Julimar Subsea Installation Environment Plan

Environment Plan Summary

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1. INTRODUCTION

Apache Energy Limited (AEL) is the registered operator for Petroleum Pipeline Licence WA-26-PL on behalf of registered Titleholders Apache Julimar Pty Ltd and KUFPEC Australia (Julimar) Pty Ltd, the pipeline licence for the Julimar-Brunello pipeline facility. Apache Energy Limited is also the registered Operator on behalf of Apache Julimar Pty Ltd and Kufpec Australia (Julimar) Pty Ltd who are the titleholders for petroleum activities within WA-49-L.

In Australia, Apache Julimar Pty Ltd is a subsidiary of AEL, an Australian operating subsidiary of Apache Corporation. AEL has had a presence on Western Australia's North West Shelf (NWS) since 1993 when it took over operations of the Harriet field and the Varanus Island gas plant and oil storage facility from Hadson Energy. Since the early 2000's, AEL has been one of the major holders of petroleum exploration permits on the NWS, and is one of the most active offshore drillers in Australia.

Apache proposes to undertake a subsea installation activity in two phases within the Julimar operational area; the first stage will take approximately 2 weeks, the second stage will take approximately 4 weeks. The EP allows for installation of manifolds, anti-scour protection, tie-in spools and supports, flying leads and electric hydraulic umbilical (EHU), as well as various pre and post installation surveys, including metrology.

1.1 Compliance

The overall purpose of the Environment Plan (EP) is to comply with statutory requirements of the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) regulations 2009 (OPGGS (E) Regulations) and to ensure that the Activity is planned and conducted in line with Apache environmental policies and standards, including the corporate Environmental Policy. The EP was assessed and accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on the 3rd of December 2014. This EP summary has been prepared in accordance with the requirements of regulation 11 (7) and (8) of the OPGGS (E) Regulations.

1.2 Schedule

Activities are scheduled to occur in a window between August 2015 and March 2016, although the activity could occur outside of this defined window. The latest date for completion of the activity is December 2016.

1.3 Other relevant approvals

The Julimar Subsea Installation Activity will be taking place over previously installed infrastructure. The worst case credible spill scenario was assessed as a release of reservoir hydrocarbons from a Christmas tree associated with Apache's Brunello drill centre due to a dropped object (e.g. manifold). The impacts and risks associated with this spill event, and the description of the receiving environment have been detailed in the accepted *Brunello Appraisal and Production Drilling Environment Plan (EA-72-RI-10004.01)* and were therefore referred to in the Julimar Subsea Installation Activity EP.

2. ACTIVITY LOCATION

Subsea facilities will be installed in petroleum production licence WA-49-L. This and the pipeline license area are contained within a larger 'operational area' defined in **Table 2-1** and **Figure 2-1**. The operational area defines the boundary within which the activity described in the EP will occur. The operational area is approximately 47 km from the WA coastline.

Bounding coordinates for the operational area are presented in **Table 2-1** below.

Table 2-1: Coordinates of the operational area

Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
-20.0334	115.1822
-19.9963	115.2399
-19.9528	115.2932
-19.9413	115.3529
-19.9091	115.3904
-19.9239	115.4041
-19.9587	115.3647
-19.9718	115.3137
-19.9808	115.2913
-20.0013	115.2684
-20.0325	115.2254
-20.0469	115.1903

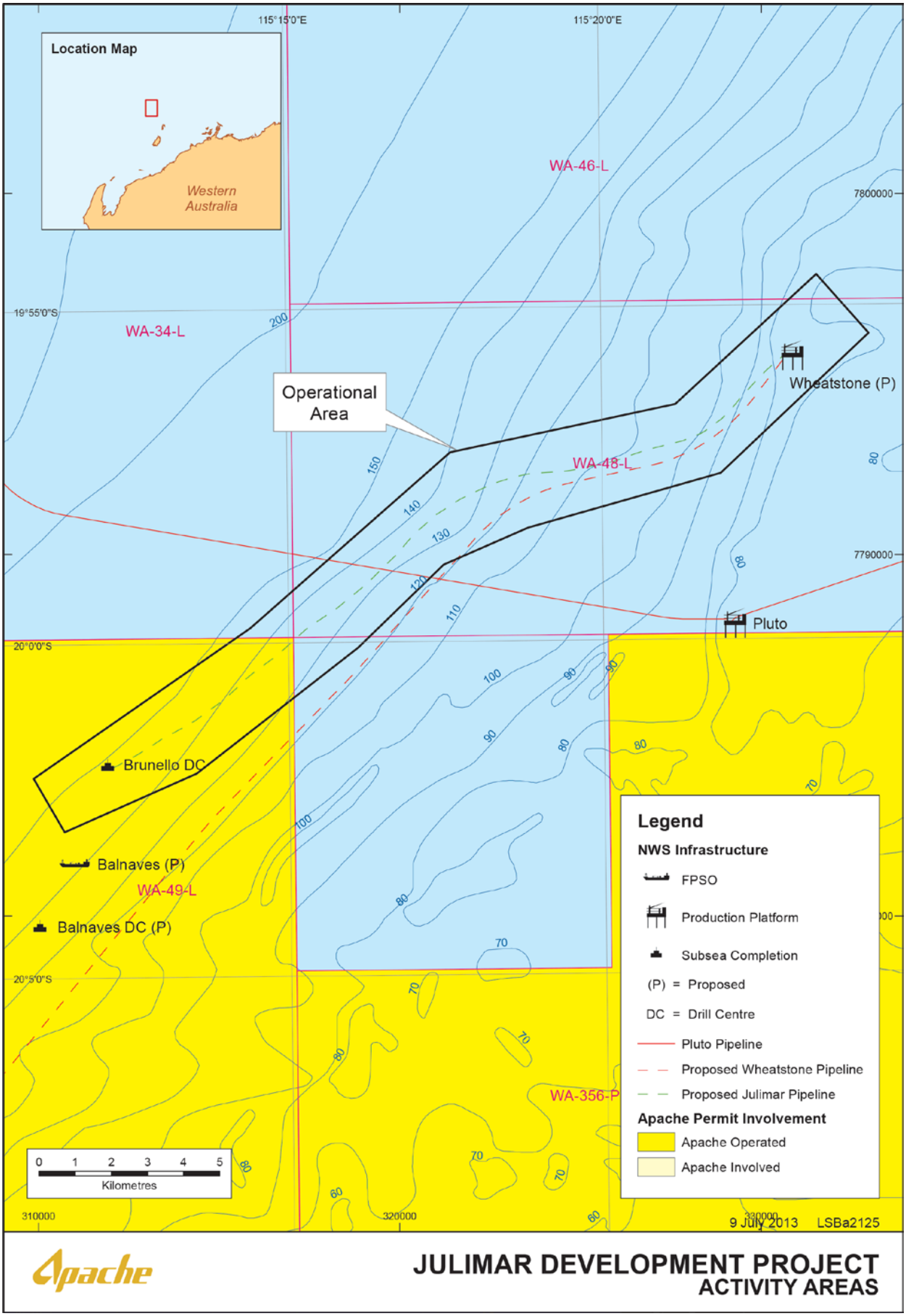

Figure 2-1: Julimar operational area

3. DESCRIPTION OF THE ACTIVITY

3.1 Activity Stages

The activity will be carried out 24 hours per day, seven days per week over two separate phases. It is envisaged that the two phases will be carried out by two different vessels.

The first stage will involve a pre-installation survey, the installation of the manifold structures, manifold anti-scour protection and tie-in spools supports. During this campaign the tie-in spool metrology will also take place. The duration of this campaign is estimated to take approximately 2 weeks to complete, excluding weather standby or other unplanned downtime.

The second stage will comprise a pre-installation survey, the installation of the tie-in spools and flying leads, the installation of the EHU and post installation testing and surveys. The duration of the second stage will be approximately 4 weeks, excluding weather standby or unplanned downtime.

The two stages of the installation activity will not run concurrently but will be separated by a period of approximately 2-3 months to allow for the tie-in spool fabrication following the completion of metrology in the first stage.

3.2 Vessels

Two types of vessels have been nominated as primary installation vessels for use during installation activities, a Heavy Construction Vessel (HCV) will be used in the first stage of installation. The second stage will utilise a Subsea Construction Vessel (SCV) for tie-in of the spools, flying leads, and installation of the EHU. Marine gas oil (MGO) only will be utilised on these vessels.

The HCV will be utilised to install the production and crossover manifolds at the Brunello (BRUA) drill centre. The SCV will then be utilised to install spools which will be tied in using remotely operated vehicles (ROVs).

The SCV will be utilised to install the tie-in spools which are offloaded from barges. The EHU will also be installed by the SCV following manifold installation. Mattresses, steel tube flying leads (STFL), utility jumpers, electrical flying leads (EFL) and optical flying leads (OFL) will also be installed by the SCV. Other project vessels will provide construction support and supply (e.g. refuelling vessel).

3.3 Pre and post installation activities

A long base line (LBL) acoustic transponder array will be installed to accurately position the Julimar Development Project manifolds, tie-in spools, and associated equipment, and used prior to spool fabrication and installation activities.

Following installation of the manifolds, anti-scour protection will be installed around the perimeter of the manifolds. This may be individual mattresses or an inflatable lattice type grout bags/filled skirt. The manifolds will undergo post-installation testing to ensure that they are functioning correctly following installation involving the discharge of preservation fluid.

To assist with the manifold tie-in works, tie-in equipment tooling basket and mattress tool laydown areas may be established adjacent to the manifolds. During installation, the tie-in spools will be deployed flooded with water, Monoethylene Glycol (MEG), oxygen scavenger, corrosion inhibitor, biocide and fluorescein dye. Due to the nature of the subsea connection system and the requirement to expose the bore of the spool and connector to facilitate the connection to the structure subsea, some of this treated water is expected to escape during the make-up of the subsea connectors at each end of the tie-in spools.

Following installation, the BRUA Drill Centre infrastructure will be tested to ensure that all equipment has been installed and connected correctly and that all systems are functioning correctly. Preservation fluid will be discharged during actuation of valves and systems and function testing in small volumes.

4. DESCRIPTION OF ENVIRONMENT

4.1 Operational area

The Julimar operational area is situated within Commonwealth waters of the North-west Marine Region (DSEWPaC, 2008). The North-west Marine Region is further divided into eight provincial bioregions. The operational area is located within the Northwest Shelf (NWS) Province. Water depths within the bioregion range from 0-200 m, with more than 45% of the bioregion having a depth of 50-100 m; water depths in the operational area range from 70 m and 150 m.

4.2 Environment that may be affected

The environment that may be affected (EMBA) encompasses the environment that could be affected by unplanned as well as planned events. The area has been derived using modelling of credible worst case spill scenarios. The EMBA does not represent the area that would be impacted following a single worst case scenario, but a cumulative area within which all potential oil spill impacts would be contained.

4.3 Physical environment

Waters from Kalbarri to the Northern Territory border predominantly lie in the arid tropics experiencing high summer temperatures and periodic tropical cyclones in summer. Rainfall in the region is low, although intense rainfall may occur during the passage of summer tropical cyclones and thunderstorms (Condie *et al*. 2006).

Major drivers of marine ecosystems include ocean currents, tides, waves, temperature and salinity. The dominant offshore sea surface current is the Leeuwin Current, which carries warm tropical water south along the edge of Western Australia's continental shelf, reaching its peak strength in winter and becoming weaker and more variable in summer (Condie *et al*. 2006). The nearshore Ningaloo Current flows northwards opposite to the Leeuwin Current, along the outside of the Ningaloo Reef and across the inner shelf from September to mid-April, (BHPB 2005, Woodside 2005). The Indonesian Throughflow is the other important current influencing the upper 200 m of the outer North West Shelf (Woodside 2005). This current brings warm and relatively fresh water to the region from the western Pacific via the Indonesian Archipelago.

Tides in the area are generally semi-diurnal (i.e. two high tides and two low tides per day) with a spring/neap cycle. The wave climate in the area is composed of locally-generated wind waves (seas) and swells that are propagated from distant areas (WNI 1995). In summer the seas typically approach from the west and south-west, while in winter the seas typically approach from the south and east. Mean sea wave heights are typically less than 1 m and peak heights of less than 2 m are experienced in all months of the year (WNI 1995).

Average swell heights are low, around 0.4–0.6 m in all months. The greatest exposure to swells is from the west. Tropical cyclones have generated significant swell heights of up to 5 m in this area, although the predicted frequency of swells exceeding 2 m is less than 5% (WNI 1996). In the open ocean, sustained winds result in wind-forced currents of approximately 3% of the wind speed (Holloway & Nye 1985).

Waters on the continental shelf are usually thermally-stratified, with a marked change in water density at approximately 20 m. Surface temperatures vary annually, being warmest in March (32°C) and coolest in August (19°C). Vertical gradients are related to the seasonality of sea surface temperatures, and are greatest during the warm-water season. Near-bottom water temperature on the North West Shelf is approximately 23°C, with no discernible seasonal variation.

Salinity is relatively uniform at 34–35 parts per thousand (ppt) throughout the water column and across the North West Shelf. Due to the low rainfall there is little freshwater run-off from the adjacent mainland. Pronounced shifts in water column characteristics can occur following the passage of tropical cyclones (McKinnon *et al.*, 2003).

4.4 Biological environment

4.4.1 Operational Area – NWS Province Bioregion

The operational area is situated in the NWS Province which is almost entirely on the continental shelf, except for a small area to the north of Cape Leveque that extends onto the continental slope. The shelf gradually slopes from the coast to the shelf break, but displays a number of seafloor features such as banks/shoals and holes/valleys. The dynamic oceanic environment influences sediment distribution throughout the bioregion. The seafloor of this bioregion is particularly strongly affected by cyclonic storms, long-period swells and large internal tides, which can resuspend sediments within the water column as well as move sediment across the shelf.

Low density benthic communities of bryozoans, molluscs and echinoids are supported within the bioregion. Sponge communities are also sparsely distributed on the shelf and are found only in areas of hard substrate. Benthic and pelagic fish communities are also highly diverse and strongly depth-related with a number of hotspots identified between Port Hedland and North West Cape. Numerous migratory species including humpback whales and whale sharks travel through the bioregion. The bioregion also supports bottlenose and indo-pacific humpback dolphins, turtle nesting sites, and several seabird breeding populations.

Extensive seabed surveys of the Julimar operational area found the benthic habitat present is primarily (>98%) soft sediments with sparse (5–25% density) epifauna and little evidence of bioturbation. Cemented sediment habitat within the operational area was found to support a mixed benthic invertebrate community including large sea fans, sponges, soft corals, sea whips and ascidians (RPS, 2010; 2011).

The Julimar EMBA also has the potential to reach other bioregions, if for example a fuel tank rupture or loss of well control were to occur.

4.4.2 EMBA geographical features

Geographical features that may be affected by an oil spill such as that which could occur as a result of a loss of well control due to subsea infrastructure damage include:

- Barrow, Montebello, Lowendal and Muiron islands;
- Ningaloo and Northern Coast;
- Dampier Archipelago; and
- Abrolhos Islands.

4.5 Habitats and Protected Significant Areas

Within the Julimar EMBA a number of habitats and protected areas occur. Within the operational area, only benthic habitats of soft sediment and cemented sediments occur and the KEF Ancient coastline at the 125m depth contour.

Table 4-1: Habitats and protected Significant Areas within the Julimar EMBA

Category	Receptor within EMBA	
Benthic Habitats	Soft sediments and associated epifauna; Coral reefs; Macroalgae; Seagrasses; and Cemented/ hard sediments and associated epifauna.	
Shoreline habitats	Rocky Shorelines; Sandy beaches; and Mangroves.	
World Heritage Areas	Shark Bay; and Ningaloo Coast.	
National Heritage Places	Ningaloo Coast; Shark Bay; Barrow Island Marine Conservation Reserve; and Montebello-Barrow Islands Marine Conservation Reserve.	
Commonwealth Marine Reserves	Abrolhos Argo-Rowley Ashmore Reef Carnarvon Canyon Cartier island Dampier Eighty Mile Beach Gascoyne	Jurien Kimberley Mermaid Reef Montebello Ningaloo Perth Canyon Shark Bay Two Rocks
State marine Parks and Marine management Areas	Barrow Island Marine Management Area Barrow Island Marine Park Jurien Bay Marine Park Marmion Marine Park Montebello Islands Marine Park Muiron Islands Marine Management Area	Shark Bay Marine Park Ningaloo Marine Park Rowley Shoals Marine Park Shoalwater Islands Marine Park Swan Estuary Marine Park
Ramsar Wetlands	Not present within the Julimar EMBA.	

Category	Receptor within EMBA
Key Ecological Features	Ancient coastline at 125 m depth contour; Ancient coastline at 90-120 m depth; Ashmore Reef and Cartier Island and surrounding Commonwealth waters; Canyons between the Argo Abyssal Plain with the Scott Plateau; Canyons on the slope between the Cuvier Abyssal Plain and the Cape Range Peninsula; Commonwealth marine environment surrounding the Houtman Abrolhos Islands; Commonwealth marine environment within and adjacent to the west coast inshore lagoons; Commonwealth waters surrounding Ningaloo Reef; Continental Slope Demersal Fish Communities; Exmouth plateau; Glomar Shoals; Mermaid Reef and Commonwealth waters surrounding Rowley Shoals; Perth Canyon and adjacent shelf break, and other west coast canyons; Seringapatam, Reef and Commonwealth waters in the Scott Reef Complex; Wallaby Saddle; Western demersal slope and associated fish; and Western Rock Lobster.

4.6 Marine Fauna

An EPBC search was conducted on the EMBA to indicate the potential receptors that may transit through or reside within the EMBA. Species listed as threatened (Endangered or vulnerable) and Migratory are provided in **Table 4-2**.

Table 4-2: Environmental values and sensitivities –Threatened and Migratory marine fauna in the Julimar EMBA

Category	Receptor	EPBC Protection Status
Marine mammals	Blue whale (*Balaenoptera musculus*)	Endangered; migratory
	Sei whale (*Balaenoptera borealis*)	Vulnerable
	Fin whale (*Balaenoptera physalus*)	Vulnerable
	Southern right whale (*Eubalaena australis*)	Endangered; migratory
	Humpback whale (*Megaptera novaeangliae*)	Vulnerable; migratory
	Antarctic minke whale (*Balaenoptera bonaerensis*)	Migratory
	Pygmy right whale (*Caperea marginata*)	Migratory
	Bryde's whale (*Balaenoptera edeni*)	Migratory
	Killer whale (*Orcinus orca*)	Migratory
	Sperm whale (*Physeter macrocephalus*)	Migratory
	Spotted bottlenose dolphin (Arafura/Timor Sea populations) (*Tursiops aduncus*)	Migratory
	Dusky dolphin (*Lagenorhynchus obscurus*)	Migratory
	Australian snubfin dolphin (*Orcaella heinsohni*)	Migratory
	Indo-pacific humpback dolphin (*Sousa chinensis*)	Migratory
	Dugong (*Dugong dugon*)	Migratory
Marine reptiles	Loggerhead turtle (*Caretta caretta*)	Endangered; migratory
	Green turtle (*Chelonia mydas*)	Vulnerable; migratory
	Leatherback turtle (*Dermochelys coriacea*)	Endangered; migratory
	Hawksbill turtle (*Eretmochelys imbricata*)	Vulnerable; migratory
	Flatback turtle (*Natator depressus*)	Vulnerable; migratory
	Olive Ridley turtle (*Lepidochelys olivacea*)	Endangered; migratory
	Short-nosed seasnake (*Aipysurus apraefrontalis*)	Critically endangered
	Leaf-scaled sea snake (*Aipysurus foliosquama)*	Critically endangered
Seabirds	Southern giant-petrel (*Macronectes giganteus*)	Endangered; migratory
	Australian lesser noddy *(Anous tenuirostris melanops)*	Vulnerable
	Southern royal albatross *(Diomedea epomophora epomophora)*	Vulnerable; migratory
	Northern royal albatross *(Diomedea epomophora sanfordi)*	Endangered; migratory
	Amsterdam albatross *(Diomedea exulans amsterdamensis)*	Endangered; migratory
	Wandering albatross *(Diomedea exulans (sensu lato))*	Vulnerable; migratory
	Tristan albatross *(Diomedea exulans exulans (D. dabbenena))*	Endangered; migratory
	Christmas Island frigatebird (*Fregata andrewsi*)	Vulnerable; migratory
	Blue petrel (*Halobaena caerulea*)	Vulnerable
	Abbott's booby (*Papasula abbotti)*	Endangered
	Northern giant-petrel (*Macronectes halli*)	Vulnerable; migratory

Category	Receptor	EPBC Protection Status
	Soft-plumaged petrel (*Pterodroma mollis*)	Vulnerable
	Australian fairy tern (*Sternula nereis nereis*)	Vulnerable
	Indian yellow-nosed albatross (*Thalassarche carteri*)	Vulnerable; migratory
	Shy albatross (*Thalassarche cauta cauta*)	Vulnerable; migratory
	White-capped albatross (*Thalassarche cauta steadi*)	Vulnerable
	Black-browed albatross (*Thalassarche melanophris*)	Vulnerable
	Campbell albatross (*Thalassarche melanophris impavida*)	Vulnerable
	Common noddy (*Anous stolidus*)	Migratory
	Fork-tailed swift (*Apus pacificus*)	Migratory
	Streaked shearwater (*Calonectris leucomelas / Puffinus leucomelas*)	Migratory
	Lesser frigatebird (*Fregata ariel*)	Migratory
	Great frigate Bird (*Fregata minor*)	Migratory
	White-tailed tropicbird (*Phaethon lepturus*)	Migratory
	Flesh-footed shearwater (*Puffinus carneipes*)	Migratory
	Wedge-tailed shearwater (*Puffinus pacificus*)	Migratory
	Little tern (*Sterna albifrons*)	Migratory
	Bridled tern (*Sterna anaethetus*)	Migratory
	Lesser crested tern (*Sterna bengalensis*)	Migratory
	Caspian tern (*Sterna caspia*)	Migratory
	Roseate tern (*Sterna dougallii*)	Migratory
	Brown booby (*Sula leucogaster*)	Migratory
	Masked booby (*Sula dactylatra*)	Migratory
	Red-footed booby (*Sula sula)*	Migratory
Sharks & Fish	Great white shark (*Carcharodon carcharias*)	Vulnerable; migratory
	Grey nurse shark (*Carcharius taurus)*	Vulnerable
	Dwarf sawfish (Pristis clavata)	Vulnerable
	Whale shark (*Rhincodon typus*)	Vulnerable; migratory
	Shortfin mako (*Isurus oxyrinchus*)	Migratory
	Longfin mako (*Isurus paucus*)	Migratory
	Mackerel shark (*Lamna nasus*)	Migratory
	Giant manta ray (*Manta birostris*)	Migratory

4.7 Socio-economic environment

Socio-economic activities that may occur within the Julimar EMBA include commercial fishing, shipping and oil and gas exploration and production (**Table 4-3**).

Table 4-3: Environmental values and sensitivities – socioeconomic in the Julimar EMBA

Category	Receptor within EMBA	Present in Operational area	Present in EMBA
Commonwealth Commercial fisheries	North West Slope Trawl Fishery	✓	✓
	Western Tuna and Billfish Fishery	✓	✓
	Western Deepwater Trawl fishery	×	✓
	Skipjack Tuna (Western) Fishery	✓	✓
	Southern Bluefin Tuna Fishery	✓	✓
State Commercial Fisheries	Pearl Oyster Managed Fishery	✓	✓
	Pilbara Trap Managed Fishery	✓	✓
	Onslow Prawn Managed Fishery	✓	✓
	Pilbara Fish Trawl Managed Fishery (Zone 1)	✓	✓
	Nikol Bay prawn limited entry fishery	×	✓
	Kimberley prawn managed fishery	×	✓
	Broome prawn managed fishery	×	✓
	Northern demersal scalefish managed fishery	×	✓
	Aquaculture pearling sites	×	✓
	West coast rock lobster managed fishery	×	✓
	Roe's abalone fishery	×	✓
	Shark Bay Crab (Interim) Managed Fishery	×	✓
	Shark Bay Prawn and Scallop Managed Fisheries;	×	✓
	Shark Bay Beach Seine and Mesh Net Managed Fishery	×	✓
	Gascoyne Demersal Scalefish Fishery;	×	✓
	Exmouth Gulf Prawn Managed Fishery	×	✓
	Mackerel Managed Fishery (Area 2 – pilbara and Area 3 - Gascoyne/West Coast)	×	✓
	Abrolhos Islands and mid-West trawl limited entry fishery	×	✓
	West Coast Deep Sea Crab (Interim) Managed Fishery (north of Cape Leeuwin and west of NT border)	×	✓
	West Coast Demersal Gillnet and	×	✓
	Demersal Longline (Interim) Managed Fishery	×	✓
	West Coast Demersal Scalefish (Interim) Managed Fishery	×	✓
	West Coast Purse Seine Fishery	×	✓

Category	Receptor within EMBA	Present in Operational area	Present in EMBA
	Cockburn Sound Crab Managed Fishery	×	✓
	Cockburn Sound Fish Net Managed Fishery	×	✓
	Cockburn Sound Line and Pot Fishery	×	✓
	South West Coast Salmon Managed Fishery	×	✓
	West Coast Estuarine Fishery	×	✓
	West Coast Beach Bait Managed Fishery;	×	✓
	South West Beach Seine Fishery	×	✓
	Marine Aquarium Fish Managed Fishery	×	✓
	Specimen Shell Managed Fishery	×	✓
	Beche-de-mer Fishery	×	✓
	Octopus	×	✓
Recreational fishing	Tourism and charter boats	×	✓
Oil and Gas	Multiple petroleum exploration and production based infrastructure and vessels	✓	✓
Shipping	Shipping traffic in the region in relation to commercial fishing and other oil and gas operations	✓	✓
Tourism	There are many sources of marine-based tourism within the spill trajectory area. Aquatic recreational activities such as boating, diving and fishing occur near the coast and islands off of the Pilbara and Ningaloo coasts	×	✓
Cultural Heritage	The search of the spill trajectory area revealed 23 listings under the Register of National Estate, of which 13 were 'natural' (one Indicative, 12 Registered), 10 were 'historic' (one Indicative, nine Registered). A number of shipwrecks are also identified	×	✓

5. STAKEHOLDER CONSULTATION

Apache Energy recognises that its development activities have the potential to impact the community and the environment, particularly in locations which feature or are near sensitive receptors, or that overlap with other economic, cultural or community uses.

To facilitate informed assessment by stakeholders of the likely potential impact of Apache activities, Apache seeks to establish long-term and meaningful dialogue with those stakeholders who have an interest in its present and planned future activities in Australia.

Apache clearly articulates engagement and consultation standards, goals, and mechanisms, seeks to effectively manage change during the life of its projects and activities, and strives to continuously improve all aspects of its stakeholder engagement processes. The key stakeholders identified for the Julimar Development Project are based on the operational area and provided in **Table 5-1**.

Table 5-1: Summary of key stakeholders consulted for the Julimar Development Project

Group	Stakeholder
Commercial fisheries	• Australian Fisheries Management Authority (AFMA); • Department of Fisheries (DoF); • Western Australian Fishing Industry Council (WAFIC); • Commonwealth Fisheries Association (CFA); • A Raptis and Sons; • Austral Fisheries; • WestMore Seafoods; • Shark Bay Seafoods; • MG Kailis; • Pearl Producers Association; and • State commercial fishing licence holders.
Recreational fisheries	• Recfishwest; and • Marine Tourism WA.
Marine conservation	• Department of Parks and Wildlife (DPaW);
Tourism	• Marine Tourism WA (formerly Charter Boat Association);
Shipping safety and security	• Australian Maritime Safety Authority (AMSA); and • Department of Defence.
Hydrocarbon spill response	• Australian Marine Oil Spill Centre (AMOSC); and • Department of Transport (DoT).
Adjacent Regulator	• Commonwealth Department of the Environment (DoE); and • Department of Mines and Petroleum (DMP).

Apache employs a dedicated Stakeholder Coordinator to manage a database of all key stakeholders in Apache's projects and operations. The purpose of the database is allow the identification, initial and ongoing contact with an appropriate stakeholder set for any given project, and to facilitate the building of long-term and meaningful dialogue with those stakeholders with whom Apache has regular contact.

Prior to preparing the Julimar Subsea Installation EP, a consultation package was distributed to stakeholders on June 12, 2014, outlining the installation activities proposed. While correspondence was

received in response to these consultation methods, no specific concerns with Julimar Subsea Installation have been raised. The most extensive consultation included the accepting and incorporating advice from DoF which was included in the development of the EP.

Apache has previously consulted on two phases of the Julimar Development Project: for the *Julimar Development Project Rock Berm Supports Installation EP* (EA-14-EI-01) (consultation distributed in February 2013) and the *Julimar Development Project Pipeline Installation EP* (EA-72-RI-008.01) (consultation distributed September 2013) the installation of rock berms and pipeline installation). Apache considers feedback collected regarding the potential impacts of other prior activities completed in near proximity is relevant to this activity and was taken into account when preparing consultation material for the EP. No major concerns were raised by stakeholders between distribution of the Julimar Subsea Installation consultation package and the submission of the EP.

The Apache Energy Quarterly Project Update has been developed in consultation with informed stakeholders and includes a summary of Apache's activities for the next six to nine months (in both Commonwealth and state waters). The quarterly updates (which include this Activity) are intended to trigger feedback, comments and requests for additional information or consultation opportunities for the future activities, and provide updates of the activities that are underway, or have previously been consulted on. Stakeholders are urged to contact Apache should they require more information or have concerns with any activities showcased.

Apache has detailed communications procedures for the life of the project and will maintain two-way communications with stakeholders regarding the Julimar Development Project and all current or proposed activities undertaken on the NWS. Many stakeholders have stated that they will contact Apache by exception, that is, if upon receiving the Stakeholder Information Package they feel the activity poses a risk to them, they will contact Apache.

6. ENVIRONMENTAL HAZARDS AND CONTROLS

Risk identification involves identifying the sources of risk, such as those events that could result in an environmental impact from the activity. The identification of events is based on a detailed understanding and experience of the activities to be carried out (Apache's engineers and project co-ordinators) and knowledge and experience of likely impacts from these activities on the environment (Apache's environmental scientists). The hazard identification workshop is the forum used to capture this expertise and was used to identify events associated. Following on from the workshop the risk assessment is further detailed through smaller working groups/ meetings as required, during the preparation of the environment plan and detailed engineering of the project design to mitigate the environmental risks identified to as low as reasonably practicable (ALARP).

AEL has undertaken environmental impact and risk assessments for the Julimar Installation Activity planned events (including any routine, non-routine and contingency activities) and unplanned events in accordance with the OPGGS (E) Regulations. The results of the assessment underpin the aspect and hazard assessments summarised in **Table 6-1** and **Table 6-2**.

The key steps of the assessment process are:

1. Define the activity and hazards (planned and unplanned events) arising from the activity;
2. Identify receptors in the environment for the activity that will or may be impacted and determine the nature and scale of impacts;
3. Determine impact and risk ranking and identify standard controls;
4. Make ALARP evaluation on impacts (planned events) and risks (unplanned events) based on standard controls and implement further controls as needed to reduce to ALARP;
5. Determine residual impact and risk ranking; and
6. Evaluate acceptability of impacts and risks.

An assessment against the Activity was undertaken and the environmental hazards or aspects were then identified. The risk assessment identified 6 potential unplanned events and 8 planned events. Environmental aspects/hazards identified for the Activity are summarised in **Table 6-1** and **Table 6-2**.

Mechanisms and thresholds for impact using scientific studies and modelling were prepared. Evaluation of impact or consequence looks at the causal effect between the aspect/hazard and the identified receptor. The consequence or risk was then evaluated on the basis that environmental performance standards as identified are implemented. Definitions to support the consequence and likelihood evaluation are included within the *Environmental Risk Identification and Analysis Procedure (EA-91-IG-004)*.

In assessing impacts associated with planned events, the likelihood of an event occurring is assumed to be 'expected' as the event is planned. As such, an evaluation of management controls that can be used to reduce the likelihood of the event (i.e. preventative controls) is not necessary.

Assessing the level of impact arising from a planned event is based on the severity of the environmental impact. In assessing unplanned events, both the likelihood of the event occurring and the severity of the impact that might arise from that unplanned event are evaluated. It is the consideration of both likelihood and Consequence Level that informs the level of environmental risk for an unplanned event.

A set of environmental performance outcome(s), environmental performance standards and measurement criteria are then identified for each aspect/ hazard. The definitions of the performance outcomes, standards and measurement criteria are consistent with the OPGGS (E) Regulations.

Table 6-1 and **Table 6-2** summarise the identified hazards and potential impacts associated with the activity. The table also lists the controls to prevent or mitigate impacts such that impacts and risks are reduced to ALARP and are at acceptable levels. The residual risk (unplanned events) and consequence (planned events) are also provided in accordance with Apache's *Environmental Risk Identification and Analysis Procedure (EA-91-IG-004)*.

Table 6-1: Environmental risk treatment summary for unplanned events

Event	Potential Impacts	Risk Level	Risk Treatment Avoidance, Mitigation & Management Controls
Hydrocarbon release (surface) – Tier 1	Accidental loss of fuel during fuel transfer would result in localised reductions in water quality that may be harmful to marine fauna in surface waters and upper layers (~1 m) of the water column	Low	• Fuel and oil transfers undertaken in accordance with contractor's permit to work and safe work procedure and include dry break connections and break-away couplings. • Vessel Safety Case accepted by NOPSEMA manages prevention of loss of containment of hydrocarbons to ALARP. • Sulphur content of MGO complies with Regulation 14 of MARPOL Annex VI in order to control SOX and particulate matter emissions. • Fuel transfer connections are bunded to contain minor spills and leaks. • Drainage and bunding systems are subject to ongoing monitoring and maintenance to ensure integrity and capacity. • Project vessels have oily water filtering systems that are compliant (i.e. discharge oily water only when oil in water <15 ppm), and surveyed, as per MARPOL Annex I/Marine Order 91. • MGO storage tanks and fluid transfer hose maintenance (including replacement of refuelling hoses every six months and base oil transfer lines at least every 12 months) undertaken in accordance with the PMS. • Oil spill response executed in accordance with Julimar Subsea Installation Oil Pollution Emergency Plan (EA-72-RI-10010.002). • Oil spill response executed in accordance with the vessel's Shipboard Oil Pollution Emergency Plan (SOPEP) as required under MARPOL. • Oil spill exercise conducted prior to the commencement of the activity and then every three months thereafter. • In line with MARPOL Annex I, all vessels involved in the activity over 400 gross tonnage will have a current SOPEP in place and a valid IOPP certificate.
Hydrocarbon release (surface) – Tier 2	The worst-case environmental incident resulting from a vessel collision is the rupturing of a vessel fuel tank resulting in the release of MGO to the environment and subsequent impacts to water quality, marine fauna and other sea users	Low	• Notification provided to key stakeholders including relevant Australian Government agencies. • Australian Hydrographic Office (AHO) (including hydro.NTM@defence.gov.au) notified of operational area, activity and duration prior to mobilisation, which triggers AHO to issue 'Notice to Mariners'. • AMSA RCC notified of operational area, activity and duration prior to mobilisation, which triggers RCC to issue an AusCoast Warning. • Australian Fisheries Management Authority (AMFA), Department of Fisheries and commercial fishing stakeholders notified prior to mobilisation. • Navigation equipment and vessel procedures compliant with all marine navigation and vessel safety requirements under the International Convention of the Safety of Life at Sea (SOLAS) 1974 and Navigation Act 2012 (or equivalent).

Event	Potential Impacts	Risk Level	Risk Treatment Avoidance, Mitigation & Management Controls
			• Project vessels equipped with an automatic identification system (AIS) and an ARPA system which can identify, track and project the closest approach for any vessel (time and location) within the operational area and radar range (<70 km away). • Vessel Safety Case accepted by NOPSEMA manages prevention of loss of containment of hydrocarbons to ALARP. • Oil spill response executed in accordance with Julimar Subsea Installation Oil Pollution Emergency Plan (EA-72-RI-10010.002). • Oil spill response executed in accordance with the vessel's Shipboard Oil Pollution Emergency Plan (SOPEP) as required under MARPOL. • Oil spill exercises conducted as per the OPEP and SOPEP and Apache's Oil Spill Response Arrangements Plan.
Non-hydrocarbon release (surface) – Liquid	Hazardous liquids (including wastes) are used or stored on board the project vessels during the activity. Accidental loss of liquid wastes to the marine environment could occur via tank pipework failure or rupture, inadequate bunding and/or storage, insufficient fastening or inadequate handling and subsea ROV operations. This may result in impacts to water quality and hence sensitive environmental receptors	Low	• Chemicals and hydrocarbons packaged, marked, labelled and stowed in accordance with MARPOL Annex III. • Chemicals (environmentally hazardous) and hydrocarbons stored in bunded areas. • Chemicals and hydrocarbons stored in accordance with relevant MSDS. • All hazardous wastes stored in a bunded area. • Vessel Safety Case accepted by NOPSEMA manages prevention of loss of containment of chemicals and non-hydrocarbon liquids to ALARP. • Chemical and hydrocarbon storage areas inspected weekly. • Apache's Environmental Chemical Approval Procedure for Operational Activities (EA-91-II-10001) will be followed to select all chemicals planned to be discharged during the Julimar activity. • Contaminated material contained onboard for onshore disposal in accordance with Environmental Protection (controlled waste) Regulations (2004). • All shipboard chemical spills and hydrocarbon spills managed in accordance with SOPEP/SMPEP. • Spill clean-up equipment located where chemicals and hydrocarbons are stored and frequently handled. • Scupper plugs or equivalent deck drainage control measures available where chemicals and hydrocarbons are stored and frequently handled. • Only non-hazardous, biodegradable detergents used for deck washing. • Secondary containment shall be available for all machinery or equipment with potential to leak chemicals or hydrocarbons to the marine environment. • Following rainfall events, bunded areas on open decks of the vessels will be cleared of rainwater. • As required by MARPOL Annex I Regulations, while in the operational area, project vessels may discharge oily water after treatment to 15 ppm in a MARPOL compliant oily water filter system.

Event	Potential Impacts	Risk Level	Risk Treatment Avoidance, Mitigation & Management Controls
			• To discharge, the project vessels will require a current International Oil Pollution Prevention (IOPP) certificate for oily water filtering equipment.
Non-hydrocarbon release (surface) - Solid	Non-hydrocarbon solid wastes such as plastics have the potential to smother benthic environments and harm marine fauna through entanglement or ingestion. Release of hazardous solids (e.g. wastes) may result in the pollution of the immediate receiving environment	Low	• Non-hazardous and hazardous wastes collected, stored, processed and disposed of in accordance with the vessel's Garbage Management Plan, as required under Regulation 9 of MARPOL Annex V. • All shipboard objects lost overboard managed in accordance with SOPEP/SMPEP and Emergency response Procedures. • Chemicals stored in accordance with relevant MSDS. • Vessel Safety Case accepted by NOPSEMA manages prevention of loss of containment of non-hydrocarbon solid waste. • Grouting procedures endorsed by Apache Project Manager specify manned operation using grout bags designed for cement loading and pumping of known volumes into grout bags.
Hydrocarbon release (sub-surface)[1]	An object dropped overboard from the project vessels (i.e. container, project vessel anchor drop/drag, installation equipment etc.) has the potential to damage benthic habitats and associated biota and result in a release from subsea infrastructure, damage to a Christmas tree at the Brunello location could result in a loss of well control. if hydrocarbons are released there is potential for impacts to water quality, marine fauna and other sea users over a period of up to 11 weeks whilst the leak is brought under control.	Medium	• Material handling and lifting equipment maintained in accordance the PMS. • Lifting equipment certified. • Detailed records of any equipment lost overboard completed. • Compliance with equipment handling and lifting procedures demonstrated by mitigation measures being included in JSA. • Vessel Safety Case accepted by NOPSEMA manages prevention of loss of containment of non-hydrocarbon solid waste. • Communications are maintained during lifts to prevent loss of objects overboard. • During preparation of the MODU safety case, all risk associated with well blowout are assessed and reduced to ALARP. • After BOPs are installed, the Brunello wells will have two barriers maintained during drilling, suspension and abandonment activities in accordance with the Apache's Drilling and Completions Standards Manual (AE-91-ID-004, Section 11). • The Brunello wells will be drilled in accordance with Apache's Well Management Drilling System (WMDS) to ensure blowout prevention and well control. • Well control equipment (e.g. BOP) included on PMS as per the Apache's Drilling and Completions Standards Manual (AE-91-ID-004, Section 11).

[1] Controls listed are for the control of dropped objects and other relevant controls relating to well containment from the *Brunello Appraisal and Production Drilling Environment Plan (EA-72-RI-10004.01)* to prevent loss of well control during the Activity

Event	Potential Impacts	Risk Level	Risk Treatment Avoidance, Mitigation & Management Controls
			• BOP test conducted at the frequency detailed in the approved Safety Case with date of last test recorded in daily drilling report. • All well control equipment, casings and wellhead equipment tested to MASP in accordance with the Apache Drilling and Completions Barrier Standard (AE-91-ID-004). • Tier 1 and 2 Oil spill response executed in accordance with Julimar Subsea Installation Oil Pollution Emergency Plan (EA-72-RI-10010.002). • Tier 3 oil spill response to a Brunello condensate and gas spill executed in accordance with Brunello Appraisal and Production Drilling Oil Spill Contingency Plan (EA-72-RI-10004.02). • Tier 3 oil spill response to hydrocarbon gas from the Pluto production flowline executed in accordance with Julimar Development Project Pipeline Installation Oil Spill Contingency Plan (EA-72-RI-008.2). • Tier 1 and 2 Oil spill response executed in accordance with the vessel's Shipboard Oil Pollution Emergency Plan (SOPEP) as required under MARPOL. • Oil spill exercises conducted as per the OPEP(s) and SOPEP.
Marine fauna collision	The main collision risk associated with the activity is through project vessel collision with large, slow moving cetaceans or whale sharks; potentially resulting in severe injury or mortality	Low	• Marine fauna identification posters and Marine Fauna Sighting Datasheets to be made available on board all project vessels. • In accordance with Part 8 of EPBC Regulations (Vessels), all vessels must travel at less than 6 knots and minimise noise within the caution zone of a cetacean (150 m radius for dolphins, 300 m for whales) known to be in the area.

Table 6-2: Environmental impact treatment summary for planned events

Event	Potential Impacts	Consequence	Impact Treatment Mitigation & Management Controls
Introduction of Invasive Marine Species (IMS)	IMS can be introduced by vessels carrying IMS on external biological fouling, internal systems (sea chests, seawater systems etc.), on marine equipment (ROVs etc.), or through ballast water exchange. Cross contamination between vessels can also occur. Some IMS pose a significant risk to environmental values, biodiversity, ecosystem health, human health, fisheries, aquaculture, shipping, ports and tourism	Minor	• Vessel anti-foulant systems are maintained in compliance with International Convention on the Control of Harmful Anti-fouling Systems on Ships. • Vessel has AQIS clearance to be in Australian waters. • A biofouling vessel risk assessment (VRASS) is completed prior to mobilisation to Australia as defined within the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (Commonwealth of Australia, 2008) and ranked as "low". • Vessels shall exchange 'high-risk' ballast water, as defined in Australian Ballast. • Water Management Requirements (AQIS, 2011), outside Australian territorial seas and in waters at least 200 m deep. • Ballast water shall be managed in accordance with Ballast water Management Plan.
Interactions with other marine users	The presence of the project vessels and the operational area could potentially inhibit commercial shipping, fishing and other oil and gas activities and the presence of vessels and infrastructure could pose a collision risk and inconvenience to fishing practices during these operations	Minor	• Australian Hydrographic Office (AHO) (including hydro.NTM@defence.gov.au) notified of operational area, activity and duration prior to mobilisation to the Julimar operational area, which will trigger AHO to issue a 'Notice to Mariners'. • AMSA RCC notified of operational area, activity and duration prior to mobilisation, which triggers RCC to issue an AusCoast Warning. • Relevant stakeholders identified and notified of operational area, activity and duration prior to mobilization.
Light Emissions	Continuous lighting in the same location for an extended period of time may result in alterations to normal marine fauna behaviour	Negligible	• No standard controls are in place other than those required for navigational and safety requirements which are detailed in each vessel safety case.
Noise Emissions	Noise generated by the project vessels and helicopters propagating through the water column , and emitted during metrology surveys during the activity may result in physiological or behavioural impacts to marine fauna	Negligible	• Compliance with Part 8 of EPBC Regulations (Vessels). • Unless an action is reasonably necessary to prevent a risk to human health or to deal with an emergency, helicopters will operate in accordance with Part 8 of EPBC Regulations (Aircraft). • In accordance with Part 8 of the EPBC Regulations 2000, and Apache whale Interaction and Sighting Procedure (EA-91-11-003), the vessels must not: o Travel at greater than 6 knots within 300 m (caution zone) of a cetacean or whale shark known to be in the area;

Event	Potential Impacts	Consequence	Impact Treatment Mitigation & Management Controls
			○ Approach closer than 100 m of a cetacean or whale shark known to be in the area; and ○ If a dolphin approaches the vessel or comes within 100 m the vessel master must not change the course or speed of the vessel suddenly. • Binoculars and Marine Fauna Sighting Datasheet available on all vessels. • Apache Marine Fauna Sighting Datasheets submitted to DSEWPaC.
Planned Operational Discharges - Surface	Operational discharges will be small and depend on rainfall, machinery activity and the number of persons onboard. Discharges include sewage, food waste, brine (from desalination), cooling water, deck drainage and oily water. The small volumes of non-hazardous discharges may cause nutrient enrichment, organic and particulate loading, thermal impacts and increased salinity primarily in surface (<5 m) waters	Negligible	• Vessels to have current and valid class survey certificate indicating the vessel meets standards for operating in Australia. • Vessels to have MARPOL certification for applicable equipment including sewage system and garbage management. • Standard Operating Procedures (SOPs) are in place to manage discharges. • Periodic audits conducted to review certification of MARPOL compliant systems. • Treated sewage will be discharged in compliance with Regulation 11 of MARPOL Annex IV. • Sewage system compliant with Regulation 9 of MARPOL Annex IV. • Untreated sewage to be stored and disposed of onshore or discharged at a distance of 12 nm from nearest land in accordance with Regulation 11 of MARPOL Annex IV. • Sewage system maintained in accordance with PMS. • Food waste processed and disposed of in accordance with the project vessels': ○ Garbage Management Plan as required under Regulation 9 of MARPOL; and/or ○ Shipboard Waste Management Plan as required under AMSA Marine Order 95: Marine Pollution Prevention ☐ Garbage. • In accordance with MARPOL Annex V regulation 9.1, AMSA placards will be displayed on project vessels to provide guidance on garbage disposal requirements. • In accordance with Regulation 3 of MARPOL Annex V food waste: ○ Discharged at least 12 nautical miles from nearest territorial baseline; and ○ Discharged at least 3 nautical miles from the nearest territorial baseline if macerated to 25 m or less. • No food waste will be discharged within the operational area as it is within the territorial baseline. • Food waste will be transferred to land for disposal. • Scupper plugs or equivalent deck drainage control measures available where chemicals and hydrocarbons are stored and frequently handled.

Event	Potential Impacts	Consequence	Impact Treatment Mitigation & Management Controls
			• Only non-hazardous, biodegradable detergents used for deck washing as per MARPOL. • Secondary containment shall be available for all machinery or equipment with potential to leak chemicals or hydrocarbons to the marine environment. • As required by MARPOL Annex I Regulations, while in the operational area, project vessels may discharge oily water after treatment to 15 ppm in a MARPOL compliant oily water filter system. • To discharge, the project vessels will require a current International Oil Pollution Prevention (IOPP) certificate for oily water filtering equipment indicating oil filtering equipment is in compliance with Regulation 14 of MARPOL Annex I. • If a MARPOL approved OWS is not present/functioning, or oily filtration residue (sludge) requires disposal, the project vessel will store oily water/sludge which will be shipped to shore for appropriate disposal at a reception facility or to a carrier licensed to receive the waste. • Oily water treatment system maintained in accordance with PMS.
Planned Operational Discharges - Seabed	There will be a small release of pipeline preservation fluid, of approximately 50 m^3 during the tie-in and installation activities from the spools, utility jumpers and steel tube flying leads. Cement discharges may also occur during fixing of installation. These discharges can result in impacts to water quality and marine fauna in a localised area	Negligible	• All facilities installed in accordance with the Installation Procedure endorsed by the Apache Project Manager, which includes work/job risk assessments and minimizes discharges (e.g. debris caps removed last). • Apache's Environmental Chemical Approval Procedure for Operational Activities (EA-91-II-10001) will be followed to select all chemicals planned to be discharged during the Julimar activity.
Atmospheric Emissions	Air emissions through the release of ozone depleting substances (ODS), and use of fuel may result in a temporary, localised reduction of air quality in the environment immediately surrounding the discharge point	Negligible	• Sulphur content of fuel oil complies with Regulation 14 of MARPOL Annex VI. • Ozone-depleting substances managed in accordance with Regulation 13 of MARPOL Annex VI. • Vessels to have current and valid class survey certificate indicating the vessel meets standards for operating in Australia. • Vessels to have MARPOL certification for applicable equipment including incinerator and engines. • Machinery maintained in accordance the PMS. • No incineration with 500 m of other surface facilities.
Seabed disturbance	Disturbance of the seabed as a result of routine activities, leading	Minor	• No project vessel anchoring within the operational area. • As-built drawings of the activity prepared within 10 weeks of completion of installation and

Event	Potential Impacts	Consequence	Impact Treatment Mitigation & Management Controls
(installation of subsea infrastructure)	to disturbance of benthic habitat and associated marine flora and fauna. Sources of disturbance may include temporary and permanent installation structures, introduction of artificial habitat, sedimentation as facilities are placed on the seabed and ROV propeller wash.		supplied to AHO (Australian Hydrographic Office) for marine chart update. • Post-installation site survey verifies subsea infrastructure constructed and installed to design. Adherence to the selected pipeline route ensures minimal disturbance to benthic communities. • All facilities installed in accordance with the Installation Procedure endorsed by the Apache Project Manager, which includes a work/job risk assessment. • Surveys undertaken prior to laying infrastructure to check for any sensitive seabed features which can be routed around. The umbilical routing is designed to avoid sensitive receptors if any are identified. • Primary installation vessels (HCV, SCV) will utilize dynamic positioning only in the operational area. • No anchoring within operational area.
Hydrocarbon spill response (refer **Section 8**)	Impacts to the environment from implementing source control, monitor and evaluate, mechanical dispersion, shoreline protection, shoreline clean-up, oiled wildlife response and scientific monitoring include those operational impacts previously specified from the operation of vessels and aircraft. Implementing oiled wildlife response may cause additional distress, physical and behavioural impacts, separation and increased predation to wildlife if not undertaken correctly. Implementing shoreline protection and clean-up response may cause additional damage to shoreline and coastal habitats from damage from movement of personnel and equipment and damaging clean-up techniques.	Risk Low	• Response priorities and activities to be documented in IAPs (including net environmental benefit analysis [NEBA] of response options for the receptor(s) of concern). • Monitoring of operations to ensure net environmental benefit achieved from response strategy and environmental harm does not occur. • Lead response personnel are trained and experienced for the activities assigned and/ or sensitive receptors targeted. • Surveillance data and spill trajectory modelling predictions incorporated into daily IAP preparation process for response strategies. • Adhere to the Source Control Plan as detailed in the *Julimar Subsea Installation OPEP EA-72-RI-10010.002.* • Adhere to the Monitor and Evaluate Plan as detailed in the *Julimar Subsea Installation OPEP EA-72-RI-10010.002.* • Adhere to the Dispersion (Mechanical) as detailed in the *Julimar Subsea Installation OPEP EA-72-RI-10010.002.* • Adhere to the Oiled Wildlife Response Plan as detailed in the *Julimar Subsea Installation OPEP EA-72-RI-10010.002.* • Adhere to the Operational Monitoring Plan as detailed in the *Julimar Subsea Installation OPEP EA-72-RI-10010.002.*

7. MANAGEMENT APPROACH

The Julimar subsea installation activity will be managed in compliance with all measures and controls detailed within the EP accepted by NOPSEMA under the OPGGS (E) Regulations, other environmental legislation and Apache's Management System (e.g. Apache Environmental Management Policy).

The objective of the EP is to ensure that potential adverse environmental impacts associated with unplanned events and planned events associated with the survey, are identified and assessed, and to stipulate mitigation measures to avoid and/or reduce any adverse impacts to the marine environment to ALARP.

The EP details specific performance objectives, standards and procedures, and identifies the range of controls to be implemented (consistent with the standards) to achieve the performance objectives. The controls for the survey activities are summarised in **Section 6**. The EP also identifies the specific measurement criteria and records to be kept to demonstrate the achievement of each performance objective.

As described in the EP, the implementation strategy includes the following:

1. Details on the systems, practices and procedures to be implemented;
2. Key roles and responsibilities;
3. Training, competencies and on-going awareness;
4. Monitoring, auditing, management of non-conformance and review;
5. Records Management;
6. Incident response including an Oil Spill Contingency Plan (OSCP); and
7. Reporting.

During the period that activities described in this EP are undertaken, Apache will ensure environmental performance is managed through an inspection and monitoring regime undertaken by Apache representatives or vessel master based on the vessels. This will include daily, weekly and monthly monitoring and is recorded via a number of checklist and inspection documents that are sent to the Apache HSE Manager or delegate. Feedback from the ongoing monitoring also informs the environment plans developed for oil and gas activities, through the risk assessment stage, and the internal review of these documents prior to submission, providing opportunity for continuous improvement.

Non-conformances (non-conformances relate to not complying with environmental performance objectives and/or performance standards) from audits are formally documented in an audit report and distributed to the Apache Project Manager, Apache HSE Manager, Client Site (Apache) Representative and Offshore Contractor Representative. An end-of-activity environmental performance report will be produced which will include a 'lessons learnt' section to help facilitate continuous improvement for future projects.

All personnel are informed of the need to report HSE incident and hazards through inductions and regular operations meetings. HSE incidents and hazards will be documented in Apache's incident management system and significant incidents will be investigated through a roots cause analysis. Incident notification and reporting to NOPSEMA and other regulators will be conducted as per the OPGGS (E) Regulations, as detailed within the EP. Reported HSE incidents and hazards will be communicated to personnel during daily operational meetings.

8. HYDROCARBON SPILL RESPONSE ARRANGEMENTS

Credible hydrocarbon spill scenarios are identified in the EP including:

- **Tier 1**: small spill from vessel such as during refuelling;
- **Tier 2**: vessel collision resulting in a ruptured fuel tank:
    - Tier 1 and 2 Oil spill response executed in accordance with *Julimar Subsea Installation OPEP* (EA-72-RI-10010.002); and
    - Tier 1 and 2 Oil spill response executed in accordance with the vessel's SOPEP as required under MARPOL.
- **Tier 3**: spill from Pluto production flowline or Brunello Xmas Tree from dropped object:
    - Tier 3 oil spill response to a Brunello condensate and gas spill executed in accordance with *Brunello Appraisal and Production Drilling Oil Spill Contingency Plan* (OSCP) (EA-72-RI-10004.02); and
    - Tier 3 oil spill response to hydrocarbon gas from the executed in accordance with *Julimar Development Project Pipeline Installation* OSCP (EA-72-RI-008.2).

During a spill response there will be both a Statutory Agency and a Control Agency assigned to the spill at all spill tier levels. Apache intends to remain the Control Agency for any vessel spills it is responsible for until such a time as AMSA or the DoT identifies the need to assume control. This will be based on Apache's ability to respond effectively.

In the event of a tier 2/3 spill event, the first step in response is forming an Incident Command Team (ICT), whose role it is to directly manage the response process from Apache's headquarters in Perth. The ICT management structure reflects the Australian Interagency Incident Management System (AIIMS) and consists of key management roles required to effectively coordinate and execute a response under emergency conditions, including logistics, environmental and human resourcing roles.

Through the assessment of the expected hydrocarbon behaviour(s), modelling results of credible worst-case spill scenario, and identified environmental priorities within the predicted spill impact areas, a set of functional, achievable oil spill response strategies were selected to respond to a tier 2 MGO incident. Initial response strategies that may be considered include monitor and evaluate and mechanical dispersion. Decision on whether to implement (and subsequently terminate) any response strategy is managed by the appropriate Combat Agency. **Table 8-1** summarises the applicability and functionality of response strategies for a Tier 2 (or lower) MGO spill. As discussed above, a Tier 3 spill response would be executed in accordance with other previously accepted OSCPs.

Table 8-1: Response Strategy Selection for Tier 1 spill or Tier 2 MGO Spill

Response strategy	Functionality and applicability	Recommended for Tier 2 MGO Spill?	Recommended for Tier 3 Spill
Source control Prevents or limits further oil loss into the marine environment.	**Achievable** - Most effective method to prevent or limit further oil loss into the marine environment.	**Yes** – Feasible strategy that should be implemented. Pumping hydrocarbons from ruptured tank, trimming the vessel and plugging/isolating the hydrocarbon source are techniques that may be employed for a tank rupture scenario. Shipboard spill clean-up and ESD of pumps are source control options for refuelling leaks.	**Yes –** Feasible strategy that should be implemented. The gas component of the blowout scenario precludes the use of a capping stack and first response toolkit for source control due to the turbulent gas bubble that would appear over the well head; preventing buoyancy of the implementation vessels and creating a potentially flammable work space. However, a relief well will be drilled to stop the blowout.
Monitor and evaluate (Type I operational monitoring) To understand the behaviour and predict the trajectory of an oil spill by vessel and aerial surveillance, tracking buoys and spill fate modelling.	**Readily achievable** - Required strategy for informing contingency planning.	**Yes** – Feasible strategy that helps inform ongoing response.	**Yes** – Feasible strategy that helps inform ongoing response.
Containment and recovery Spilt hydrocarbon is contained with floating booms and mechanically recovered.	**Unachievable** - MGO cannot be efficiently contained by floating booms under expected conditions (waves and currents).	**No** – Not feasible for MGO spill, spill likely to have dispersed before resources are deployed to site.	**No** – Not feasible for light crude spill given the high rate of spreading.
In situ burning Contained oil is ignited to remove hydrocarbons from marine environment.	**Unachievable** –Sufficient oil containment unfeasible to reach required ignition threshold.	**No** – Not feasible for MGO as light hydrocarbon will evaporate rapidly and spill likely to have dispersed before resources are deployed to site.	**No** – The low specific gravity of the anticipated hydrocarbons means they are likely to weather and disperse rapidly and would not be conducive to containing within booms for igniting.

Response strategy	Functionality and applicability	Recommended for Tier 2 MGO Spill?	Recommended for Tier 3 Spill
Dispersion (Chemical) Oil displaced from the water surface into the water column by use of chemical dispersants.	**Ineffective** - Chemical dispersants ineffective on MGO **Inefficient** – Expected ambient conditions are likely to favour evaporation of MGO, which is preferable to the hydrocarbon remaining in the marine environment.	**No** – Not feasible for MGO as inefficient.	
Dispersion (Mechanical) Assists with natural dispersion and entrainment into the water column. Vessel movement and wash can be used to mechanically disperse oil into water column.	**Effective** - Effective over small areas under suitable conditions (highly opportunistic strategy).	**Yes –** Feasible with resources in immediate area.	**Yes –** Feasible with resources in immediate area.
Shoreline protection Prevention of floating oil from reaching sensitive shorelines or emergent habitats by isolating the habitat with protection booms.	**Tier 2** **Potentially –**MGO spill is not predicted to reach shorelines at impact thresholds, however shoreline accumulation could occur. **Tier 3** **Effective and achievable** - Effective in minimising impacts to shoreline.	**Yes** – If NEBA indicates that shoreline operations will be effective and operational monitoring indicates there will be shoreline contact.	**Yes** – Considered if spill is predicted to impact sensitive shorelines.

Response strategy	Functionality and applicability	Recommended for Tier 2 MGO Spill?	Recommended for Tier 3 Spill
Shoreline deflection Prevention of floating oil from reaching sensitive shorelines or emergent habitats by redirecting oil away from habitat by deflection booms.	**Tier 2** **Potentially –**MGO spill is not predicted to reach shorelines at impact thresholds, however shoreline accumulation could occur. **Tier 3** **Effective and achievable** - Effective in minimising impacts to shoreline.	**Yes** – If NEBA indicates that shoreline operations will be effective and operational monitoring indicates there will be shoreline contact.	**Yes** – Considered if spill is predicted to impact sensitive shorelines.
Shoreline clean-up Activities to remove stranded oil from shoreline areas (where access can be gained).	**Tier 2** **Potentially –**MGO spill is not predicted to reach shorelines at impact thresholds, however shoreline accumulation could occur. **Tier 3** **Effective and achievable** - Effective in minimising impacts to shoreline.	**Yes** – If NEBA indicates that shoreline operations will be effective and operational monitoring indicates there will be shoreline contact.	**Yes** – If NEBA indicates that shoreline operations will be effective and operational monitoring indicates there will be shoreline contact. Response strategies may include manual bagging of stranded oil, surf washing where wave action and sandy beaches are accessible, tilling and turning the sand to aid bioremediation, rock flushing with high volume low pressure sea water, or leaving the weathered oil in-situ to breakdown where access for man or machinery is not possible.

Response strategy	Functionality and applicability	Recommended for Tier 2 MGO Spill?	Recommended for Tier 3 Spill
Oiled wildlife response (OWR) Pre-oiling activities to reduce the incidence of animals becoming oiled, including hazing and pre-emptive capture of turtle hatchlings, etc. Post-oiling activities include collection and rehabilitation of oiled fauna.	**Effective and achievable** - Effective in minimising impacts from oil and rehabilitating impacted fauna.	**Yes** – Feasible to undertake hazing to prevent oiled wildlife.	**Yes** – hazing is applicable for marine animals that come close to the spill when on the water and shorelines. Capture and rehabilitation is applicable for oiled marine animals.
Waste management	**Tier 2** **Ineffective –** Ineffective as a tier 2 MGO spill will not produce significant amounts of waste. All oiled wastes will be dealt with in accordance with **Section 7.2** in this EP. **Tier 3** **Effective and achievable** - Effective in minimising wastes where available through recycling/reusing options, and to comply with waste treatment, transport and disposal regulations.	**No** – Not feasible as no wastes over and above what is already discussed in the EP will be produced.	**Yes -** minimising wastes where available through recycling/ reusing options and compliance with waste treatment, transport and disposal regulations.

Response strategy	Functionality and applicability	Recommended for Tier 2 MGO Spill?	Recommended for Tier 3 Spill
Type II (scientific) monitoring To quantify the extent and degree of pollution and the environmental recovery.	**Effective** - Effective in detecting extent of impact and recovery of the environment.	**Yes –** Scientific monitoring activities may include water and sediment quality monitoring, shoreline and coastal habitat monitoring (including sandy/rocky shores, intertidal zones and mangroves), benthic habitat monitoring and monitoring of seabird/shorebirds, marine mammals and turtles. In addition fish, fisheries and aquaculture and seafood monitoring may be initiated.	**Yes –** Extent/impact of spill locations to determine the extent of Type II monitoring. Monitoring may include those listed under Tier 2.

9. CONTACT DETAILS

Further information about the Julimar Subsea Installation Activity can be obtained from:

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