-specific trigger level (where these exist), if this is lower. For infauna assemblages, abundance and species diversity/richness/composition are not significantly different from baseline (where baseline data exists) or are not statistically significantly different from comparable non-impacted benthic infauna assemblages. Forensic fingerprinting of the released hydrocarbon and sediment quality samples by way of GC/MS may be used to determine the source of contaminants where this is not otherwise clear from operational monitoring.
Receptor impact	Impact to sediment quality is measured through change in hydrocarbon content and concentration. Change to sediment quality is also reflected by changes to infaunal assemblages. Potential impact to infaunal assemblages are measured through change(s) in: + Taxonomic diversity + Assemblage composition + Abundance of indicator species

SMP2 – Sediment Quality	
	Other pressures to these states are: + Discharge of other toxicants + Physical disturbance including dredging + Sedimentation + Introduction of marine pests + Shading from marine infrastructure + Climate change
Methodological approach	Overall sampling design approach will be enacted according to the availability of baseline data guided by the structured decision-making process based on Gregory et al. (2012): 1. If sites are contacted in which long-term baseline data is available, a control chart (time-series) design will be applied; 2. If insufficient long-term baseline data is available, where appropriately matched baseline data sites are impacted and non-impacted, a before-after-control-impact (BACI) approach to monitoring will be applied; 3. Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied. See **Appendix B** and **Figure 1** for detailed description of these approaches. The selection of potentially impacted and non-impacted sites will be informed by Operational Monitoring, including operational water quality monitoring and spill trajectory modelling. Sampling frequency will be dictated by the spatial extent of the spill, the number and location of sampling sites and the philosophy of the sampling design <u>Sediment quality</u> Operational Monitoring (including spill trajectory modelling) and the results of SMP1 Marine Water Quality monitoring will be used to inform the location of potentially impacted sediment sites. Sediment monitoring sites in nearshore and shoreline locations will also consider and align where practicable, with sites selected for habitat monitoring (i.e. SMP3, 4, 5 and 6). Sampling frequency will be dictated by the spatial extent of the spill, the number and location of sampling sites and the philosophy of the sampling design. At each site, replicate sediment samples will be taken including those for QA/QC purposes. Sediment grab (i.e. Van Veen or Box corer) or coring equipment will be selected based on water depth (offshore, inshore or shoreline) and sample size requirements. Sediment sample collection and handling will align with Standard operating procedures found in the Oil Spill Monitoring Handbook (Hook et al. 2016), specifically the following sections according to sampling equipment utilised: + Appendix G hydrocarbon analysis (Grab samplers) + Appendix H hydrocarbon analysis (Ship borne corer) + Appendix H Manual push corer, and + Appendix O Sediment infauna. The laboratory(ies) will inform and supply the appropriate sample containers, storage requirements, holding times, detection limits/limit of reporting for required analytes and the analysis required for each sediment sample. Sediment samples shall be analysed for key contaminants of concern including metals, hydrocarbons, nutrients, particle size distribution, and nutrients. <u>Infauna samples</u> A subset of the sediment sample shall be sieved in the field (if time permits) with collected infauna preserved (10% buffered formalin or 70% ethanol as prescribed by the receiving

SMP2 – Sediment Quality	
	laboratory) and sent to laboratory for identification of infauna to lowest taxonomic resolution possible. eDNA will also be collected to detect for the presence of marine infauna species in sediments. Sediment will be removed from the surface of a subset of the sediment sample and sent to an appropriate laboratory for analysis.
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP having been activated.
Resources	+ Marine scientist with field experience in deep sea sediment sampling + Scientist with skills in infauna identification + GIS personnel + NATA accredited laboratory for sample contaminant analysis + Laboratory for infauna sorting and taxonomic identification + Vessel with appropriate davit/winch to deploy grab/corer equipment and tender in operation + Refuelling facilities + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider to be capable of mobilising within 72 hours of the SoW having been approved by Santos. Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Sediment samples analysed by NATA-accredited laboratories for presence and concentrations of hydrocarbons associated with the spill including full suite PAHs and total organic carbon. A government endorsed laboratory for forensic fingerprinting (GC/MS) will be used. Infauna samples sorted and identified by qualified marine invertebrate specialist to acceptable taxonomic groups. Data will be entered to spatially explicit database and analysed statistically in order to detect significant differences among sites. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP3 – Sandy Beaches and Rocky Shores	
Rationale	Contact of entrained oil and stranded floating oil of shoreline habitats may occur on sandy beaches and rocky shores. Rocky and sandy shores provide habitat for a variety of intertidal organisms, which in turn provide food for shorebirds. Large tides tend to create a large degree of horizontal zonation amongst taxa. Rocky and sandy shores are included within the one receptor as they are often spatially mixed and both represent high energy regions.
Aim	To monitor changes in biota of sandy and rocky shoreline habitats in relation to an oil spill and associated activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, relevant available databases shall be reviewed for applicable rocky shoreline and sandy beach biota baseline data.

SMP3 – Sandy Beaches and Rocky Shores	
Initiation criteria	Operational monitoring, SMP1 or SMP2 indicates that rocky and/or sandy shorelines are contacted or predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Shoreline assemblage structure, and hydrocarbon concentration levels in representative invertebrate species, are not significantly different from their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted assemblages; AND SMP2 Sediment Quality monitoring at the site has been terminated AND Shoreline clean-up at the site has been completed.
Receptor impact	Impact to shoreline invertebrates from pressures including hydrocarbons is measured through change in: + Species diversity + Assemblage composition + Abundance of indicator taxa. Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Litter/waste + Introduction of marine pests + Over-collection + Nutrification + Climate change.
Methodological approach	Monitoring will be designed as follows: 1. Where long-term baseline data sites are contacted, a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved, a post-spill pre-impact (preferable) or gradient approach to quantifying impacts will be applied. Owing to potentially high spatial variation in assemblage structure, post-spill pre-impact monitoring will be a priority where no baseline data exists. If this opportunity is not available, a gradient approach to monitoring will be applied. Sampling frequency will be dictated by the number and location of sampling sites and the philosophy of the sampling design. Rocky shoreline intertidal assemblages (fauna and flora) will be monitored using a quadrat/transect approach, with the positioning of quadrats/transects accounting for any natural variation in assemblage structure along a seaward-landward gradient. Assemblage structure to be recorded through in-situ counts of fauna and flora or still images taken for further analysis. Sandy shoreline infauna will be sampled by way of replicated grab/core samples. Sampling sites within impacted and non-impacted areas to consider any cross-shore gradient in assemblage structure that may exist. Where baseline data exists, the methodology will be adapted to available data so that results are comparable. Samples to be sieved with collected infauna preserved (10% buffered formalin or 70% ethanol as prescribed by the receiving laboratory) and sent to laboratory for identification of fauna to lowest taxonomic resolution possible. Process to follow that for baseline data where this pre-exists.

SMP3 – Sandy Beaches and Rocky Shores	
	Biomonitoring of hydrocarbon concentrations in shoreline invertebrates will occur through collection of replicated tissue samples from representative, and preferably widely available species, across impact and non-impacted locations. The laboratory(ies) will supply and inform the appropriate method for collection, storage and holding times of tissue samples for required laboratory analysis and to avoid cross-contamination among samples. Where limitations in the distribution and abundance of representative invertebrate species preclude collection of sufficient samples for analysis, in-situ biomonitoring using a locally available species (e.g. the use of caged oysters) shall be considered for assessing spatial and temporal changes in bioaccumulation of hydrocarbon concentrations in invertebrates across impact and reference sites.
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Senior Scientist with experience in shoreline macroinvertebrates sampling + Supporting Scientist + GIS personnel + Helicopter or available vessel and tender in operation + Refuelling facilities + Sample containers and preservative + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby + Laboratory facilities for sorting and taxonomic identification of specimens
Implementation	With the aim of collecting post-spill pre-impact data, service provider able to mobilise within 72 hours of the SoW having been provided to them (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Specimens not identified in situ (in the field) will be processed and identified in the laboratory by appropriately qualified scientists. Biota tissue samples (if collected) analysed for hydrocarbon contaminants by NATA-accredited laboratories. Data will be entered to spatially explicit database and analysed in order to test for significant difference between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP4 – Shorelines and Coastal Habitats - Mangrove Communities	
Rationale	In the event of Tier 2 or 3 spill, mangroves may be contacted by floating or entrained oil. Mangrove health may be adversely affected due to increased concentration of hydrocarbons in sediments and coating due to surface oil, which in turn can lead to leaf-loss, mortality and a reduction in areal extent of mangrove habitat. This plan's focus is mangrove vegetation. Associated monitoring of sediment quality and mudflat fauna is described in SMP2 and SMP5, respectively.

SMP4 – Shorelines and Coastal Habitats - Mangrove Communities	
Aim	To monitor changes to mangrove extent and health in relation to an oil spill and associated activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). Baseline extent and of mangroves is monitored by remote sensing in several regions, and further historical and post-impact data for mangrove health and extent can be obtained as remotely sensed imagery (e.g., Sentinel, Landsat and WorldView).
Initiation criteria	Operational Monitoring, SMP1 or SMP2 indicates that mangroves are contacted or predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Mangrove extent and health are not significantly different from their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted mangroves; AND Sediment quality monitoring (SMP2) at the site has been terminated; AND Shoreline response at the site has been completed.
Receptor impact	Impact to mangroves from pressures including hydrocarbons is measured through change in: + Tree health + Aerial extent. Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Litter + Introduction of marine pests + Dust + Sedimentation from human activities + Climate change.
Methodological approach	Remote sensing data will be accessed for the purpose of detecting change in aerial cover and change in canopy health through and index of plant health (e.g., NDVI or MSAVI) (Astron Environmental Services 2013). Where long term on-ground baseline monitoring has occurred, further post impact on-ground monitoring should be carried out to complement any analysis of remote sensing. Analysis of long-term on-ground monitoring data will be as follows: 1. Where long-term baseline data sites (only) are contacted a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved a gradient approach to quantifying impacts will be applied (See Appendix B for detailed description of these approaches and Figure 1, detailed in Baseline Data Review (Astron Environmental Services 2019) (QE-00-BI-20001)). On-ground monitoring of mangroves will aim to detect change in mangrove health, including canopy cover and plant/leaf health indices. Field methodology will follow the routine monitoring techniques currently employed for Santos operations (Quadrant Energy Australia Limited 2018), adapting where required to align with pre-existing baseline field data, where available. Sampling of sediments as per SMP2 will occur at mangrove health assessment sites to allow any changes in mangrove health to be related to sediment hydrocarbon levels.

SMP4 – Shorelines and Coastal Habitats - Mangrove Communities	
	In-field mangrove health sampling frequency will be dictated by the number and location of sampling sites and the sampling design applied.
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Senior Scientist with experience in mangrove condition assessment + Supporting Scientist + GIS and remote-sensing personnel + Available vessel in operation + Satellite and/or aerial imagery
Implementation	On-ground monitoring will only occur where long-term baseline data has been collected, and hence no post-spill pre-impact data collection will be required. On-ground post-spill data will be collected at an appropriate time as guided by the analysis of remote sensing imagery, and potential on-ground assessment.
Analysis and reporting	Data will be entered to spatially explicit database and analysed in order to test statistically significant change to parameters associated with hydrocarbon spill. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP5 – Shorelines and Coastal Habitats - Intertidal Mudflats	
Rationale	Intertidal mudflat communities are primary producer habitats which support invertebrate fauna, which in turn provides a valuable food source for shorebirds. High diversity of infauna (particularly molluscs) occur within these habitats and may be affected by penetrating oil. At high tide, these habitats become foraging grounds for vertebrates such as rays and sharks. These habitats are at high risk of impact as the sheltered environments promote high faunal diversity combined with low-energy wave action.
Aim	To monitor changes in intertidal mudflat communities associated with an oil spill and associated activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, relevant available baseline databases shall be reviewed for applicable intertidal mudflat infauna baseline data.
Initiation criteria	Operational Monitoring, SMP1 or SMP2 indicates that mudflat habitats are contacted or predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Mudflat infaunal assemblages are not significantly different from their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted assemblages; AND SMP2 Sediment Quality monitoring at the site has been terminated; AND Clean-up of the shoreline site has been completed.
Receptor impact	Impact to mudflat epifauna and infauna from pressures, including hydrocarbons, is measured through change in: + Species diversity + Assemblage composition + Abundance of indicator taxa.

SMP5 – Shorelines and Coastal Habitats - Intertidal Mudflats	
	Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Overfishing (bait collecting) + Introduction of marine pests + Climate change.
Methodological approach	Monitoring will be designed as follows: 1. Where long-term baseline data sites are contacted, a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved a post-spill pre-impact (preferable) or gradient approach to quantifying impacts will be applied (See Appendix B for detailed description of these approaches and Figure 1). Owing to potentially high spatial variation in assemblage structure, post-spill pre-impact monitoring will be a priority if baseline data are not available. If this opportunity is not available, a gradient approach to monitoring will be applied. Mudflat infauna will be sampled by way of replicated grab/core samples. Sampling sites within impacted and non-impacted areas to consider any cross-shore gradient in assemblage structure that may exist. Where baseline data exists methodology to adapt to available data such that results are comparable. Sites selected for mudflat infauna sampling to be concurrently sampled for sediment quality as per SMP2. Sampling frequency will be dictated by the number and location of sampling sites and the philosophy of the sampling design. Samples to be sieved with collected infauna preserved (buffered formalin or 70% ethanol as prescribed by the receiving laboratory) and sent to laboratory for identification of fauna to lowest taxonomic resolution possible. Process to follow that for baseline data where this pre-exists.
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Senior Scientist with experience in epifauna and infauna assessment and sampling + Supporting Scientist + GIS personnel + Helicopter or available vessel and tender in operation + Refuelling facilities + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	With the purpose of collecting post spill pre-impact data, service provider able to mobilise within 72 hours of the scope of work having been provided to them (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilization time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database and analysed to determine significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card.

SMP5 – Shorelines and Coastal Habitats - Intertidal Mudflats	
	Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP6 – Benthic Habitats	
Rationale	Benthic habitats are those habitats associated with the seafloor. Major benthic habitats at risk are: + Coral reefs (likely high susceptibility to spill) + Macroalgae and seagrass (likely moderate susceptibility to spill) + Non-coral benthic filter feeders (likely moderate susceptibility to spill) + Sub-tidal pavement (likely moderate susceptibility to spill) + Soft-substrate (likely lower susceptibility to spill). Macroalgal and seagrass communities are important primary producers that also provide habitat, refuge areas and food for fish, turtles, dugongs, and invertebrates. Seagrass and macroalgae also increase structural diversity and stabilise soft substrates. Non-coral benthic filter feeders, which include sponges, molluscs, sea whips and gorgonians, are considered indicators of disturbance due to their immobility and long life cycles. Corals are important primary producers that provide food, substrate, and shelter for a diversity of marine life, including invertebrates and fish. They also protect coastlines from wave erosion and provide important substrate for algae. Undisturbed intertidal and subtidal coral reefs occur in several locations throughout the region.
Aim	To monitor changes in the cover and composition of benthic habitats in relation to an oil spill and associated activities. To monitor change in hard coral health and reproduction in relation to an oil spill and associated activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, relevant available baseline metadata databases will be reviewed for applicable benthic habitat and coral health and reproduction baseline data. Remote sensing data, satellite and aerial imagery previously acquired may also be applicable for shallow clear-water benthic habitats to detect changes in benthic habitat cover and composition. Pollution-induced change to benthic habitat cover and composition may take some time to be detected. Therefore, post-spill, pre-impact benthic survey data will be collected when required to have a baseline state following initial oil contact.
Initiation criteria	<u>Benthic habitat cover and composition</u> Operational Monitoring, SMP1 or SMP2 indicates that subtidal benthic habitats are contacted or are predicted to be contacted by a hydrocarbon spill. <u>Coral health and reproduction</u> Operational Monitoring, SMP1 or SMP2 indicates that coral habitat is contacted or is predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	<u>Benthic habitat cover and composition</u> Cover and composition of benthic habitats are not statistically significantly different from that of their baseline state (where baseline data exists) or are not statistically significantly different from comparable non-impacted assemblages.

SMP6 – Benthic Habitats	
	Coral health and reproduction Hydrocarbon concentration in corals, reproductive state and settlement indices are not statistically different from the baseline state (where baseline data exists) or from comparable non-impacted assemblages.
Receptor impact	Impact to benthic habitats from pressures including hydrocarbons is measured through change in: + Species diversity + Assemblage composition + Percent cover. Other pressures to these states are: + Physical disturbance + Discharge of toxicants + Introduction of marine pests + Shading + Climate change.
Methodological approach	Monitoring design will be as follows: 1. Where long-term baseline data sites are contacted, a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved, a gradient approach to quantifying impacts will be applied (See Appendix B for detailed description of these approaches and Figure 1). Benthic Habitat Cover and Composition Field survey methodology will be based upon acquiring repeat digital imagery (video or still images) of benthic habitats along random transects (preferable), using a stratified sampling approach at each site to target different habitat types and depths where clear gradients in these conditions exist. Site selection and image acquisition methodology will aim to align applicable baseline studies where these exist, such that imagery is comparable. The number of sites and frequency of sampling will depend upon the sampling design philosophy. Divers, towed video or remotely operated vehicles (ROVs) will be employed to collect imagery considering safety aspects and the depth of water at survey locations. Where divers are employed, fish species may also be recorded where practicable (for example following methodologies employed by Babcock et al. (2008) to contribute to SMP11. Coral Health and Reproduction Using divers, selected coral colonies will have tissue samples removed for the purpose of laboratory analysis of the concentration of accumulated hydrocarbons and for determining reproductive state, noting sampling for reproductive state will be dependent upon the timing of coral spawning. Reproductive state will be determined from measures of gamete size, stage and fecundity determined from in-field examination and laboratory analysis of histological samples. In addition to the standard suite of ecotoxicology testing done on the released hydrocarbon as part of the Operational Monitoring Program, ecotoxicology testing of the released hydrocarbon on the larval competency of representative coral species will be conducted. Settlement plates will be deployed to monitor settlement of coral recruits following spawning periods to ascertain the level of coral recruitment at impacted and non-impacted sites.
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.

SMP6 – Benthic Habitats	
Resources	+ Senior Marine Scientist with experience in benthic habitat assessment + Supporting Scientist + Divers or ROV operators + GIS personnel + Available vessel in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby + Diving equipment or ROVs + Video recording facilities + Satellite imagery
Implementation	Service provider is to be able to mobilise within 72 hours of the SoW being approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Digital imagery will be analysed using a point-count technique (using software such as AVTAS, Coral Point Count with Excel extensions (CPCe) or TransectMeasure (SeaGIS)) to estimate the percentage cover of biotic and abiotic categories (in line with the CATAMI classification scheme) comprising the benthic habitat. Biotic categories to include the following as applicable: corals; macroalgae and seagrass; and non-coral benthic filter feeders. Live, dead and bleached coral cover shall be recorded. The imagery collected will allow for the determination of percent cover, abundance, measurement of size (if scaling lasers are included in the image) and a visual assessment of health (Kohler and Gill 2006). NATA accredited laboratory analysis to determine the concentration of hydrocarbons within coral tissue. Reproductive output to be determined by complementary means, including in-field and laboratory analysis of gametes, including microscopic examination of histological samples preserved in the field. Coral larval competency tests to be conducted by ecotoxicological laboratory in addition to standard suite of ecotoxicological tests using released hydrocarbon. Data will be entered to spatially explicit database and analysed to determine significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card provided as part of report. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP7 – Seabirds and Shorebirds	
Rationale	Marine waters and coastal habitats in the EMBA contain key habitats that are important to birds, including offshore islands, sandy beaches, tidal flats, mangroves and coastal and pelagic waters. These habitats support a variety of birds which utilise the area in different ways and at different times of the year. Birds can be broadly grouped according to their preferred foraging habitat as coastal/ terrestrial birds, seabirds and shorebirds, both migratory and resident. For the purposes of this document, seabirds and shorebirds are defined as: shorebirds – those birds that inhabit and feed in the intertidal zone and adjacent areas and are resident or migratory, using the area principally during the austral summer.

SMP7 – Seabirds and Shorebirds	
	seabirds – those birds associated with the sea and deriving most of their food from it, and typically breeding colonially, including the marine raptors osprey and white-bellied sea eagle.
Aim	Quantify seabirds and shorebirds, in the spill and response areas. Quantify lethal and/or sub-lethal impacts of hydrocarbon spill exposure on seabirds and shorebirds. Monitor changes in seabird populations (reproductive success) in relation to the hydrocarbon spill and clean-up activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). The Oil Spill Response Atlas (Australian Maritime Safety Authority (AMSA)), National Conservation Values Atlas (Department of Agriculture, Water and the Environment (DAWE) (http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) and any local oiled wildlife response plans should also be consulted.
Initiation criteria	Operational monitoring indicates that known foraging, roosting or nesting areas for seabirds and/or shorebirds has been contacted, or are predicted to be contacted, by a hydrocarbon spill; OR Operational monitoring indicates that seabirds and shorebirds have been contacted, or are predicted to be contacted, by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Detectable levels of hydrocarbons attributable to the hydrocarbon spill are not present in seabird and shorebird tissues; AND Measured variables are not statistically significantly different from their baseline or pre-spill state (where these data exist) or from measured variables at non-impacted sites; AND Monitoring is terminated in consultation with the relevant environmental authority (relevant regional authority and/or DAWE).
Receptor impact	Impact to seabirds and shorebirds from pressures including hydrocarbons is measured through change in: + Species diversity + Bird abundance + Health/condition + Breeding success (resident species only). Other pressures to these states are: + Physical disturbance of foraging and nesting habitat + Accidental chemical spillage + Entanglement in litter + Displacement by less favourable species (e.g. Silver Gull) + Predation + Climate change.
Methodological approach	Monitoring design will be as follows: 1. Where long-term baseline data sites are contacted a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. Given the ease of survey establishment, post-spill pre-impact monitoring will be attempted wherever practicable in order to established pre-impact state.

SMP7 – Seabirds and Shorebirds	
	3. Where no baseline data sites are involved a gradient approach to quantifying impacts will be applied (See Appendix B for detailed description of these approaches and Figure 1, detailed in Baseline Data Review (Astron Environmental Services 2019) (QE-00-BI-20001)). Monitoring for seabirds and shorebirds will measure abundance and diversity in key foraging/roosting areas with the timing of surveys to coincide with seasonal peaks in abundance. The seabird and shorebird roost count monitoring will follow current accepted survey methodology, such as Birdlife Australia's Australian Shorebird Monitoring Program and survey guidelines standardised by the DAWE (Department of the Environment and Energy 2017). Monitoring of seabirds to focus on nesting (burrow) density, breeding participation and breeding success, taking measurements of the number of adults, eggs and chicks with the timing of surveys to allow assessments immediately after egg laying and immediately prior to chick fledging. Bird mortality to be recorded during monitoring of seabirds and shorebirds with tissue samples taken from dead birds for hydrocarbon analysis in the laboratory. Necroscopies will follow the process of Gagnon and Rawson (2010).
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	+ Experienced seabird biologist + Experienced shorebird biologist + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis and necropsy + Available vessel and tender in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider able to mobilise within 72 hours of the scope of work having been provided to them (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and associated timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database and analysed in order to determine significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card. Draft annual report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP8 – Marine Mammals	
Rationale	At least 11 species of listed marine mammals are known to, or are thought to occur, in Australian waters within the environment that may be affected. These include cetaceans (whales and dolphins) and sirenians (dugong). Effects to marine megafauna due to presence of surface oil, entrained oil and dissolved aromatic hydrocarbons may include behavioural (e.g. deviation from migratory routes), physiological (e.g. disruption to digestion) or physical effects. Given large spatial variation in occurrence and broad scale movement, population estimates, and associated change are not often available. This plan will focus on assessing the extent of impacts to animals within the region, and where possible, the level of recovery. This will then be used to deduce potential impacts at a population level.

SMP8 – Marine Mammals	
Aim	To monitor short and long-term environmental effects on marine mammals that may have resulted from the hydrocarbon spill and associated response.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). The Oil Spill Response Atlas (Australian Maritime Safety Authority (AMSA)), National Conservation Values Atlas (DAWE -http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) and local oiled wildlife response plans should also be consulted.
Initiation criteria	Operational monitoring indicates that marine mammals are contacted or predicted to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Restoration or resumption of key biological processes (e.g. abundance, distribution, breeding) necessary to ensure post-impact recovery is demonstrated. Specific criteria to be developed by Marine Scientist(s) with expertise in marine mammals of the region; AND No further instances of dead marine mammals with detectable levels of hydrocarbons attributable to the hydrocarbon spill; AND Monitoring is terminated in consultation with the relevant environmental authority (relevant regional authority and/or DAWE).
Receptor impact	Impact to marine mammals from pressures including hydrocarbons is measured through observed injury and mortality. Other pressures to these states are: + Physical disturbance + Entanglement in fishing gear and litter + Accidental chemical spillage + Climate change + Over-exploitation.
Methodological approach	Aerial and marine surveys will be implemented to identify individuals in proximity of the spill and to quantify damage: + Aerial surveys will follow the protocols of Hedley et al. (2011), **Appendix C8** + Marine surveys will follow the protocols of Watson et al. (2009), **Appendix C8** Tissue sampling of dead or injured animals will follow the protocols of: + Department of Environment and Heritage (DEH) (2006) (Cetaceans) + Eros et al. (2000) (Dugongs).
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.
Resources	**Aerial survey** + Senior Marine Scientist + Trained marine wildlife observers x 2 + Fixed wing aircraft (incl. pilot/s) + Refuelling facilities **Vessel-based survey** + Senior Marine Scientist + Trained marine wildlife observers x 2 + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis and necropsy + Available vessel in operation

SMP8 – Marine Mammals	
	+ Sample container and preservative + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database. Data and conclusions will be summarised in an environmental report card. Statistical power related to these receptors is likely to be low, due to observational data and small sample sizes. Therefore, the assessment of quantified impacts will be corroborated with marine scientist(s) with expertise in relevant fauna. Draft annual report to be prepared within one month of annual monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP9 – Marine Reptiles	
Rationale	At least 10 species of listed marine reptiles are known to, or are thought to occur, in Australian waters within the environment that may be affected. This includes six species of marine turtle that occur in, use the waters, and nest on sandy beaches, two species of sea snake and one species of estuarine crocodile found in most major rivers systems of the Kimberley region and in the Northern Territory. Impacts to marine reptiles due to presence of surface oil, entrained oil and dissolved aromatic hydrocarbons may include behavioural, physiological (e.g. disruption to digestion) or physical effects.
Aim	To observe and quantify the presence of marine reptiles in the spill and response areas, and broader regional areas. To assess and quantify lethal impacts or sub-lethal impacts of this exposure or interactions. To monitor changes in marine reptile populations in relation to an oil spill and associated activities.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). The Oil Spill Response Atlas (Australian Maritime Safety Authority (AMSA)), National Conservation Values Atlas (DAWE -http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) and local oiled wildlife response plans should also be consulted.
Initiation criteria	Operational monitoring indicates that marine reptiles or nesting sites are contacted or likely to be contacted by a hydrocarbon spill; OR Operational monitoring indicates that marine reptiles are contacted, or are predicted to be contacted, by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Detectable levels of hydrocarbons attributable to the hydrocarbon spill are no longer present in marine reptile tissues collected from live or dead individuals; AND In the event that an impact attributable to the hydrocarbon spill is detected on marine reptiles, the measured parameters are not statistically significantly different from their baseline or pre-spill state (where these data exist) or from measured parameters at non impacted sites; AND

SMP9 – Marine Reptiles	
	Monitoring is terminated in consultation with the relevant environmental authority (relevant regional authority and/or DAWE).
Receptor impact	Impact to marine reptiles from pressures including hydrocarbons is measured through change in: + Abundance + Health/condition + Nesting success (turtles and crocodiles). Impact to other marine reptiles from pressures including hydrocarbons is measured through change in observed injury and condition. Other pressures to these states are: + Lighting and flares causing disorientation (turtles) + Vessel strike + Physical disturbance of nesting sites + Predation + Entanglement in fishing gear and litter + Accidental chemical spillage + Habitat loss or change due to dredging + Climate change + Over-exploitation.
Methodological approach	**Abundance** In-water impacts – aerial surveys. Shoreline impacts – ground surveys (either rapid census survey or tagging program). **Health/condition** In-water impacts – vessel surveys (collecting observations on animal condition and collection of tissue samples or dead specimens for analysis). Shoreline impacts – ground surveys (collecting observations on animal condition and collection of tissue samples or dead specimens for analysis). Dead reptiles will be collected for autopsy following Gagnon (2009). **Reproductive success** Shoreline impacts – ground surveys (detailed tagging and/or nesting success studies). Design of ground surveys will be applied as follows: 1. Where long-term baseline data sites are contacted a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. Where no baseline data sites are involved, and timing allows, a post spill pre-impact approach will be attempted. 4. If a post-spill pre-impact approach is not practicable, a gradient approach to quantifying impacts will be applied
Scope of work	Prepared by monitoring provider for issue within 24 hours of SMP being activated.

SMP9 – Marine Reptiles	
Resources	**Aerial survey** + Senior marine scientist + Trained marine wildlife observers x 2 + Fixed wing aircraft (incl. pilot/s) + Refuelling facilities **Vessel-based Survey** + Senior Marine Scientist + Trained marine wildlife observers x 2 + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis and necropsy + Available vessel in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	Data will be entered to spatially explicit database. Turtle data will be analysed in order to test for significant differences between impacted and non-impacted assemblages. Data and conclusions will be summarised in an environmental report card. Owing to their observational nature and potentially low sample size, observed impacts to other reptile fauna will be corroborated with marine scientist(s) with expertise in relevant fauna for the region. Draft annual report to be prepared within one month of annual monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP10 – Seafood Quality	
Rationale	Exposure of commercial and recreationally targeted demersal and pelagic fish species to entrained and dissolved aromatic hydrocarbons can cause flesh tainting and increase the levels of toxicants above human consumption guidelines. Aromatic hydrocarbons are carcinogenic to humans. This scope includes finfish, sharks and invertebrates (principally crustacea).
Aim	To identify potential human health risks due to the presence of hydrocarbon concentrations in the flesh of targeted seafood species for consumption.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). Human health benchmarks relating to the exposure of PAHs shall be used to determine health effects as per Yender et al. (2002). Flesh samples from non-impacted sites to be used as baseline for olfactory analysis for flesh taint.
Initiation criteria	Operational monitoring and results from SMP1 predict or observes contact of oil to target species for consumption as defined in **Table 1**.

SMP10 – Seafood Quality	
Termination criteria	The following termination criteria will be adopted in consultation with responsible fisheries and human health agencies. Hydrocarbon concentrations in seafood tissues are not above levels considered a human health risk; AND Flesh taint is not detected from olfactory testing of seafood samples; AND Target species are no longer exposed to hydrocarbons in the water column.
Receptor impact	Impact to seafood quality from hydrocarbons is measured through change in: + Toxicity indicators + Olfactory taint. Other pressures to these states are: + Accidental chemical spillage + Disease.
Methodological approach	Target fish species determined from water quality monitoring results and relevant and available commercial and recreational-fished species. Sampling of target species will follow a gradient design (Gagnon and Rawson 2012) ranging from impacted to non-impacted (or non-suspect) catches using commercial and recreational fishing techniques undertaken by commercial and recreational fishers. Sampling method (netting, trawling, baited fish traps, spear fishing, line fishing) will be determined by habitat, target species and spill location. If more than one target species is affected, replicate samples of each species shall be collected, with a minimum of five replicate samples. Olfactory testing will follow Rawson et al. (Rawson et al. 2011) in **Appendix C10**, following the duo-trio method (Standards Australia 2005).
Scope of work	Prepared by monitoring provider for issue within 24 hours of this SMP being activated.
Resources	+ Senior marine scientist + Marine vessel + Sample containers and preservative + NATA accredited laboratory for sample analysis + Decontamination/washing facilities
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	Laboratories will be NATA-accredited for food standards analyses. Data will be stored in spatially explicit database and analysed to test for significant differences between impacted and non-impacted seafood. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP11 – Fish, Fisheries and Aquaculture	
Rationale	Impacts to fisheries species due to presence of entrained hydrocarbons may include lethal and sub-lethal physiological effects (e.g. reduced growth) and physical effects. The region comprises the Indo-West Pacific area which consists of a high diversity of fish species and assemblages and provides important spawning and nursery grounds for several fisheries species. Fish are concentrated in a number of biodiversity hotspots. The environment is also conducive to aquaculture including pearl production. Fisheries species that spawn or inhabit near shore areas face a greater risk to an oil spill than finfish found in deeper waters.
Aim	To monitor changes in structure and distribution of fish assemblages in relation to an oil spill and associated activities. To monitor the effect of hydrocarbon exposure and physiological condition on fisheries and aquaculture species.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). In addition, available relevant survey databases shall be reviewed for applicable baseline data.
Initiation criteria	Operational monitoring indicates fish, fisheries or aquaculture are contacted or likely to be contacted by a hydrocarbon spill as defined in Table 1.
Termination criteria	Fish assemblages are not statistically significantly different than those of baseline or similar non-impacted assemblages; AND Hydrocarbon concentrations, physiological condition indices, and biomarker levels in affected fish and aquaculture species are not statistically significantly different from those of non-impacted samples; AND Termination of monitoring is done in consultation with the responsible fisheries agencies.
Receptor impact	Impact to fish, fisheries and aquaculture from pressures including hydrocarbon concentrations is measured through change in: + Species diversity + Abundance of indicator taxa + Assemblage structure + Health. Other pressures to these states are: + Accidental chemical spillage + Overfishing + Introduction of marine pests + Habitat disturbance + Climate change.
Methodological approach	Fish assemblages will be assessed using the stereo-baited remote underwater videos (BRUVs) following Shortis et al. (2009), **Appendix C11**. Fish assemblages will be randomly sampled within discrete habitats at cross-shelf impact areas and non-impact areas. Sampling design for fish assemblages will be as follows: 1. Where long-term baseline data sites are contacted a control chart (time-series) design will be applied. 2. Where appropriately matched baseline data sites are impacted and non-impacted, a BACI approach to monitoring will be applied. 3. If baseline data is not available, a gradient approach to quantifying impacts will be applied (See Appendix B for detailed description of these approaches and Figure 1).

SMP11 – Fish, Fisheries and Aquaculture	
	Where relevant, data available from responsible fisheries agencies including catch/effort data, will be assessed to determine potential changes from baseline levels in fishing grounds potentially affected by an oil spill compared to after the event. For fish and aquaculture species potentially exposed to an oil spill, species will be sampled across the contamination gradient as per Gagnon and Rawson (2012). Hydrocarbon concentrations (particularly PAH) within tissues of fish and aquaculture species will be determined. Exposure to hydrocarbons on fish health will also be determine through analysis of physiological indices and biochemical markers following Gagnon and Rawson (2012). If fish kills are observed, whole specimens will be obtained and preserved (frozen) for necropsy to determine the cause of death.
Scope of work	Prepared by monitoring provider for issue within 24 hours of this SMP being activated.
Resources	+ Senior marine scientist + Marine scientist trained in fish identification and necropsy + Marine scientist with BRUV experience + NATA accredited laboratory for sample analysis + Available vessel and tender in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby + Resources to analyse BRUV data.
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	BRUV imagery will be processed using EventMeasure (SeaGIS) software. NATA-accredited laboratories will be employed for health analyses. Data will be entered to spatially explicit database and analysed to test for statistically significant differences between non-impacted and impacted fish assemblages. Data and conclusions will be summarised in an environmental report card. Final draft report to be prepared within one month of monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

SMP12 – Whale Sharks	
Rationale	The whale shark (*Rhincodon typus*) is known to occur within the region. One of the best known aggregation sites occurs along the central and north-west coast of Western Australia from March to July. Whale sharks are also known to be highly migratory and a biologically important area for foraging extending into the Kimberley region of Western Australia also overlaps with the environment that may be affected. Effects to the whale shark due to presence of surface oil, entrained oil and dissolved aromatic hydrocarbons may include behavioural (e.g. deviation from migratory routes), physiological (e.g. disruption to digestion) or physical effects. Given large spatial variation in occurrence and broad scale movement, population estimates, and associated change are not often available. This plan will focus on assessing the extent of

SMP12 – Whale Sharks	
	impacts to animals within the region, and where possible, the level of recovery. This will then be used to deduce potential impacts at a population level.
Aim	To quantify impacts of an oil spill on whale sharks within Biologically Important Areas (BIAs) along the north-west and north Western Australian coastline.
Baseline	Refer to the Baseline Data Review (Astron Environmental Services 2021) (SO-91-RF-20022 Rev 0). The Oil Spill Response Atlas (Australian Maritime Safety Authority (AMSA)), National Conservation Values Atlas (DAWE -http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf) and Pilbara Region Oiled Wildlife Response Plan (Department of Parks and Wildlife and Australian Marine Oil Spill Centre 2014) should also be consulted.
Initiation criteria	Operational monitoring indicates that whale shark aggregations are contacted or likely to be contacted by a hydrocarbon spill as defined in **Table 1**.
Termination criteria	Measured parameters of whale shark abundance and distribution are not significantly different to baseline levels; AND The water quality at feeding/aggregation sites has been measured as not significantly different to baseline levels.
Receptor impact	Impact to whale sharks from pressures including hydrocarbons is measured through observed injury and mortality. Other pressures to these states are: + Intentional and unintentional mortality from fishing outside Australian waters + Boat strike + Habitat disruption from mineral exploration, production and transportation + Marine debris + Climate change.
Methodological approach	During spill activities may require the following surveys and sampling: + Aerial surveys + Satellite tagging + Toxicology + Food chain studies + Photo-identification + Vessel and plane logs + Acoustic tagging. The methodologies adopted will follow the approaches of those baseline studies identified allowing consistency of data from baseline to impact and recovery phases.
Scope of work	Prepared by monitoring provider for issue within 24 hours of this SMP being activated.
Resources	+ Senior marine scientist + Trained marine wildlife observers x 2 + Fixed wing aircraft (incl. pilot/s) + Refuelling facilities + Personnel with pathology or veterinary skills + NATA accredited laboratory for sample analysis + Available vessel and tender in operation + Decontamination/washing facilities + Safety aircraft/rescue vessels on standby

SMP12 – Whale Sharks	
Implementation	Service provider to be able to mobilise within 72 hours of the scope of work having been approved by Santos (this time allowing for costing, preparation of equipment and disposables and travel to site). Actual mobilisation time will depend on the decision to adopt post-spill pre-impact monitoring and spill timing requirements.
Analysis and reporting	Draft annual report to be prepared within one month of annual monitoring completion; external peer review of final draft within two weeks of report provision to reviewer; finalise report within two weeks of peer review having been completed.

Appendix E: SMP Activation Process

Oil Spill Operational and Scientific Monitoring Activation Form

astron
astron.com.au

Instructions

In the event of a spill requiring a response from Astron follow these steps:

1. **Activate a response – call 1300 902 700**
2. **Immediately complete this Activation Form and email to spillresponse@astron.com.au**

You will receive a call back from the Monitoring Coordinator within 30 minutes. In the event that a call back is not received, please call 1300 902 700 again.

Note: If new information should become available after submitting this form, or the situation changes, please advise the Astron Monitoring Coordinator as soon as possible.

Section 1: Contact Details

Name of notifying person		
Position in Incident Command Team		
Direct phone		
Mobile		
Email address		
Command centre location		
Command centre direct phone		
Date and time of notification	Click here to enter a date.	Enter time, i.e. 1400 WST

Section 2: Spill Details

Date and time of spill		Click here to enter a date.			Enter time, i.e. 1400 WST		
Spill source location (GDA94, MGA Zone 50)		Insert coordinates in GDA94 MGA Zone 50 format (easting and northing).					
		Insert location description					
Source of spill							
Cause of spill (if known)							
Status of spill		☐ Secured	☐Uncontrolled	☐Unknown			
Release rate	Instantaneous release						State units
	OR						
	Continuous release		per hour for		☐Hours	☐Days	
Description of spill	Estimated quantity						State units
	Incident tier	☐1	☐2	☐3			
	Direction of travel						
	Trajectory						
Modelling provider log in details							

Oil Spill Operational and Scientific Monitoring Activation Form

Section 3: OMP/SMP activation	
SMPs to be activated. Where there is doubt whether an SMP should be activated the SMP should be selected. Refer to the Oil Spill Scientific Monitoring Plan (EA-00-RI-10099) for initiation criteria for SMPS.	☒SMP1 – Water quality ☒Operational water quality monitoring ☐SMP2 – Sediment quality ☐SMP3 – Sandy beaches and rocky shores ☐SMP4 – Mangroves ☐SMP5 – Intertidal mudflats ☐SMP6 – Benthic habitats ☐SMP7 – Seabirds and shorebirds ☐SMP8 – Marine megafauna ☐SMP9 – Marine reptiles ☐SMP10 – Seafood quality ☐SMP11 – Fish, fisheries and aquaculture ☐ Yet to be determined ☐ Other:_____

Section 4: Safety	
Detail any known safety or security risks	

Section 5: Approval	
I authorise the activation of a response by Astron Environmental Services Pty Ltd in connection with the above incident under the terms of Contract # [insert contract].	
Signature:	
Date and Time:	

Activate Our Team

In the event of a spill requiring scientific monitoring response call:

1300 902 700

Advise the operator:

1. **Your company**
2. **Your name and contact number**
3. **Brief reason for call (i.e. Exercise or Spill)**

A message will be relayed to our team to call you back.

↓

Provide additional details as requested by the Monitoring Coordinator on call-back

↓

Complete and submit the *Activation Form*

↓

Astron initiates Oil Spill Scientific Monitoring Activation & Response Process – refer to next page

Oil Spill Scientific Monitoring Activation and Response Process

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
Phase 1 – Activation					
1	Santos IMT (Environmental Team Leader (ETL))	Astron Monitoring Coordinator notified of incident.	On approval from Santos Incident Commander	Astron oil spill response phone number and answering service	
2	Astron Monitoring Coordinator (MC)	Call back client for further details, request *Activation Form* if not received.	Within 30 minutes of receiving initial notification	Activation Form	
3	Astron MC	Call Planning & Logistics Officer to advise of incident.	Immediately following Step 2	n/a	
4	Santos IMT (ETL)	Complete *Activation Form* and submit to Astron via email.	Within one hour following initial notification (Step 2)	Activation Form	
5	Astron Planning & Logistics Officer (PLO)	Notify MCT, Technical Advisors and key subcontractors via SMS Global.	Within 30 minutes of Step 3	SMS Global Guidance	
6	Astron PLO	Notify all staff of incident via SMS Global.	Within one hour of receiving Activation Form	SMS Global Guidance	
Phase 2 – Response Planning					
7	Astron MC	Maintain verbal communication with Santos IMT (ETL).	At least twice daily (0800 and 1700)	n/a	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
8	Astron MC Astron Operations Officer Astron PLO	Maintain Functional Log.	Daily	Functional Log	
9	Astron PLO	Set up Command Room.	Within 4 hours of activation (Step 5)	Command Room Resource Checklist	
10	Astron MC, PLO and BMT Oceanica Operations Officer	Attend Santos incident briefing and relay information to MCT.	As advised by the Santos IMT (ETL)	n/a	
11	Astron Operations Officer	MCT and Technical Advisors to meet at Royal St office, review personnel and equipment resource status.	Within 6 hours of activation (Step 5)	Capability report Training matrix Resource chart	
12	Astron PLO	Confirm availability of additional personnel and equipment resources.	Within 16 hours of activation (Step 5)	External Supplier Details Requisition Request Form	
13	Santos IMT (ETL)	Provide spill trajectory modelling and sensitive receptor information to Astron.	When available	APASA modelling Department of Transport database Santos GIS Mapping	
14	Astron MC in consultation with Santos ETL	Define the scale of response - identify which SMPs are activated. Identify if operational water quality monitoring is required.	Within 2 hours of receiving spill and receptor information (Step 13).	Scientific Monitoring Plan* Relevant OPEP Spill trajectory modelling Operational monitoring results	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
15	Astron Technical Advisors in consultation with Santos ETL	**Determine monitoring locations for activated SMPs:** • Identify monitoring locations in order of priority for activated SMPs based on: o nature of hydrocarbon spill o spill trajectory modelling and time to shoreline impacts o sensitive receptors impacted or potentially at risk of being impacted o state of current baseline data o current environmental conditions o current results of operational monitoring. • Determine if post-spill pre-impact data is required to be collected from any locations. See SMP Work Method Statements for decision making process when considering availability of baseline data.	Within 6 hrs of relevant SMP activation (Step 14).	Relevant SMPs Information from Astron: • baseline information for relevant receptors. Information from Santos IMT: • sensitive receptor information (including relevant conservation/management plans) from relevant EP, Santos GIS mapping and online resources (DoT oil spill response atlas, DoE conservation values atlas, DoE species profile and threats database) • oil spill trajectory modelling • response strategies and priority protection areas • results from OMPs currently activated • baseline information for relevant receptors as reference in the relevant SMP.	
16	Astron Technical Advisors in consultation with Santos ETL	Submit Department of Parks and Wildlife Licence applications	Within 12 hrs of relevant SMP activation (Step 14)	• Proposed monitoring locations • SMP methods	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
17	Astron Operations Officer, PLO & Technical Advisors in consultation with Santos ETL	**Determine personnel requirements:** • Identify number and competencies of personnel required for monitoring teams for each SMP based on: o activated SMPs o number of locations to be monitored o number of locations where pre-spill baseline data needs to be collected o timing of hydrocarbon spill and overlap with sensitive receptors in activated SMPs o logistical and equipment resource constraints. • Arrange additional personnel if required.	Within 12 hrs of activation if pre-impact data is needed.**	Information from Astron: • Capability report • Training matrix • Resource chart • relevant SMPs and WMS. Information from Santos IMT: • sensitive receptor information • oil spill trajectory modelling • response strategies and priority protection areas • equipment (i.e. vessels, aircraft) availability • logistics (availability of flights, accommodation, etc).	
18	Astron Operations Officer, PLO & Technical Advisors in consultation with Santos ETL	**Determine equipment requirements:** • Identify number and competencies of equipment required for each SMP based on: o activated SMPs o number of locations to be monitored o number of field teams and timing of mobilisation to the field o logistical and equipment resource constraints. • Arrange additional equipment resources if required.	Within 12 hrs of activation if pre-impact data is needed.**	Information from Astron: • Resource chart • relevant SMPs and WMS. Information from Santos IMT: • equipment (i.e. vessels, aircraft) availability • logistics (availability of flights, accommodation, etc).	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
19	Astron MC, Operations Officer, PLO & Technical Advisors	**Prepare and submit Monitoring Action Plan** (mission, objectives, strategies, tactics, tasks), including scope of works. **Prepare and submit cost estimate.** **Prepare and submit logistics request:** • Allocate personnel and equipment resources to field teams for relevant SMPs. • Submit SOW and logistics request for each activated SMP to Santos IMT for approval.	Within 24hrs of request for SoW (Step 15) for relevant SMP if pre-impact data is needed.**	Information from Astron: • Resource chart • relevant SMPs and WMS • agreed monitoring locations • Mobilisation and Logistics Form (incorporating SOW) • Monitoring Action Plan. Information from Santos IMT: • request for SoW • agreed monitoring locations.	
20	Santos IMT (ETL)	Santos to approve SOW, provide purchase order and initiate logistical arrangements.	Within 24 hours of SOW submission (Step 19).	Astron Mobilisation and Logistics Request	
21	Astron MC	Advise field personnel by email meeting invite, or phone if not in office.	Within 24 hours of SOW approval (Step 20).	Field team allocation	
22	Astron	Conduct incident briefing with all available Astron personnel.	Within 24 hours of SOW approval (Step 22).	Briefing template Monitoring Action Plan	
Phase 3 – Mobilisation					
24	Astron PLO	GIS and device preparation requests (field maps, data capture) submitted, and discussed with Geospatial team.	Within 24 hours of SOW approval (Step 22).	https://voyager/	
25	Astron Operations Officer	Conduct field team overview briefing, allocate tasks.	Within 36 hours of SOW approval (Step 22).	Briefing Template	

Step	Responsibility	Action	Timeframe#	Resources	Date/Time Complete
26	Field Team Leaders	Compile SMP grab packs, GIS information, field equipment, and prepare and submit HSE documentation to Santos IMT.	Within 48 hours of SOW approval (Step 22).	Information from Astron • SoW • Grab packs, SMP WMS and HSE documentation • GIS information/field maps • field equipment. Information from Santos IMT: • booking and logistics confirmations.	
27	Astron Technical Advisors	Conduct scope specific pre-mobilisation briefings.	Prior to mobilisation.	Pre-mob Briefing Template	
28	Santos ETL	Santos to approve HSE plan.	Within 24 hours of receiving HSE Plan.	Mobilisation and Logistics Form HSE plan	
29	Astron PLO	Personnel mobilised to site.	Within 72 hrs of SOW approval (Step 22) if pre-impact data is needed.**	Approved SOW	
Phase 4 – Response Operations					
30	Astron MC	Conduct Monitoring Action Plan review with MCT and Technical Advisors and communicate to Santos IMT (ETL).	Daily	Monitoring Action Plan template	
31	Astron PLO	Hold post-demobilisation debrief with field teams.	Within 3 days of demobilisation.	Demob Meeting Template	
32	Santos ETL	Santos to arrange approval of Monitoring Action Plan revisions and any additional mobilisation/logistics requirements.	Daily or as required	Monitoring Action Plan Mobilisation and Logistics Form	
33	Astron Field Team Leaders	Provide activity reports to Santos ETL.	Daily	Daily Activity Report Template	

[#] Timeframes are indicative and may be require adjustment where activities are dependent on information availability or affected by logistical constraints

*The Scientific Monitoring Plan (EA-00-RI-10099) provides the most up to date list of SMPs and activation criteria. Refer to the OPEP for operational water quality monitoring requirements.

**If post-spill, pre-impact data is not required then timeframes will be specific to each SMP. The lead times for resourcing, preparation of SoW and mobilisation of field teams may be longer depending on the timing of the spill, likely trajectory and life stages of receptors present or likely to be impacted.

For example, in SMP4 if post-spill, pre-impact data collection is not required then mangrove decline is likely to take several weeks to occur and there is lower priority for mobilisation of field teams for this SMP within the 72 hr timeframe. In this case, mobilisation within 30 days may be more appropriate.

Abbreviations

EMBA – Environment that May Be Affected
IMT – Incident Management Team
OMP – Operational Monitoring Program
OPEP – Oil Pollution Emergency Plan
Santos – Santos Energy Australia Limited
SMP – Scientific Monitoring Plan/Program
SoW – Scope of Works
WMS – Work Method Statement

Appendix F: Scientific Monitoring Capability

Scientific Monitoring Assurance and Capability Assessment

Assurance arrangements

Astron Environmental Services (Astron) is currently Santos' primary Monitoring Service Provider for the implementation of SMPs 1-11. A contractual arrangement exists with Astron to maintain standby arrangements as per the Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162) and have the resourcing capability to implement a first-strike response at all times. Astron maintains a relationship with a primary sub-contractor (BMT) for the provision of scientific monitoring for those SMPs where Astron does not have the required capability. Between Astron and BMT, capability exists to deliver first strike resourcing against SMPs 1-11 and SMP 12 will be conducted by capability obtained through the Australian Institute of Marine Science (AIMS).

Assurance on the continued maintenance of capability is provided through the delivery of monthly capability reports. These reports are generated by the Astron and BMT Planning and Logistics Officers and delivered to the Santos Spill Response Adviser along with a summary of any changes in resourcing or, and if required, how gaps in resourcing have been managed. Since the establishment of the scientific monitoring contract in 2015 Astron has always demonstrated through this process that it has the required capability to meet first strike resourcing as per the standby services contract.

Santos ensures that Astron/BMT standby arrangements are adequate through its exercise and auditing program. Santos regularly conducts exercises and tests with Astron and BMT to ensure that Santos IMT roles and Astron/BMT monitoring roles are familiar with the SMP activation arrangements while providing spot checks on resource availability. Santos has also recently undertaken a Tier 2 audit of Astron (December 2018) against its Oil Spill Scientific Monitoring Standby and Response Manual (EA-00-RI-10162). Assurance activities to date have demonstrated a high degree of compliance with standby service requirements.

Continuous improvement

Santos is committed to further improving its oil spill scientific monitoring capability. To that end, Santos is participating in a Joint Industry Operational and Scientific Monitoring Plans project, governed through an APPEA-Industry Steering Committee. This project, being progressed throughout 2021, is working towards a joint-industry capability for implementing a common suite of oil spill operational and scientific monitoring plans. The project aims to deliver efficiencies in implementing and testing oil spill scientific monitoring arrangements while increasing the level of resourcing and capability available to participating companies.

Baseline Data Assessment

The Santos approach to undertaking a baseline assessment is to focus on those sensitive receptors for which modelling predicts contact[6] within seven days at a probability > 5%, as indicated in RPS 2019 and RPS 2021 modelling reports. It is considered that contact within seven days would require

[6] Contact is defined as oil concentrations at sensitive receptors of >1 g/m^2 for surface oil, >10 g/m^2 shoreline oil and > 10 ppb for entrained and dissolved oil.

an enhanced understanding of available baseline data to ensure a timely response for scientific monitoring and these locations are referred to as Scientific Monitoring Priority Areas.

The Scientific Monitoring Priority Areas identified include the Vernon Islands, Bathurst Island, Melville Island, Cox-Finniss, Darwin, Litchfield, South Alligator, and the Oceanic Shoals Marine Park. A baseline assessment has been undertaken for Bathurst Island, Melville Island (collectively known as the Tiwi Islands) and the Oceanic Shoals AMP. An assessment is currently underway for the Cox-Finniss, Darwin, Litchfield and South Alligator regions, and will be complete before the Activity commences.

The following data sources were reviewed to identify baseline data related to the Scientific Monitoring Priority Areas identified:

+ all previously identified monitoring programs to confirm whether these programs were ongoing or complete
+ published scientific papers, searched for using relevant key words within Google Scholar, Web of Science and Research Gate
+ publicly available literature
+ monitoring plans from government agencies and industry
+ other internet references relevant to monitoring
+ agency progress reports and annual monitoring reports
+ Index of Marine Surveys for Assessments (IMSA) database
+ North West Atlas web portal
+ Australian Institute of Marine Science (AIMS), Western Australian Marine Science Institution (WAMSI), Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Marine Biodiversity Hub webpages and publication databases.

Following this an assessment of baseline data was undertaken and included the following steps:

1. A review of the following parameters for each program identified:
    - Integrated Marine and Coastal Regionalisation of Australia
    - Custodian- contact point for data
    - Spatial extent
    - Variables available for monitoring
    - Methods applied to monitoring
    - Year of most recent data capture
    - Total duration of monitoring program
    - Data completeness (number of years monitored as proportion of program duration)
    - How often data is captured
    - Appropriateness of variables (Judgement as to whether variables are appropriate for future oil spill monitoring)
    - Is there any clear indication that the monitoring will continue?

2. The quality of the following parameters were then ranked as high, medium, low or unknown:
   I. Year of most recent capture:
      - 2017-2021 (if a single data capture has occurred in the last two years, then the overall program can be considered of high quality) = high
      - 2011-2016 = medium
      - <2011 = low
   II. Duration:
      - >4 years = high
      - 2-4 years = medium
      - 1 year = low
   III. Data completeness:
      - 100% = high
      - 75-99% = medium
      - <75% = low
   IV. Frequency of capture
      - Annually = high
      - Bi-annually = medium
      - <Bi-annually = low
   V. Appropriateness of parameters
      - High/medium/low

      Appropriateness of parameters was based on reference to the Scientific Monitoring Plan's targeted states for each receptor and considering whether the monitoring parameters were sufficient to compare against these states. Parameters were considered highly appropriate if all targeted states for a receptor could be quantified, of medium appropriateness if only some states could be quantified and low if the monitored parameters had little relevance to the targeted states of an individual receptor.

3. An overall assessment of each study program was then made as follows:
   - All parameters rated high = overall 'good'
   - At least one parameter rated medium = overall 'fair'
   - At least one parameter rated low = overall 'poor'
   - Unknown = overall not enough data to rate

The above assessment process was also performed across monitoring programs which included either of the two Scientific Monitoring Priority Areas (Oceanic Shoals Marine Park and the Tiwi Islands). The above assessment was then used to determine if 1) the baseline data available could be used to detect change in the state in the event of a significant impact - Classified as "good" in the above assessment (i.e., data was current, of reasonable duration and frequency, and employed appropriate methodologies) or 2) the existing baseline data is unlikely to be suitable to detect change in state – classified as "fair" or "poor" by the above assessment (i.e., the data was dated, infrequent, of limited duration and/or relied on inappropriate methodologies).

A Scientific Monitoring Priority Area by SMP matrix summarising recommendations on baseline data status and recommendations for further action was then developed (**Table F-1** and **Table F-2**) based on three categories:

- Not applicable – SMP is not applicable to the priority protection area as sensitive receptor does not occur.
- Survey - current monitoring/knowledge is considered sufficient (i.e., could be used to detect change in state in the event of a significant impact) and is considered a lower priority for post-spill pre-impact data collection.
- Priority survey – current monitoring is not in place or not practicable; post-spill pre-impact baseline data collection should be prioritised.

ConocoPhillips commissioned the Australian Institute of Marine Science (AIMS) to conduct a seabed diversity survey in 2017 focussing on areas of the Oceanic Shoals AMP, including areas traversing the pipeline route (Radford et al. 2018). This survey provides a valuable baseline for benthic habitat and fish communities at the Oceanic Shoal locations, however noting that sampling occurred over a short duration (14 days).

In 2012, during a 21-day field expedition to the Oceanic Shoals AMP, mid-water baited remote underwater video systems documented numerous vertebrate species and the findings indicate that the Oceanic Shoals AMP is a reservoir of biodiversity comparable to other documented offshore oceanic hotspots (Bouchet et al. 2020). This study also suggested that that the Oceanic Shoals AMP is a possible distant foraging destination for sea turtles, and possible breeding and /or nursing ground for a number of cetacean species. Given the limited extent of data available and preliminary indications that the Oceanic Shoals Marine Park is a biodiversity hotspot, pre-impact baseline data collection should be prioritised for the majority receptors present (refer to **Table F-1**).

There have been a number of high-quality monitoring programs that have included the Tiwi Islands; however the relevance of this data is uncertain due to its age and priority would be to collect sufficient data to both contribute to baseline datasets and assess the applicability of previous survey data (refer to **Table F-2**). Jacobs (2019) collated all of the publicly available environmental, social, cultural and economic data sets in 2019 and then produced sensitivity maps of the Tiwi Islands with input from traditional stakeholders. The sensitivity rankings were grouped by the following categories: fauna; shoreline and habitats; cultural and heritage; economic; and social, amenity and recreation. If a spill were to occur, these sensitivity maps will aid scientific monitoring surveys on the Tiwi Islands, along with Indigenous stakeholder engagement.

For the Scientific Monitoring Areas currently undergoing a baseline assessment (Vernon Islands, Cox-Finniss, Darwin, Litchfield and South Alligator) a precautionary approach was taken and 'Priority survey' recommended for all receptors, apart from Mangroves (SMP4), given remote sensing data would be used.

Table F-1: Summary of recommendations for further action based on review of available baseline data

Receptors	Scientific Monitoring Priority Areas							
	Vernon Island	Bathurst Island	Melville Island	Cox-Finniss	Darwin	Litchfield	South Alligator	Oceanic Shoals AMP
Marine Water Quality (SMP1)	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey
Sediment Quality (SMP2)	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey
Sandy Beaches and Rocky Shores (SMP3)	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Not Applicable
Mangrove Communities (SMP4)	Survey	Survey	Survey	Survey	Survey	Survey	Survey	Not Applicable
Intertidal Mudflats (SMP5)	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Not Applicable
Benthic Habitats (SMP6)	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey
Seabirds and Shorebirds (SMP7)	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey
Marine Mammals (SMP8)	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey
Marine Reptiles (SMP9)	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey
Seafood Quality (SMP10)	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey	Priority Survey

Receptors	Scientific Monitoring Priority Areas							
	Vernon Island	Bathurst Island	Melville Island	Cox-Finniss	Darwin	Litchfield	South Alligator	Oceanic Shoals AMP
Fish, Fisheries & Aquaculture (SMP11)	Survey	Survey	Survey	Survey	Survey	Survey	Survey	Survey
Whale Sharks (SMP12)	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Capability Assessment

Based on the assessment of Scientific Monitoring Priority Areas outlined in **Table F-1 ,** a capability assessment was undertaken to understand whether existing scientific monitoring capability would be sufficient to mount a first-strike monitoring program to gather baseline data within a short-timeframe (<7 days); noting that in the event of very short contact timeframes mobilisation of scientific monitoring teams to priority receptor sites may not be possible within contact timeframes and experimental designs not relying on pre-impact baseline would have to be employed. These experimental approaches are outlined in the Santos Oil Spill Scientific Monitoring Plan (EA-00-RI-10099) and are selected as appropriate to the receptor type.

Given that **Table F-1** lists Scientific Monitoring Priority Areas that could be contacted based on stochastic modelling data (i.e. the outcomes of hundreds of spill modelling simulations rather than a single spill event), it was not considered appropriate or credible that baseline monitoring would occur at all areas over this timeframe. To assess the first-strike scientific monitoring capability available, those locations with the highest probability of contact, and in close proximity to one another, were selected (Tiwi Islands, Vernon Island, Litchfield and South Alligator) (**Table F-2**).

The results of the Baseline Data Review document (QE-00-BI-20001) and subsequent baseline and capability assessment of Scientific Monitoring Priority Areas summarised herein (but detailed further in DC-40-RI-20017) has been provided within the Environment Functional Team Folder on the Emergency Response Intranet page so that this information is accessible to guide Santos IMT Environmental roles and monitoring provider roles in the event of activating oil spill scientific monitoring.

Table F-2: Capability assessment for rapid sampling of Tiwi Islands, Vernon Islands, Litchfield and South Alligator within seven days

Receptors	Required capability for rapid response				Actual Team Capability
	Vernon Islands	Litchfield	South Alligator	Tiwi Islands	
Water Quality (SMP1)	2 teams of 2 personnel			1 team of 2 personnel	3 teams of 2 personnel at least one member in each team to have experience in water sampling at least one member in each team to have experience in deep sea sediment sampling
Sediment Quality (SMP2)					
Sandy Beaches/Rocky Shorelines (SMP3)	1 teams of 2 personnel[8]		1 teams of 2 personnel	1 teams of 2 personnel	3 teams of 2 personnel at least one team member of team with experience in shoreline macrofauna/infauna assessment
Intertidal Mudflats (SMP5)					
Mangroves (SMP4)	Rapid priority response not required				Not required
Benthic Habitats (SMP6)	1 teams of 2 personnel			1 teams of 2 personnel	2 teams of 2 personnel at least one team member of team with experience in benthic habitat assessment ROV operator or divers
Seabirds/ shorebirds (SMP7)	1 ground-based survey team of 2 personnel[2, 6, 8]	1 ground-based survey team of 2 personnel[2, 6, 8]	1 ground-based survey team of 2 personnel[2, 6, 8]	2 ground-based survey team of 2 personnel[2, 6, 8]	4 teams of 2 available at least one member of team be experienced ornithologist
Marine mammals (SMP8)	1 aerial survey team of 2 personnel[1] 1 vessel-based survey team of 2 personnel[1]		1 aerial survey team of 2 personnel[1] 1 vessel-based survey team of 2 personnel[1]	1 aerial survey team of 2 personnel[1] 2 vessel-based survey teams of 2 personnel[1,7]	2 teams of 2 available (aerial) all to be experienced wildlife observers 2 teams of 2 available (vessel) all to be experienced wildlife observers

Receptors	Required capability for rapid response				Actual Team Capability
	Vernon Islands	Litchfield	South Alligator	Tiwi Islands	
Marine reptiles (SMP9)	1 aerial survey team of 2 personnel[1] 1 vessel-based survey team of 2 personnel[1] 1 ground-based survey team of 2 personnel[28]		1 aerial survey team of 2 personnel[1] 1 vessel-based survey team of 2 personnel[1] 1 ground-based survey team of 2 personnel[2, 8]	1 aerial survey team of 2 personnel[1] 2 vessel-based survey teams of 2 personnel[1,7] 2 ground-based survey teams of 2 personnel[2, 8]	2 teams of 2 available (aerial)[4] all to be experienced wildlife observers 3 teams of 2 available (vessel)[4] all to be experienced wildlife observers 3 teams of 2 available (ground-based)[5] at least one member with experience in turtle survey techniques
Seafood Quality (SMP10)	2 teams of 3 personnel			1 teams of 3 personnel	3 teams of 3 personnel at least one member of team to have experience in fish identification and necropsy at least one member of team to have BRUV experience
Fish, Fisheries & Aquaculture (SMP11)					
Whale sharks (SMP12)	Not applicable				Not required

[1]Aerial and vessel surveys could be conducted by the same team. The aerial-based surveys would be conducted first and then this would help inform target areas for vessel-based surveys.

[2]Ground based surveys for shorebirds/seabirds and marine reptiles could be conducted by the same survey team.

[3]Remote sensing data would be collected for mangroves, with no field team required to be mobilised.

[4]Two of these teams are those also assigned to SMP8.

[5]One of these teams is also assigned to vessel-based surveys for the same SMP. They can be moved according to priority for either vessel-based or ground surveys.

[6]Sightings of seabirds/ shorebirds will also be captured during aerial and vessel surveys for SMP8 and SMP9.

[7]Vessel surveys for SMP8 and SMP9 could be conducted by the same team.

[8]Where ground surveys are precluded by crocodiles, surveys may be conducted from vessels (where practicable) or via alternative methods (e.g., helicopters and/or drones)

References

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Appendix G: Shoreline Clean-up Assessment Implementation Considerations

To assist in determining which response methods are most appropriate for shorelines, it is necessary to obtain information about shoreline character (topography, complexity, exposure, etc.), degree and distribution of oiling (if present), presence of sensitive receptors (habitats, fauna, etc.) and information on shoreline processes and access routes that could aid or hamper response efforts. This detailed information can be collected from shoreline clean-up assessments. A well-established systematic approach known as Shoreline Clean-up Assessment Technique (SCAT) will be used to document the status of oiled shorelines in the event of a worst-case release and their subsequent treatment recommendations.

For petroleum activity spills, the NT IMT are the designated Control Agency for shoreline response in the NT. The designated Control Agency will direct resources provided through Santos for the purposes of shoreline clean-up assessments and shoreline response activities. Santos will provide additional information on shoreline character and oiling collected as part of aerial surveillance activities carried out under its control (refer **Table 4-2**).

Existing information on shoreline character and distribution of habitats/fauna can be obtained from Santos Energy GIS, including habitat/fauna distribution layers and aerial imagery.

The information provided below is included for planning purposes and represents how Santos would approach shoreline clean-up assessments to support the Control Agency. In the event of a spill with the potential for shoreline contact, the Control Agency is responsible for the implementation of the response and therefore, depending on the circumstances of the spill, may determine that some tasks be varied, should not be undertaken or should be reassigned.

Table G-1 presents considerations for planning and conducting the assessments.

Table G-1: Shoreline clean-up assessment considerations

Considerations for Shoreline Clean-up **Assessment**	
Survey design	Shoreline Clean-up Assessment requires a systematic assessment of shorelines, which is typically undertaken in a number of stages (according to the extent of the spill): + Reconnaissance surveys: designed as an initial phase (or further as required, such as inaccessible shorelines) to characterise the distribution, extent, and condition of shoreline habitats + Continual monitoring surveys: monitors hydrocarbon spill extent at the shoreline to assess the potential impact, extent of actual impact, and the effectiveness of clean-up. A shoreline clean-up assessment may include the following tasks: + Assessment of shoreline character, habitats and fauna, including: – shoreline structured biotic habitats – distribution of fauna – shoreline and processes (e.g. wave, tidal flows) – shoreline substrate (e.g. mud, sand, pebble, rock) – shoreline form (e.g. width, shape and gradient) – access/safety constraints. + Assessment of shoreline oiling (if present): – surface distribution and cover

Considerations for Shoreline Clean-up Assessment	
	– subsurface distribution – oil type, thickness, concentration and physical character – sampling of oil for laboratory analysis. + Recommendations for response: – applicable strategies based on oil type and habitat – potential access, safety and environmental constraints – likely resourcing (personnel and equipment) requirements. + Post-treatment shoreline survey and sign-off/completion, including: – post-clean-up inspections to confirm if end points have been achieved or if they require further treatment – approve termination of response activities in each sector. Surveys undertaken on foot, by vehicles or by small vessel will occur at prioritised areas (access permitting) to provide a close-range assessment of shoreline physical characteristics, coastal habitats/fauna, scale and character of oiling and safety/access constraints. Shoreline clean-up assessment team leaders will include personnel from AMOSC Core Group, State and National Response Team and OSRL, or contracted staff who have completed SCAT training. Team members may include personnel who have completed a brief training course and are supervised on the job by team leaders, particularly for deployment to locations that are not contacted in the first few weeks of the spill. The deployment of survey teams will be directed by the relevant control agency. The deployments will be informed by the observed and predicted contact of oil and from existing baseline information on shoreline character. Shoreline surveys will be undertaken within segments that are recorded and/or mapped that share common traits based on coast geomorphology, habitat type, fauna presence, level of oiling or access. Information on shoreline character and habitat/fauna distribution for each segment should be recorded through the use of: + still or video imagery collected with simultaneous GPS acquisition + field notes together with simultaneous GPS acquisition + mud maps outlining key natural features, oil distribution, imagery locations of quantitative data (transects, oil samples) + transects (cross-shore, longshore) and vertical sediment profiles + samples of oil and/or oiled sediments. The parameters that should be assessed are: + physical characteristics: rocky, sandy beach, flat, dune, other wetland + major habitat types: mangrove, salt marsh, saltpan flats, fringing reef, rubble shore, seagrass verge + coastal fauna and key habitats (e.g. nests) including quantification/distribution of oiled fauna + state of erosion and deposition: deposition, erosion, stable + human modified coastline (access tracks, facilities, etc.) + oil character, if present, including appearance, surface thickness, depth (into sediments), distribution, area and percentage cover.
Analysis and reporting	Shoreline survey reports to be submitted to the Control Agency IMT at completion of assessments. All raw data collected will be included as appendices to the report and provided in a geospatial format for subsequent use in GIS mapping software.

Appendix H: Aerial surveillance marine fauna sighting record

Santos

OIL SPILL SURVIELLANCE - MARINE FAUNA SIGHTING RECORD SHEET

Date:		**Time:**	
Latitude:		**Longitude:**	

MARINE FAUNA ID GUIDE

○ Humpback whale

○ Blue whale

○ Minke whale

○ Sperm whale

○ Killer whale

○ Bryde's whale

○ Whale species unknown

○ Whale shark

○ Dugong

○ Hawksbill turtle

○ Loggerhead turtle

○ Green turtle

○ Flatback turtle

○ Bottlenose dolphin

○ Spinner dolphin

○ Dolphin species unknown

○ Leatherback turtle

○ Turtle species unknown

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FAUNA DETAILS					
Category	**Type/species?** **Adult/juvenile?** **ID confidence?**	**Number**	**Date/Time**	**Photo/ video taken?** **Reference No.**	**Behaviour / Comments.** **Proximity to oil? Oiled?** **Milling? Feeding? Transiting?**
Cetaceans (Whales/ Dolphins)					
Turtles					
Birds					
Dugongs					
Sharks					
Other					

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Other details for each observation location

WEATHER DETAILS

Sea State ◯ Mirror calm ◯ Small waves ◯ Slight ripples ◯ Large waves some whitecaps ◯ Large waves, many whitecaps

Visibility ◯ Excellent ◯ Good ◯ Moderate ◯ Poor ◯ Very Poor

OBSERVER DETAILS

Observer Name	Observer signature	**Observer** ◯ Inexperienced ◯ Experienced

APPENDIX F – SANTOS ENVIRONMENT CONSEQUENCE DESCRIPTORS

Consequence Level		I	II	III	IV	V	VI
Acceptability		Acceptable	Acceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable
Severity Description		*Negligible* *No impact or Negligible impact*	Minor *Detectable but insignificant change to local population, industry or ecosystem factors. Localised effect*	Moderate *Significant impact to local population, industry or ecosystem factors*	Major *Major long-term effect on local population, industry or ecosystem factors*	Severe *Complete loss of local population, industry or ecosystem factors AND/ OR extensive regional impacts with slow recovery*	Critical *Irreversible impact to regional population, industry or ecosystem factors*
Environmental Receptors	Fauna In particular, EPBC Act listed threatened/migratory fauna or *WA Biodiversity Conservation Act 2016* specially protected fauna	Short-term behavioural impacts only to small proportion of local population and not during critical lifecycle activity. No decrease in local population size. No reduction in area of occupancy of species. No loss/disruption of habitat critical to survival of a species. No disruption to the breeding cycle of any individual. No introduction of disease likely to cause a detectable population decline.	Detectable but insignificant decrease in local population size. Insignificant reduction in area of occupancy of species. Insignificant loss/disruption of habitat critical to survival of a species. Insignificant disruption to the breeding cycle of local population.	Significant decrease in local population size but no threat to overall population viability. Significant behavioural disruption to local population. Significant disruption to the breeding cycle of a local population. Significant reduction in area of occupancy of species. Significant loss of habitat critical to survival of a species. Modify, destroy, remove, isolate or decrease availability of quality of habitat to the extent that a significant decline in local population is likely.	Long-term decrease in local population size and threat to local population viability. Major disruption to the breeding cycle of local population. Major reduction in area of occupancy of species. Fragmentation of existing population. Major loss of habitat critical to survival of a species. Modify, destroy, remove, isolate or decrease availability of quality of habitat to the extent that a long-term decline in local population is likely.	Complete loss of local population. Complete loss of habitat critical to survival of local population. Wide-spread (regional) decline in population size or habitat critical to regional population.	Complete loss of regional population. Complete loss of habitat critical to survival of regional population.

Consequence Level		I	II	III	IV	V	VI
Acceptability		Acceptable	Acceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable
Severity Description		*Negligible* *No impact or Negligible impact*	Minor *Detectable but insignificant change to local population, industry or ecosystem factors. Localised effect*	Moderate *Significant impact to local population, industry or ecosystem factors*	Major *Major long-term effect on local population, industry or ecosystem factors*	Severe *Complete loss of local population, industry or ecosystem factors AND/ OR extensive regional impacts with slow recovery*	Critical *Irreversible impact to regional population, industry or ecosystem factors*
				Introduce disease likely to cause a significant population decline.	Introduce disease likely to cause a long-term population decline.		
	Physical Environment/Habitat Includes: air quality; water quality; benthic habitat (biotic/abiotic), particularly habitats that are rare or unique; habitat that represents a Key Ecological Feature[12]; habitat within a protected area; habitats that include benthic primary producers[13] and/or epi-fauna[14]	No or *Negligible* reduction in physical environment/habitat area/function.	Detectable but localised and insignificant loss of area/function of physical environment/habitat. Rapid recovery evident within approximately two years (two season recovery).	Significant loss of area and/or function of local physical environment/habitat. Recovery over medium-term (two to ten years).	Major, large-scale loss of area and/or function of physical environment/local habitat. Slow recovery over decades.	Extensive destruction of local physical environment/habitat with no recovery. Long-term (decades) and wide-spread loss of area or function of primary producers on a regional scale.	Complete destruction of regional physical environment/habitat with no recovery. Complete loss of area or function of primary producers on a regional scale.
	Threatened ecological communities	No decline in threatened ecological	Detectable but insignificant decline in	Significant decline in threatened ecological	Major, long-term decline in	Extensive, long-term decline in threatened	Complete loss of threatened ecological

[12] As defined by the Department of Agriculture, Water and Environment (DAWE)
[13] Benthic photosynthetic organisms such as seagrass, algae, hard corals and mangroves
[14] Fauna attached to the substrate including sponges, soft corals and crinoids.

Consequence Level		I	II	III	IV	V	VI
Acceptability		Acceptable	Acceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable
Severity Description		*Negligible* *No impact or Negligible impact*	Minor *Detectable but insignificant change to local population, industry or ecosystem factors. Localised effect*	Moderate *Significant impact to local population, industry or ecosystem factors*	Major *Major long-term effect on local population, industry or ecosystem factors*	Severe *Complete loss of local population, industry or ecosystem factors AND/ OR extensive regional impacts with slow recovery*	Critical *Irreversible impact to regional population, industry or ecosystem factors*
	(EPBC Act listed ecological communities)	community population size, diversity or function. No reduction in area of threatened ecological community. No introduction of disease likely to cause decline in threatened ecological community population size, diversity or function.	threatened ecological community population size, diversity or function. Insignificant reduction in area of threatened ecological community.	community population size, diversity or function. Significant reduction in area of threatened ecological community. Introduction of disease likely to cause significant decline in threatened ecological community population size, diversity or function.	threatened ecological community population size, diversity or function. Major reduction in area of threatened ecological community. Fragmentation of threatened ecological community. Introduce disease likely to cause long-term decline in threatened ecological community population size, diversity or function.	ecological community population size, diversity or function. Complete loss of threatened ecological community.	community with no recovery.

Consequence Level		I	II	III	IV	V	VI
Acceptability		Acceptable	Acceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable
Severity Description		*Negligible* *No impact or Negligible impact*	Minor *Detectable but insignificant change to local population, industry or ecosystem factors. Localised effect*	Moderate *Significant impact to local population, industry or ecosystem factors*	Major *Major long-term effect on local population, industry or ecosystem factors*	Severe *Complete loss of local population, industry or ecosystem factors AND/ OR extensive regional impacts with slow recovery*	Critical *Irreversible impact to regional population, industry or ecosystem factors*
	Protected Areas Includes: World Heritage Properties; Ramsar wetlands; Commonwealth/ National Heritage Areas; Land/ Marine Conservation Reserves.	No or *Negligible* impact on protected area values. No decline in species population within protected area. No or *Negligible* alteration, modification, obscuring or diminishing of protected area values.*	Detectable but insignificant impact on one of more of protected area's values. Detectable but insignificant decline in species population within protected area. Detectable but insignificant alteration, modification, obscuring or diminishing of protected area values.*	Significant impact on one of more of protected area's values. Significant decrease in population within protected area. Significant alteration, modification, obscuring or diminishing of protected area values.	Major, long-term effect on one of more of protected area's values. Long-term decrease in species population contained within protected area and threat to that population's viability. Major alteration, modification, obscuring or diminishing of protected area values.	Extensive loss of one or more of protected area's values. Extensive loss of species population contained within protected area.	Complete loss of one or more of protected area's values with no recovery. Complete loss of species population contained within protected area with no recovery.
	Socio-economic receptors Includes: fisheries (commercial and recreational); tourism; oil	No or *Negligible* loss of value of the local industry. No or *Negligible* reduction in key natural features or	Detectable but insignificant short-term loss of value of the local industry. Detectable but insignificant reduction in key natural features	Significant loss of value of the local industry. Significant medium-term reduction of key natural features or	Major long-term loss of value of the local industry and threat to viability. Major reduction of key natural features	Shutdown of local industry or widespread major damage to regional industry.	Permanent shutdown of local or regional industry. Permanent loss of key natural features or populations

Consequence Level		I	II	III	IV	V	VI
Acceptability		Acceptable	Acceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable
Severity Description		*Negligible* *No impact or Negligible impact*	Minor *Detectable but insignificant change to local population, industry or ecosystem factors. Localised effect*	Moderate *Significant impact to local population, industry or ecosystem factors*	Major *Major long-term effect on local population, industry or ecosystem factors*	Severe *Complete loss of local population, industry or ecosystem factors AND/ OR extensive regional impacts with slow recovery*	Critical *Irreversible impact to regional population, industry or ecosystem factors*
	and gas; defence; commercial shipping.	populations supporting the activity.	or population supporting the local activity.	populations supporting the local activity.	or populations supporting the local activity.	Extensive loss of key natural features or populations supporting the local industry.	supporting the local or regional industry.