Macedon Operations Environment Plan Summary (State)

August 2023

Revision 5

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1. INTRODUCTION

This Macedon Operations Environment Plan Summary (State) (Summary) summarises the Macedon Operations Environment Plan (State) (EP). This Summary has been prepared in accordance with Regulation 14(1) of the Petroleum (Submerged Lands) (Environment) Regulations 2012 (WA) (PSLER) and Regulation 11(7) of the Petroleum Pipelines (Environment) Regulations 2012 (WA) (PPER).

The scope of the EP covers the following activities associated with the Macedon Operations:

- routine operations
- routine inspection, monitoring, maintenance, and repair (IMMR) activities of the:
  - wet gas (State waters and onshore) pipeline; and
  - dry sales gas (onshore) pipeline
- rehabilitation and remediation activities for the onshore wet and dry gas pipelines
- non-routine and unplanned activities and incidents associated with the above

The Macedon Operations is a Western Australian domestic gas pipeline that commercialises gas reserves in the offshore Macedon gas field located in production licence WA-42-L (in Commonwealth waters). The Macedon wet gas pipeline traverses State waters and extends onshore to the Onshore Gas Plant located approximately 17 km southwest of Onslow. The gas is then piped onshore for sale.

The infrastructure covered by this EP includes:

- Wet gas pipeline located in State waters (licence TPL/23)
- Dry Sales gas pipeline located onshore (licence PL 88)

Other activities mentioned in this EP, including operation of the Onshore Gas Plant, are covered by other legislation and are included to best describe the overall project scope and to support Woodside's environmental management for the development but are not submitted for regulatory review.

1.1 Contact Information of the Operator

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2. DESCRIPTION OF THE ACTIVITY

2.1 Location and Operational Area

The Macedon gas field in Commonwealth waters is located approximately 40 km north of Exmouth and 100 km west of Onslow, Western Australia (**Figure 2-1**). The Macedon Operations involves the production and transport of gas from the Macedon gas field via four subsea wells and associated infrastructure to shore.

Treated gas is then exported through a sales gas pipeline to an injection point on the Dampier to Bunbury Natural Gas Pipeline (DBNGP). Location details of the pipeline facilities within the Operational Area is presented in **Table 2-1**.

Table 2-1: Pipeline Facilities within the Operational Area

Name	Instrument Number	Start Point	End Point	Constructed Length (km)
Macedon Sales Gas Pipeline	PL 87	Pig launcher/receiver at the Macedon Gas Plant 7595426 N; 291150 E	Tie in point at the DBNGP 7556910 N; 343151 E	66.79
Macedon Wet Gas Pipeline	PL 88	MLWM connection with the Macedon Offshore Wet Gas Pipeline 7593556 N; 277180 E	Launcher/receiver at the Macedon Gas Plant 7595485 N; 291041 E	15.53
Macedon Wet Gas Pipeline (Terr Sea)	TPL/23	Macedon Wet Gas Pipeline at the Cwth/State Water boundary 7615512 N; 241985 E	MLWM connection with the Macedon Onshore Wet Gas Pipeline 7593556 N; 277180 E	43.56
Macedon Gas Plant	PL 90 (surrendered, included for reference only)	Wet gas launcher/ receiver at the Macedon Gas Plant 7595485 N; 291041 E	Sales gas launcher/ receiver at the Macedon Gas Plant 7595426 N; 291150 E	1

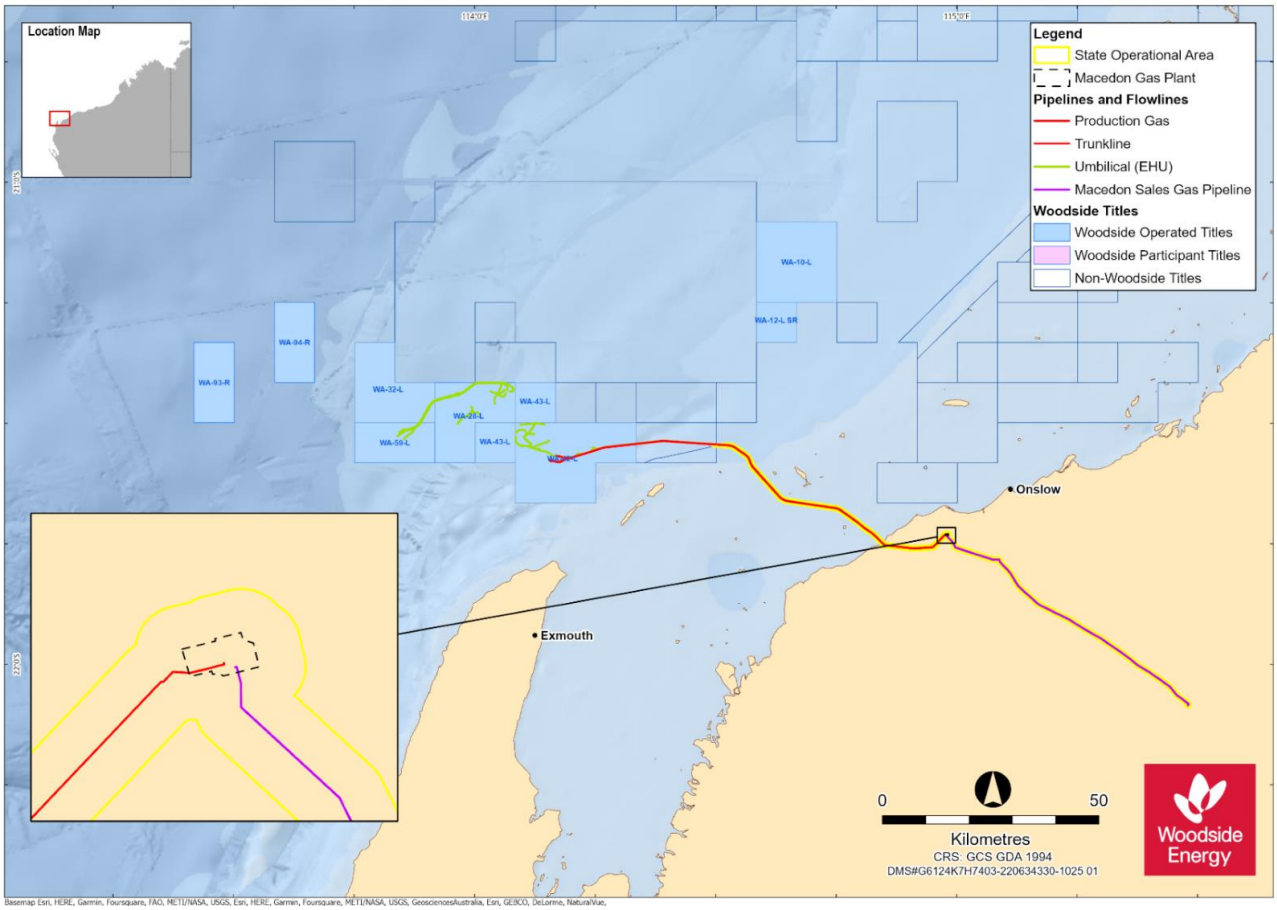

Figure 2-1: Location of Macedon Operational Area (Macedon Gas Plant, indicative only)

2.2 Description and Operations

The Macedon Operations commenced production in 2013 and operates 24 hours a day, 365 days a year. Inspection, monitoring, maintenance and repairs (IMMR) are conducted on an 'as required' basis throughout the operation design life. Macedon production is currently estimated to continue until approximately 2038. This estimate does not account for extensions of life through future development or repurposing of the structure.

Normal operations of the four subsea wells and facilities are remotely controlled via the umbilical from the central control room located at the Onshore Gas Plant.

The Onshore Gas Plant has a single train with a nominal capacity of 220 million standard cubic feet per day (MMSCFD) of gas or 222 Terajoules per day (TJ/day) feed gas, 13 m^3/day condensate and approximately 1,200 m^3/day produced water (peak rate not expected rate). The gas is conditioned to sales specifications by removing mercury, water removal via silica bed dehydration and hydrocarbon dewpoint control. It is compressed and exported via a 67 km sales gas pipeline where it is metered and injected into DBNGP. The majority of operational activities undertaken at the Macedon Gas Plant are managed under a Dangerous Goods Licence regime, not under this EP.

The sales gas metering station is located approximately 67 km from the onshore Gas Plant adjacent to the DBNGP tie-in on a cleared area of 6,250 m^2. Gas from the pipeline passes through filter coalescers to remove any dust and other solid or liquid matter, waxes, gums and gum-forming constituents. The metering station analyses hydrocarbon composition, oxygen, hydrogen sulphide and moisture and meter gas prior to the tie-in station.

2.3 Inspection, Monitoring, Maintenance and Repair Activities

Subsea activities can be broadly categorised into inspection, monitoring, maintenance and repair (IMMR) activities. IMMR activities are typically undertaken from a support vessel via remotely operated vehicle (ROV), autonomous underwater vehicles (AUV) and/or divers.

Inspection and monitoring are undertaken to verify the integrity of the infrastructure and identify any problems before they present an integrity risk. Maintenance and repair activities are those required on a planned or as-required basis to support the integrity of infrastructure.

Typical inspection and monitoring activities for the onshore pipelines include:

- Biannual cathodic protection surveys
- Biannual visual inspections
- Internal (pigging) inspections
- Process composition testing
- Corrosion probes
- Corrosion mitigation checks
- Metocean and seismic monitoring
- Process monitoring (temperature, pressure, etc.)
- Cyclone weather monitoring
- Hydraulic fluid usage

In the unlikely event that maintenance or repairs are required, typical maintenance and repair activities may include:

- Minor excavation works
- Undertake a more detailed assessment (e.g. non-destructive testing)
- Remedial works
- Pipeline or spool support with grout bag, mattress, anchors, or rock dumping
- Pipeline or umbilical reburial
- Pipeline spool disconnection and/or replacement
- Scour prevention installation
- Cathodic protection system replenishment/repair

Support vessels and/or divers may be required to support IMMR activities. The specifications of the vessel may vary depending on operational requirements, vessel schedules, capability and availability. It is expected that all vessels used for IMMR activities will have been previously operating on the North-West Shelf (NWS). However, in cases of an emergency, the Woodside Petroleum Deepwater (PetDW) Invasive Marine Species risk assessment process is in place to assess and manage risks for vessels.

3. DESCRIPTION OF THE ENVIRONMENT

The key existing environment characteristics of the activity are described in terms of the Operational Area and the environment that may be affected (EMBA). The Operational Area encompasses the key existing environment characteristics and receptors that may be affected by planned aspects of the Petroleum Activity Program. The EMBA encompasses all environmental characteristics and receptors with the potential to be impacted by unplanned activities. The EMBA presented for the Macedon Operational Area presents areas that are a composite of numerous theoretical paths, integrated over the full duration of the simulations under various metocean conditions.

The Operational Area is located within both the terrestrial environment and State waters of North-Western Australia:

- The offshore wet gas pipeline and umbilical in State waters, extending from the State-Commonwealth water boundary, is located within the North-west Marine Region (NWMR) and lies within the NWS Province (0-60m water depths). The marine environment for the offshore EMBA extends from the upper intertidal zone through to the outer margin of the continental shelf (100-200 m water depth and 75km wide), which gradually increases in depth from the edge of the inner shelf to the continental slope.
- The onshore wet gas pipeline, extending from the shore crossing to the Onshore Gas Plant inlet flange, is located across the boundary between the Fortescue and Carnarvon Botanical Districts, containing elements of both systems. The onshore Operational Area is located within a sedimentary basin, mostly covered by alluvium and colluvium, with low-lying salt flat/clay pan areas and minimal vegetation within coastal areas.

3.1 Physical Environment

The Macedon gas field located in Commonwealth waters is approximately 40 km north of Exmouth and 100 km west of Onslow while the Onshore Gas Plant is located approximately 17 km southwest of Onslow, Western Australia.

Climate

The clime of Onslow is arid tropical with a current average annual rainfall of 306 mm predominately occurring between January and July, typically due to tropical cyclones or depressions. The Onslow region is positioned within the cyclone belt where 3 to 5 severe cyclones may affect the region every year and are usually associated with torrential rain and large seas, which may result in abnormal tides and storm surges. Wind speeds outside of cyclonic events, rarely exceed 40 km/hr at Onslow, with prevailing winds from the south and southeast in winter and westerly in summer.

The nearshore wind pattern is often dominated by local land/sea breezes, causing reversals in regional wind pattern. Whereas offshore wind patterns are governed by synoptic pattern of pressure systems from west to east.

Hydrology and Hydrogeology

The Onshore Gas Plant is located on an area of isolated sand dunes at the downstream end of the Ashburton River catchment. There is no surface water on site and no drainage lines within the operation area. The wet gas pipeline and access road crosses the lower Ashburton River and floodplain, where there is a number of salt pans/flats located within tidal creeks and pools, which may become inundated following rainfall. Groundwater levels in the area are generally less than 10 m below ground surface inland and very shallow near the coast, flowing from the northwest towards the coast.

3.2 Biological Environment

Habitats

The onshore operational area is located across the boundary between the Fortescue and Carnarvon Botanical Districts and contains elements of both systems. The vegetation condition in the region ranges from 'Excellent' in very few areas, such as the limestone dune in the onshore gas plant are, to 'Very Poor' / 'Completely Degraded' in areas of mesquite invasion.

The offshore region contains significant habitats and benthic primary producers associated with shallow island platforms and major reefs. A narrow band of shallow subtidal beach rock / low relief reef, located approximately 800 m offshore, comprises of exposed rock with scattered corals, sponges, and macroalgae, and scattered seagrass and algae observe on either side of the reef. The State waters section of the pipeline contains secondary features, such as limestone pavement, raised pavement, and low relief reefs. Further varying densities of corals, seagrasses, and macroalgae occur around the various reefs and uninhabited islands, such as Lockyer Island and Hood Reef. However, the majority of the pipeline in the WA State waters lies in shallow waters (< 30 m) occurring over sparse densities of seagrass communities.

One protected area overlaps the onshore Operational Area, the Cane River (Mount Minnie and Nanutarra) Nature Reserve System. There are no Threatened Ecological Communities (TECs) or Ramsar Wetlands overlapping the Operational Area or EMBA.

Communities

Onshore, the Onslow Coastal Plain within the Fortescue Botanical district and the Yannarie Coastal Plain within the Carnarvon Botanical district supports shrub species and seaward fringe mangrove communities, as well as coastline mangroves, coastal sand dunes, grassland and claypans, and sandy plains.

Offshore, plankton communities are peak primary producers within the EMBA during late summer/early autumn along the shelf edge of the Ningaloo Reef, linking with mass coral spawning events, peak zooplankton and fish larvae abundance, with periodic upwelling throughout the year.

Pelagic and demersal fish populations of the NWS host a diverse assemblage of fish, with up to 1,400 species known to occur, predominantly within shallow coastal waters. Features such as the Ancient Coastline, Cuvier Abyssal Plain, the Cape Range Peninsula, and the Commonwealth water adjacent to the Ningaloo Reef are known to support pelagic and demersal fish populations near the Operational Area.

Epifauna and infauna communities such as sponges, ascidians, soft corals, and gorgonians, are filter feeders, which actively filter suspended matter and food particles in the water column. Filter feeders are notable with high diversity of sponges within the Commonwealth waters of Ningaloo Marine Park. The discrete areas of hard substrate host sessile filter feeding communities that are potentially associated within the Ancient Coastline, Canyons linking the Cuvier Abyssal Plain and the Commonwealth waters adjacent to Ningaloo Reef. Filter feeder communities are present on the subsea infrastructure, which provide additional substrate for attachment.

Species

A total of 85 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Listed Threatened and/or Migratory species were identified as potentially occurring within the EMBA. Of these, 68 species were identified as potentially occurring within the Operational Area. A description of the species relevant to the Operational Area and EMBA is noted in **Table 3-1**.

Table 3-1: Summary of EPBC Act listed species within the Operational Area and EMBA

Receptor	Description
Turtles	There are 21 EPBC-listed marine reptile species potentially occurring in the Operational Area or EMBA, 8 of these are listed as Threatened, 5 of which are migratory Operational Area • Barrow Island, Montebello Islands, Serrier Island and Thevenard Island nesting and interesting buffer is identified as habitat critical to the survival of a species for the Green and Flatback turtle. • Cape Preston to the mouth of Exmouth Gulf, including Montebello Islands and Lowendal Island nesting locations and interesting buffer is identified as habitat critical to the survival for Hawksbill turtle. • Nesting periods are November to March for Green turtle, October to March for Flatback turtle, and all year for Hawksbill turtle. • Thevenard Island – south coast is a biological important area (BIA) for Flatback turtle (nesting and interesting) and Hawksbill turtle (Nesting and interesting). EMBA • Exmouth Gulf and Ningaloo coast nesting locations and interesting buffer is identified as habitat critical for Loggerhead turtle. • Nesting period for the Loggerhead turtle occurs from November to March. • Montebello Island, Hermite Island, NW Island, and Trimouille Island is an additional interesting buffer for Flatback turtle. • West Coast Middle Island and North and West Coast Barrow Island are a BIA for Green turtle (Nesting, interesting, mating, and basking). • North-West Cape is a BIA for Green turtle (nesting and interesting).
Sea snakes	Operational Area and EMBA • Sea snakes frequent the waters of the continental shelf and around offshore islands. • The short-nosed sea snake is a species endemic to WA and has been recorded from the Exmouth Gulf to the reefs of the Sahul Shelf.
Marine Mammals	Operational Area and EMBA • There are 35 potentially occurring species of marine mammals listed under the EPBC Act, 8 of which are listed as Threatened and an additional 9 are listed as Migratory. • The Humpback whale migration (north and south) (south of Shark Bay, north to Kimberly Region) BIA overlaps the Operational Area and the foraging and migration BIAs for the Blue whale subspecies (Pygmy Blue whale) are located further offshore.
Sharks and Rays	Operational Area and EMBA • There are 47 potentially occurring species of fish species listed under the EPBC Act, 10 of these species are listed as Threatened along with 6 species listed as Migratory. • Whale shark foraging BIA (northward from Ningaloo) overlaps with the Operational Area.
Birds	Operational Area and EMBA • There are 47 potentially occurring species of seabirds and migratory shorebirds listed under the EPBC Act, 15 of these are listed as Threatened and an additional 24 as Migratory. • Breeding BIAs for the Fairy Tern (Pilbara and Gascoyne coasts and islands), Wedge-tailed Shearwater (Kimberley, Pilbara and Gascoyne coasts and Islands including Ashmore reef), Lesser Crested Tern (Kimberley, Pilbara and Gascoyne coasts and Islands including Ashmore reef), and Roseate Tern (Kimberley, Pilbara and Gascoyne coasts and Islands including Ashmore reef), are overlapped by, or adjacent to the Operational Area.

3.3 Socio-economic and Cultural Environment

Cultural Heritage

There is one Native Title claim or determination overlapping the Operational Area—Thalanyji—and there are three Indigenous land use agreements (ILUAs) overlapping the Operational Area:

- Macedon ILUA
- Onslow ILUA
- Thalanyji and Minderoo Pastoral ILUA

The Operational Area does not overlap any Commonwealth or State Marine Park Management Plans.

There are two Native Title claims or determinations adjacent to the Operational Area:

- Gnulli, Gnulli #2 and Gnulli #3 - Yinggarda, Baiyungu and Thalanyji People
- Thalanyji

There are three Indigenous land use agreements (ILUAs) adjacent to the Operational Area:

- Macedon ILUA
- Onslow ILUA
- Thalanyji and Minderoo Pastoral ILUA

Commercial Fisheries

There are a number of Commonwealth and State fisheries designated management areas located within the Operational Area and EMBA. The following Commonwealth and State commercial fisheries management areas overlap with the Operational Area, and potentially interact during the Petroleum Activities Program:

- Pilbara Line Fishery
- Marine Aquarium Fish Managed Fishery
- West Coast Deep Sea Crustacean Managed Fishery
- Mackerel Managed Fishery (Area 2)
- Exmouth Gulf Prawn Managed Fishery
- Onslow Prawn Managed Fishery
- Specimen Shell Managed Fishery

Traditional Fisheries

Within the EMBA, and Barrow Island and Montebello (outside of the EMBA), traditional fisheries are typically restricted to shallow coastal waters and/or areas with structures such as reefs. Fishing in Onslow is typically localised and small scale, hunting for turtles and dugongs, fishing and gathering shellfish. The Operational Area and EMBA are outside of the Memorandum of Understanding Box, which allows Indonesian fishers to fish in designated areas.

Tourism and Recreation

The nearest population centres to the Operational Area include towns of Onslow and Exmouth, which offer easy access to tourists, vacationers, and recreational fishers to the Mackerel Islands (10 islands approximately 30 km from the Operational Area). Peak tourism occurs from April to October with

marine-based activities concentrated around infrastructure such as boat launching ramps, jetties, marinas etc. are limited within the EMBA. Further expansion in tourism and recreational activities is recognised for the Pilbara and Gascoyne regions.

Commercial Shipping

The Australian Maritime Safety Authority (AMSA) has introduced a network of marine fairways across the NWMR off WA to minimise vessel collisions with offshore infrastructure. The Operational Area lies outside of these declared and charted shipping fairways with a known shipping activity occurring within the Onslow and Ashburton Port Areas located in the EMBA.

Defence

Department of Defence (DoD) areas, facilities and unexploded ordnances (UXOs) overlap with the Operational Area and EMBA include the Learmonth air training area. However, other DoD areas, facilities and UXOs overlap with only the EMBA include:

- Naval Communications Station Harold E. Holt
- UXO SDG096 Sea Dumping: Anchor Island
- Potential Depth Charge UXO DEP022: Northwest of Bessieres Island
- UXO 793 and 794

3.4 Values and Sensitivities

The offshore environment of the NWMR contains environmental assets of high value or sensitivity including coastal waters and habitats, and the associated resident, temporary or migratory marine life.

No key ecological features (KEFs) occur in the Operational Area. However, the Ancient Coastline at 125 m Depth Contour, Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula, Continental Slope Demersal Fish Communities, and Commonwealth water adjacent to Ningaloo Reef are identified within the EMBA.

One protected area overlaps the onshore Operational Area (Cane River (Mount Minnie and Nanutarr)- Nature Reserve Systems (NRS) Addition – Gazettal in Progress). There are no Threatened Ecological Communities (TECs) or Ramsar Wetlands overlapping the Operational Area or EMBA.

Established protected places and other sensitive areas overlapping the EMBA include the following:

- 2 Australian Marine Parks
- 4 State Marine Parks, Marine Management Areas and Reserves
- 17 State Terrestrial Protected Areas

4. CONSULTATION

In support of the EP Woodside conducted a relevant persons assessment based on the activity location and potential impacts. A consultation package was sent electronically to the relevant stakeholders with the opportunity for stakeholders to assess potential impacts of the proposed activity and provide feedback. A list of relevant persons consulted is provided in **Table 4-1**.

Table 4-1: Summary of consultation activities undertaken for the EP.

Stakeholder	Relevance to Activity
Australian Government department or agency	
Australian Border Force – (ABF)	Responsible for coordinating maritime security.
Australian Fisheries Management Authority (AFMA)	Responsible for managing Commonwealth fisheries
Australian Hydrographic Office (AHO)	Responsible for maritime safety and Notice to Mariners.
Australian Maritime Safety Authority (AMSA) – Marine Pollution	Legislated responsibility for oil pollution response in Commonwealth waters.
Australian Maritime Safety Authority (AMSA) – Marine Safety	Statutory agency for vessel safety and navigation
Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Responsible for implementing Commonwealth policies and programs to support climate change, sustainable energy use, water resources, the environment and our heritage. Administers the *Underwater Cultural Heritage Act 2018 in collaboration with the States, Northern Territory and Norfolk Island, which is responsible for the protection of shipwrecks, sunken aircraft and other types of underwater heritage and their associated artefacts in Commonwealth waters.*
Department of Agriculture, Fisheries and Forestry (DAFF) – Biosecurity (marine pests, vessels, aircraft and personnel) *(formerly DAWE)*	DAFF administers, implements and enforces the Biosecurity Act 2015. The Department requests to be consulted where an activity has the potential to transfer marine pests. DAFF also has inspection and reporting requirements to ensure that all conveyances (vessels, installations and aircraft) arriving in Australian territory comply with international health regulations and that any biosecurity risk is managed. The Department requests to be consulted where an activity involves the movement of aircraft or vessels between Australia and offshore petroleum activities either inside or outside Australian territory.
Department of Agriculture, Fisheries and Forestry (DAFF) – Fisheries *(formerly DAWE)*	Responsible for implementing Commonwealth policies and programs to support agriculture, fishery, food and forestry industries
Department of Defence (DoD)	Responsible for defending Australia and its national interests.
Department of Planning, Lands and Heritage (DPLH)	Responsible for state level land use planning and management, and oversight of Aboriginal cultural heritage and built heritage matters.
Department of Industry, Science, and Resources (DISR) *(formerly DISER)*	Department of relevant Commonwealth Minister and is required to be consulted under the Regulations.
Director of National Parks (DNP)	Responsible for the management of Commonwealth parks and conservation zones. Whilst no field activities are planned that would trigger the DNP's functions, interests or activities, Woodside has chosen to provide information on arrangements for unplanned events, such as an oil spill, which have potential to impact the values within a Commonwealth marine park.

Western Australian Government department or agency or advisory body	
Department of Biodiversity, Conservation and Attractions (DBCA), Parks and Wildlife Service	Responsible for managing WA's parks, forests and reserves to achieve wildlife conservation and provide sustainable recreation and tourism opportunities. Whilst no field activities are planned that would trigger DBCA's functions, interests or activities, Woodside has chosen to provide information on arrangements for unplanned events, such as an oil spill, which have potential to impact the values within a State marine park.
Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Department of relevant State Minister
Department of Primary Industries and Regional Development (DPIRD)	Responsible for management of State fisheries. There has been commercial fishing effort in State-managed fisheries that overlap the Operational Area.
Department of Transport (DoT)	Legislated responsibility for oil pollution response in State waters.
State fisheries*	
• Mackerel Managed Fishery – Pilbara (Area 2) • Marine Aquarium Fish Managed Fishery • West Coast Deep Sea Crustacean Managed Fishery • Onslow Prawn Managed Fishery • Exmouth Gulf Prawn Managed Fishery • Pilbara Demersal Scalefish Fisheries (Pilbara Trap and Line) • Western Australian Sea Cucumber Fishery • Specimen Shell Managed Fishery	The fishery overlaps the Operational Area and DPIRD data indicates active fishing within the Operational Area.
Other marine users	
• Exmouth Recreational Marine Users • Gascoyne Recreational Marine Users	Other marine users listed have the potential to be active within the Operational Area.
Historical cultural heritage groups or organisations	
• Western Australian Museum	Manages 200 shipwreck sites of the 1,500 known to be located off the Western Australian coast.
Aboriginal corporations and organisations	
• Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC) • Buurabalayji Thalanyji Aboriginal Corporation (BTAC) • Yinggarda Aboriginal Corporation (YAC) • Yamatji Marlpa Aboriginal Corporation (YMAC)	Organisations representing the rights and interests of Indigenous people of the region.
Industry representative organisations	
Australian Petroleum Production and Exploration Association (APPEA)	Represents the interests of oil and gas explorers and producers in Australia.
Marine Tourism WA	Represents the interests of marine tourism in WA

Commonwealth Fisheries Association (CFA)	Represents the interests of commercial fishers with licences in Commonwealth waters
Recfishwest	Represents the interests of recreational fishers in Western Australia. Activities have the potential to impact recreational fishers.
WA Game Fishing Association	Represents the interests of game fishers in WA.
Western Australian Fishing Industry Council (WAFIC)	Represents the interests of commercial fishers with licences in State waters. Potential for interaction with licence holders in the Pilbara Line Fishery.
Local Government and other representative organisations	
• Shire of Ashburton • Dampier Community Association • Onslow Chamber of Commerce Industry • Pilbara Development Commission	Local government service providers and organisations responsible for promoting or representing the interests of local business and community members.
Titleholders and Operators	
• Carnarvon Energy • AGI Tubridgi • Allasso Energy • Energy Resources • Buru Energy Ltd	Titleholder or Operator

5. ENVIRONMENTAL IMPACTS AND RISKS

Woodside undertook an environmental risk and impact assessment to understand the potential environmental impacts associated with the Petroleum Activities Program, and used Woodside standards and methods to ensure they are reduced to As Low As Reasonably Practicable (ALARP) and will be of an acceptable level. All control measures described below will be implemented to ensure risks and impacts are reduced to ALARP and an acceptable level.

Table 5-1: Environmental impacts and risks and Control measures for Macedon Operations (State)

Impact/ Risk	Source of Environmental Impact/ Risk	Key Potential Environmental Impact	Control Measures
Offshore Planned Activities			
Physical presence: disturbance to marine users	Presence of subsea infrastructure (pipelines / flowlines) excluding and / or displacing other users from safety exclusion zone. Presence of vessel activities (IMMR) excluding and/or displacing other users from Operational Area.	Interference with other sea users (e.g., commercial, and recreational fishing, and shipping).	• Vessels compliant with Marine Orders for safe vessel operations: - Marine Order 21 (Safety and emergency procedures) 2016 - Marine Order 27 (Safety of navigation and radio equipment) 2016 - Marine Orders 30 (Prevention of Collisions) 2016 • Pipeline gazetted and marked on navigation charts. • Promote awareness of the operations and IMMR activities with relevant persons and marine users and advise the presence of infrastructure and IMMR activities. • Notification of details of IMMR activities to Australian Hydrographic Office to issue a 'Notice to Mariners' where vessels will be in the Operational Area (but outside of the Petroleum Safety Zone) for >3 weeks. • Notify AMSA Joint Rescue Coordination Centre (JRCC) of activities and movements where vessels will be in the Operational Area (but outside of the Petroleum Safety Zone) >3 weeks.
Physical presence: disturbance to the seabed	Presence of subsea infrastructure (pipelines / umbilical) modifying marine habitats. IMMR activities (e.g., mattress / grout bag installation, removal of foreign objects, ROV, AUV surveys).	Minor changes / impacts to seabed habitat in and adjacent to infrastructure footprint. Damage to seabed or Underwater Cultural Heritage.	• ROV as-left survey is undertaken, to confirm all temporary equipment has been removed and to record location of new subsea infrastructure. • All IMMR activities in State waters are restricted to within the designated pipeline corridor Operational Area. • Undertake a desktop cultural underwater heritage survey using available geotechnical or

			geophysical data for the Macedon subsea infrastructure. Desktop survey to involve data to be reviewed by a qualified maritime archaeologist prior to commencement of seabed disturbance activities. • Monitoring and maintenance of subsea infrastructure to manage scour and flowline movement to within integrity envelope.
Routine acoustic emissions: noise	Noise generated within the Operational Area from vessel and IMMR activities, and noise from side scan sonar.	Interference to marine fauna from noise emitted through the marine environment.	• Vessels operate in accordance with EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures: - Vessels will not travel greater than 6 knots within 300 m of a cetacean or turtle (caution zone). - Vessels will not approach closer than 50 m for a dolphin or turtle and/or 100 m for a whale (with the exception of animals bow riding). - If the cetacean or turtle shows signs of being disturbed, support vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. - Vessels will not travel greater than 8 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.
Routine and non-routine discharges: hydrocarbons and chemicals	Discharges from pipeline / umbilicals during IMMR activities.	Potential short-term, localised decrease in water quality at release location.	• Chemicals chosen using Woodside's Chemical Selection and Assessment Environment Guideline.
	Discharges of chemicals from marine growth / scale removal during IMMR activities.	Localised, short-term decrease in water quality around subsea system within Operational Area.	
Routine and non-routine discharges: sewage, putrescible waste, greywater, bilge water, drain water, cooling water and brine	Routine discharges from vessels including sewage, grey water, brine, deck drainage, cooling water and food waste.	Localised nutrient or salinity increase, addition of surfactants (soaps and detergents) and chemicals to the water column.	• Contract vessels compliant with Marine Orders for safe vessel operations: - Marine Orders 91 (Oil) - Marine Orders 95 (Pollution prevention – Garbage) - Marine Orders 96 – (Pollution prevention –sewage) • Chemicals chosen using Woodside's Chemical Selection and Assessment Environment Guideline.
Routine and non-routine atmospheric	Vessel engines, generators and mobile / fixed plant and equipment.	GHG emissions and reduction in local air quality.	• Vessel operations compliant with Marine Order 97 (Marine Pollution Prevention – Air Pollution) to reduce atmospheric

and GHG emissions			emissions associated with vessel operations, including: - International Air Pollution Prevention (IAPP) Certificate, required by vessel class - use of low sulphur fuel when available - Ship Energy Efficiency Management Plan (SEEMP), where required by vessel class - onboard incinerator to comply with Marine Order 97. • National Greenhouse and Energy Reporting Scheme (NGERS) and National Pollutant Inventory (NPI) reporting.
Routine light emissions	Light emissions from vessels.	Potential localised disturbance to marine fauna.	• Ministerial Conditions compliance on EPBC Referral No. 2008/4605: "external lighting on all vessels will be minimised during night-time operations". • Implementation of appropriate management measures according to best practice lighting design as described in the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds.
Offshore unplanned events			
Unplanned discharges: Hazardous and non-hazardous waste management	Loss of non-hazardous solid waste (rubbish) overboard.	Impacts to marine fauna	• Chemicals chosen using Woodside's Chemical Selection and Assessment Environment Guideline. • Contract vessels compliant with Marine Orders for sage vessel operations: - Marine Oder 94 (Marine pollution prevention – packaged harmful substances) 2014; - Marine Oder 95 (Pollution prevention – Garbage) • Reasonable attempts will be made to recover environmentally hazardous or non-hazardous solid objects or waste containers lost overboard, if safe and practicable. • Lifting procedures applied by all vessels to minimise risk of dropped objects overboard.
	Dropped objects from vessels.	Damage to seabed habitat.	
	Accidental leaks from storage and equipment, ROV, AUV hydraulic fluid.	Localised contamination / pollution.	
	Leak from umbilical connector.	Contamination / pollution of water column.	
Physical presence: vessel collision with marine fauna	Physical presence of vessels.	Potential lethal impact or harm to protected species.	• Vessels operate in accordance with EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures: - Vessels will not travel greater than 6 knots within

			300 m of a cetacean or turtle (caution zone). - Vessels will not approach closer than 50 m for a dolphin or turtle and/or 100 m for a whale (with the exception of animals bow riding). - If the cetacean or turtle shows signs of being disturbed, support vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. - Vessels will not travel greater than 8 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.
Physical presence: Introduction of invasive marine species (IMS)	Invasive species in vessel ballast tanks or on vessels / submersible equipment.	Introduction of IMS to area leading to major impact to native species.	• All vessels will manage their ballast water using one of the approved ballast water management options on arrival in Australia. • Woodside PetDW's IMS risk assessment process will be applied to the project vessels and immersible equipment. Assessment will consider the following risk factors: For vessels: • vessel type • recent IMS inspection and cleaning history, including for internal niches • out-of-water period prior to mobilisation • age and suitability of antifouling coating at mobilisation date • internal treatment systems and history • origin and proposed area of operation • number of stationary/slow speed periods greater than seven days • region of stationary or slow periods • type of activity – contact with seafloor. For immersible equipment: • region of deployment since last thorough clean, particularly coastal locations • duration of deployments • duration of time out of water since last deployment • transport conditions during mobilisation

			• post-retrieval maintenance regime. Based on the outcomes of each IMS risk assessment, management measures commensurate with the risk (such as the treatment of internal systems, IMS inspections or cleaning) will be implemented to minimise the likelihood of IMS being introduced.
Diesel spill to the environment from bulk storage failure	Vessel collision. Vessel grounding.	Contamination / pollution of water column.	• Contract vessels compliant with Marine Orders for safe vessel operations: - Marine Order 21 (Safety and emergency procedures) 2016 - Marine Order 27 (Safety of navigation and radio equipment) 2016 - Marine Orders 30 (Prevention of Collisions) 2016 - Marine Orders 91 (Marine pollution prevention -oil) 2014 • All vessels to comply with MARPOL Annex 1 and have a current Shipboard Oil Pollution Emergency Plan (SOPEP) in place where required. • Notifications and reporting of all incidents resulting in a release of greater than 80L as per OPGGS (Safety) Regulations 1009, Part 4, Notifying and Reporting Accidents and dangerous occurrences (s 2.41) and (s 2.41, Item 5). • Campaign planning to include in contract for vessel work scopes that no refuelling of vessels is to be undertaken in the Operations Area. • Campaign planning to include in contract for support vessels work scopes, that no refuelling of support vessels is to be undertaken within 12 nautical miles of Ningaloo Marine Park (as defined by outer Commonwealth boundary), the north and south Muiron islands and Serrurier Island (as defined by 0 metres lowest astronomical tide, LAT), unless refuelling is to occur in a port or harbour for example Exmouth Boat Harbour. • Vessels will have constant bridge watch and use navigation equipment and radar to support AMSA Marine Order 30 requirements.

			• Develop SIMOPS plan if more than one Woodside contracted vessel is operating in the Operational Area at any time. • Incident reports are raised for unplanned releases within event reporting system. • Maintain environmental incident response equipment to enact the Oil Spill Contingency Plan. • In the event of a spill emergency response activities implemented in accordance with the Oil Spill Contingency Plan. • Arrangements supporting the activities in the Oil Spill Contingency Plan tested to ensure the Oil Spill Contingency Plan can be implemented as planned.
Onshore Planned Activities			
Physical Presence: Soil disturbance	Clearing or ground disturbance associated with IMMR activities.	Reduction in soil and vegetation structure and quality.	• Implement the Rehabilitation Monitoring and Evaluation Plan until rehabilitation criteria are met in consultation with DBCA. • All IMMR activities are undertaken only in Woodside easements and leases. • All vehicle movements are contained to existing roads and tracks.
	Vehicles driving off sealed roads for IMMR activities and general operations		
Physical presence: Fauna interaction	Fauna interaction (e.g., vehicle strike) during IMMR activities.	Collision with and potential fatalities to fauna.	• Implement the Rehabilitation Monitoring and Evaluation Plan until rehabilitation criteria are met in consultation with DBCA. • All IMMR activities are undertaken only in Woodside easements and leases. • Ground disturbing works are managed to reduce impacts via the work packs developed for each specific IMMR scope of work. • Routine pipeline inspection activities along the right-of-way (ROW) and pipeline easement are only undertaken during daylight hours. • Vehicles travel at reduced speed (maximum of 20 km/h) on the ROW. • Keep vegetation regrowth low along the pipeline ROW and access track.
	Ground disturbing activities.	Trapping of fauna leading to injury or death.	
	Vegetation slashing for track maintenance.	Disturbance to fauna.	
Physical Presence: Spread of	Vehicle movements on right-of-way (ROW).	Increased spreading of weeds, potential infectious disease from introduced pests (i.e. rats and mice), to	• Weed spraying of key species along the ROW as required in the Mt Minnie Conservation area,

pests/ weeds/ disease	Presence of operational pipeline in landscape.	area leading to major impact to native species.	until rehabilitation criteria are met in consultation with DBCA. • All vehicles that travel along the ROW will be inspected for vegetative material, mud and debris prior to departure. • Pest control is undertaken at the metering station.
Routine and non-routine atmospheric emissions and GHG emissions	Venting gas from valves, fugitives, generators, analysers, and maintenance at metering station.	Local reduction in air quality, climate change impacts.	• Vehicles are checked and serviced regularly to maintain efficiency and prevent breakdowns. • Vehicle pre-start checks carried out before each journey. • Leak detection program for detection of fugitive emissions from the pipeline.
	Vehicle fuel consumption, combustion engines used during maintenance, and dust.	Local reduction in air quality.	
Routine light emissions	Operational lighting at the meter station.	Disturbance to fauna.	• Routine pipeline inspection activities along ROW and pipeline easement are undertaken during daylight hours. • Lighting has been designed at low elevation. Where lighting is required on equipment that is above 15 m above height datum, this will have manual activation, to ensure it is only utilised when required for safe operational inspection and maintenance at night.
	Temporary lighting and vehicle light during IMMR activities.		
Onshore Unplanned Events			
Unplanned discharges: hazardous materials and chemicals	Release of hazardous materials during storage, handling or use.	Contamination to atmosphere, soil, or water.	• Chemicals will be stored safely to prevent the release to the environment. • Hydrocarbon and chemical containment, clean-up, and soil remediation procedures in the event of a spill. • Continuous bunding or drip trays used around machinery / equipment with the potential to leak chemicals / fuel. • Chemicals chosen using the Chemical Selection and Assessment Environment Guideline. • Vehicles are checked and serviced regularly to maintain efficiency and reduce the likelihood of breakdowns. • Vehicle pre-start checks carried out before each journey.
	Vehicle fuel leak.		
Unplanned discharges:	Pipeline and umbilical leaks caused by damage or loss of integrity.	Groundwater contamination and/or localised reduction in air quality.	• Integrity Management Plan, which drives the inspection

hydrocarbons or emissions	Fugitive emissions of gas from unplanned leaks on the onshore pipelines via seals, gaskets and valves.		program to identify integrity issues. • Hydrocarbon and chemical containment, clean-up and soil remediation procedures in the event of a spill. • Design chemical controls to maintain pipeline integrity, including use of corrosion inhibitor.
Incomplete rehabilitation (pipeline corridors and borrow pits)	Incomplete rehabilitation (pipeline corridors and borrow pits).	Loss of plant species diversity.	• Implement the Rehabilitation Monitoring and Evaluation Plan until rehabilitation criteria are met in consultation with DBCA. • Weed spraying of key species along the ROW as required in the Mt Minnie Conservation area, until rehabilitation criteria are met in consultation with DBCA.

6. IMPLEMENTATION STRATEGY

6.1 Systems, Practices and Procedures

Woodside PetDW HSE Management System

The Woodside PetDW Health Safety Environment (HSE) Management System defines the boundaries within which all activities are conducted. It provides a structured framework to set common requirements, boundaries, expectations, governance and assurance for all activities. It also supports accountabilities and responsibilities as defined in the organisational structure.

This EP has been designed to meet the environmental aspects of the Woodside PetDW HSE Management System framework and establishes the foundation for continual improvement through the application, monitoring and auditing of consistent requirements across all aspects of the Petroleum Activity including:

- Identification of statutory obligations and commitments to ensure maintenance of licence to operate
- Implementation of petroleum risk management processes, including this EP
- Scheduled monitoring and auditing of control implementation
- Completion of reviews, and reporting outcomes of these reviews.

Management of Change

Proposed changes to this EP and OSCP will be managed in accordance with the Woodside PetDW Management of Change (MoC) procedure and consider the requirements of Regulations 7, 8, and 18 of the PSLER.

For a proposed change to proceed, the MoC procedure will determine whether a revision of the EP is required and whether that revision is to be submitted to DEMIRS. Where any singular or a series of occurrence of significant new or increased impacts and risks are identified, the associated environmental impacts and risks must be demonstrated to be acceptable and ALARP. Depending on the nature and scale of the change, additional stakeholder consultation may be required. The MoC procedure also allows for the assessment of new information that may become available post EP acceptance.

In the event of a change to Woodside's nominated liaison person, or a change to the contact details for the titleholder or the nominated liaison person, Woodside will notify DEMIRS of the change in writing as soon as practicable.

6.2 Roles and Responsibilities

Table 6-1: Roles and responsibilities

Title (role)	Environmental Responsibilities
All Personnel	
All facility-based personnel and onshore support personnel	Understand the Woodside standards and procedures that apply to their area of work. Carry out assigned activities in accordance with approved procedures and the EP. Prompt reporting of environmental hazards/incidents to their supervisor and assist in event investigation. Attend HSE meetings, training and drills when required.
Office-based Personnel	
Macedon Asset Manager	Accountable for ensuring all necessary regulatory approvals are in place to operate.

Title (role)	Environmental Responsibilities
	Responsible for continuous improvement of operations of the facility, including environmental performance. Accountable for incident notification, reporting and investigation in line with regulatory requirements, the Woodside PetDW HSE Management System and EP requirements.
Macedon Person In Charge	Responsible for the operation of the facility in accordance with legislative/regulatory requirements (including this EP) and the Woodside PetDW HSE Management System. Accountable for aspects of integrity management. Accountable for conformance to production Operations processes.
Environment Manager	Facilitate operations environmental approval documentation and timely submission in accordance with regulatory requirements. Monitor and communicate to internal stakeholders all relevant changes to legislation, policies, regulator organisation that may impact the EP or business.
Production Environment Adviser	Manage change relevant to the EP in accordance with the Environment Regulations and the EP. Liaise with Woodside contractors and Subsea Support Bessel crew to communicate and ensure their understanding of IMMR related requirements under this EP. Ensure environmental monitoring, offshore inspections, and reporting is undertaken as per the requirements of this EP.
Subsea and Pipelines (IMMR) Activity Manager	Ensure IMMR process undertaken in line with EP commitments. Provide sufficient resources to implement the EP requirements. Monitor and close out corrective actions raised from IMMR environmental inspections/ audits or incidents.
Corporate Affairs Adviser	Stakeholder identification and consultation.
Woodside Marine Services Function	Responsible for pre-charter assurance for all contracted vessels. Conduct of ongoing operational assurance of vessels contracted through Woodside Marine, to confirm vessels operate in compliance with relevant legislation, rules and Woodside Marine Charterers Instructions in order to be able to meet safety, navigation, operational and emergency response requirements.
Contractor Sponsors	Ensure implementation of EP for the contractor's scope of work. Confirm contractors have adequate environmental capability in order to execute their respective scopes of work.
Vessel-based Personnel	
Vessel Master of Subsea Intervention Vessel	Understand and manage HSE aspects of the vessel, including environmental requirements. Communicate with Offshore Installation Manager as required regarding potential environmental risks applicable to vessel activities. Notify AMSA and other authorities of any incidents as per maritime requirements. Ensure the vessel's Emergency Response Team have sufficient training to implement the vessel's SOPEP.
Subsea and Pipelines Site Woodside Representative	Ensure relevant management measures in this EP are implemented on the Subsea Support Vessel. Ensure periodic environmental inspections are completed. Ensure environmental incidents or breaches of EPOs, EPSs or MCs are reported in accordance with Woodside and regulatory requirements.

6.3 Training and Competency

Environmental awareness training is required for all personnel, detailing awareness and compliance with the Contractor's environmental policy and environmental management system.

Inductions are provided to all relevant personnel (e.g. Contractors and Woodside representatives) before mobilising to or on arrival at the activity location. The induction covers the HSE requirements and environmental information specific to the activity location. Attendance records are maintained.

6.4 Monitoring and Management of Compliance

Monitoring is conducted during an activity to monitor compliance against the environmental performance objectives, environmental performance standards and measurement criteria which are developed based on the impacts, risks and associated controls described above. These are reviewed throughout the life of the EP to identify opportunities for improvement.

Any non-conformances with the environmental performance objectives and environmental performance standards in the EP are classified as environmental incidents. These are reported and managed in accordance with Woodside's Health, Safety and Environment Event Reporting and Investigation Procedure and the EP.

All emissions and discharges to the environment from vessels will be monitored to assess the environmental performance, as required in the EP.

6.5 Reporting

To meet the environmental performance objectives and standards outlined in this EP, Woodside reports at a number of levels. Internal reporting includes:

- daily progress reports and meetings
- regular HSE meetings
- performance reporting.

External routine reporting also occurs, which includes:

- environmental performance review and reporting
- incident reporting
- quarterly emissions and discharges reporting.

6.6 Emergency Preparedness and Response

Woodside has detailed Oil Pollution Emergency Arrangements and Hydrocarbon Spill Preparedness and Response Procedures. These are supported by various plans that detail the actions and resources available in the event of various emergency scenarios.

Relevant vessels are required to have a Ship Oil Pollution Emergency Plan (SOPEP) in accordance with the requirements of the Australian Marine Orders. These plans outline responsibilities, specify procedures and identify resources available in a hydrocarbon or chemical spill from vessel activities.

The Macedon First Strike Plan provides immediate actions required to commence a response if hydrocarbons are released to the marine environment and would be implemented in conjunction with the SOPEP and the Tactical Response Plans that have been developed for priority protection areas.

In the event of a major spill, the Department of Transport (DoT), as the administrator of the State Hazard Plan Maritime Environmental Emergencies, provides support to Woodside through advice and access to equipment, people and liaison. The interface and responsibilities are described in the Oil Pollution Emergency Arrangements and the Macedon First Strike Plan. In the event of a Level 2/3 spill, the role of Controlling Agency may be appointed to either DoT or any relevant Port Authority

and will be determined by the Jurisdictional Authority (DoT) in consultation with the Port Authority. The Controlling Agency will be the agency deemed most capable of performing the role of Controlling Agency. The Controlling Agency will appoint an Incident Controller and form a separate Incident Management Team.

Testing of Hydrocarbon Spill Response Arrangements

Woodside's emergency response testing regime is aligned to existing or developing risks associated with Woodside's operations and activities. Woodside regularly tests hydrocarbon spill arrangement to:

- ensure relevant responders, contractors and key personnel practice their assigned roles and responsibilities in hydrocarbon spill response
- test response arrangements and actions to validate response plans
- ensure lessons learned are incorporated into Woodside processes and procedures and improvements made where required.

Testing methods may include audits, drills, field exercises, functional workshops, assurance reporting, assurance monitoring and review of key external dependencies.

APPENDIX A

Species identified by the EPBC Act Protected Matters Search Tool as potentially occurring within the Operational Area or EMBA

Species Name	Common Name	Threatened Status	Migratory Status	Operational Area	EMBA
Mammals					
Balaenoptera musculus	Blue whale	Endangered	Migratory	✓	✓
Balaenoptera physalus	Fin whale	Vulnerable	Migratory	✓	✓
Balaenoptera borealis	Sei whale	Vulnerable	Migratory	✓	✓
Megaptera novaeangliae	Humpback whale	N/A	Migratory	✓	✓
Balaenoptera edeni	Bryde's whale	N/A	Migratory	✓	✓
Tursiops aduncus (Arafura/Timor Sea populations)	Spotted bottlenose dolphin (Arafura/Timor Sea populations)	N/A	Migratory	✓	✓
Sousa sahulensis	Australian Humpback Dolphin	N/A	Migratory	✓	✓
Orcaella heinsohni	Australian Snubfin Dolphin	N/A	Migratory	✓	✓
Dugong dugon	Dugong	N/A	Migratory	✓	✓
Physeter macrocephalus	Sperm whale	N/A	Migratory	X	✓
Eubalaena australis	Southern right whale	Endangered	Migratory	✓	✓
Balaenoptera bonaerensis	Antarctic Minke Whale	N/A	Migratory	X	✓
Orcinus orca	Killer whale	N/A	Migratory	✓	✓
Macroderma gigas	Ghost Bat	Vulnerable	N/A	✓	✓
Rhinonicteris aurantia (Pilbara form)	Pilbara Leaf-nosed Bat	Vulnerable	N/A	✓	✓
Petrogale lateralis lateralis	Black-flanked Rock-wallaby	Endangered	N/A	X	✓
Dasyurus hallucatus	Northern Quoll	Endangered	N/A	✓	✓
Reptiles					
Caretta caretta	Loggerhead turtle	Endangered	Migratory	✓	✓
Chelonia mydas	Green turtle	Vulnerable	Migratory	✓	✓
Dermochelys coriacea	Leatherback turtle	Endangered	Migratory	✓	✓
Eretmochelys imbricata	Hawksbill turtle	Vulnerable	Migratory	✓	✓
Natator depressus	Flatback turtle	Vulnerable	Migratory	✓	✓
Aipysurus apraefrontalis	Short-nosed sea snake	Critically Endangered	N/A	✓	✓
Aipysurus foliosquama	Leaf-scaled sea snake	Critically Endangered	N/A	✓	✓
Liasis olivaceus barroni	Olive Python (Pilbara subspecies)	Vulnerable	N/A	✓	✓
Fishes and Elasmobranchs					
Carcharodon carcharias	Great white shark	Vulnerable	Migratory	✓	✓

Species Name	Common Name	Threatened Status	Migratory Status	Operational Area	EMBA
Carcharias taurus	Grey nurse shark (west coast population)	Vulnerable	N/A	✓	✓
Rhincodon typus	Whale shark	Vulnerable	Migratory	✓	✓
Isurus oxyrinchus	Shortfin mako	N/A	Migratory	X	✓
Isurus paucus	Longfin mako	N/A	Migratory	X	✓
Sphyrna lewini	Scalloped Hammerhead	Conservation Dependent	N/A	✓	✓
Carcharhinus longimanus	Oceanic whitetip shark	N/A	Migratory	✓	✓
Pristis zijsron	Green sawfish	Vulnerable	Migratory	✓	✓
Pristis clavata	Dwarf sawfish	Vulnerable	Migratory	✓	✓
Pristis pristis	Freshwater Sawfish	Vulnerable	Migratory	✓	✓
Anoxypristis cuspidata	Narrow sawfish	N/A	Migratory	✓	✓
Manta birostris	Giant manta ray	N/A	Migratory	✓	✓
Manta alfredi	Reef manta ray	N/A	Migratory	✓	✓
Ophisternon candidum	Blind Cave Eel	Vulnerable	N/A	X	✓
Milyeringa veritas	Cape Range Cave Gudgeon	Vulnerable	N/A	X	✓
Thunnus maccoyii	Southern Bluefin Tuna	Conservation Dependent	N/A	✓	✓
Birds					
Calidris canutus	Red knot, knot	Endangered	Migratory	✓	✓
Numenius madagascariensis	Eastern curlew, Far eastern curlew	Critically Endangered	Migratory	✓	✓
Calidris ferruginea	Curlew sandpiper	Critically Endangered	Migratory	✓	✓
Macronectes giganteus	Southern giant-petrel	Endangered	Migratory	✓	✓
Pterodroma mollis	Soft-plumaged Petrel	Vulnerable	N/A	X	✓
Sternula nereis nereis	Australian fairy tern	Vulnerable	N/A	✓	✓
Limosa lapponica	Bar-tailed godwit	N/A	Migratory	✓	✓
Limosa lapponica baueri	Bar-tailed godwit (baueri)	Vulnerable	N/A	✓	✓
Limosa lapponica menzbieri	Northern Siberian bar-tailed godwit	Critically Endangered	N/A	✓	✓
Rostratula australis	Australian painted snipe	Endangered	N/A	✓	✓
Anous stolidus	Common noddy	N/A	Migratory	✓	✓
Fregata ariel	Lesser frigatebird	N/A	Migratory	✓	✓
Actitis hypoleucos	Common sandpiper	N/A	Migratory	✓	✓
Calidris acuminata	Sharp-tailed sandpiper	N/A	Migratory	✓	✓
Calidris melanotos	Pectoral sandpiper	N/A	Migratory	✓	✓
Pandion haliaetus	Osprey	N/A	Migratory	✓	✓
Calonectris leucomelas	Streaked shearwater	N/A	Migratory	✓	✓
Apus pacificus	Fork-tailed swift	N/A	Migratory	✓	✓

Species Name	Common Name	Threatened Status	Migratory Status	Operational Area	EMBA
Ardenna pacifica	Wedge-tailed shearwater	N/A	Migratory	X	✓
Ardenna carneipes	Flesh-footed Shearwater	N/A	Migratory	X	✓
Hydroprogne caspia	Caspian tern	N/A	Migratory	X	✓
Sterna dougallii	Roseate tern	N/A	Migratory	X	✓
Charadrius leschenaultia	Greater sand plover	Vulnerable	Migratory	✓	
Charadrius veredus	Oriental plover	N/A	Migratory	✓	✓
Glareola maldivarum	Oriental pratincole	N/A	Migratory	✓	✓
Onychoprion anaethetus	Bridle tern	N/A	Migratory	X	✓
Sternula albifrons	Little tern	N/A	Migratory	✓	✓
Thalasseus bergii	Greater Crested tern	N/A	Migratory	X	✓
Tringa nebularia	Common greenshank	N/A	Migratory	X	✓
Thalassarche carteri	Indian, yellow-nosed albatross	Vulnerable	Migratory	✓	✓
Thalassarche impavida	Campbell Albatross	Vulnerable	Migratory	X	✓
Falco hypoleucos	Grey Falcon	Vulnerable	N/A	✓	✓
Erythrotriorchis radiatus	Red goshawk	Endangered	N/A	✓	✓
Pezoporus occidentalis	Night parrot	Endangered	N/A	✓	✓
Phaethon lepturus fulvus	Christmas Island White-tailed Tropicbird	Endangered	N/A	X	✓
Phaethon lepturus	White-tailed tropicbird	N/A	Migratory	✓	✓
Limnodromus semipalmatus	Asian Dowitcher	N/A	Migratory	✓	✓
Hirundo rustica	Barn Swallow	N/A	Migratory	✓	✓
Motacilla cinerea	Grey wagtail	N/A	Migratory	✓	✓
Motacilla flava	Yellow Wagtail	N/A	Migratory	✓	✓