Julimar Development Project Rock Berm Supports Installation Environment Plan Summary

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1. INTRODUCTION

The Julimar Development Project (JDP) is a subsea development that will supply raw gas from the Julimar and Brunello gas fields to the Chevron-operated Wheatstone Development. The JDP intersects petroleum production licence WA-49-L and WA-48-L (**Figure 1-1**). First gas to the Wheatstone platform is expected in mid-2015 and first LNG shipment is expected in late 2016.

Apache is the operator of JDP on behalf of its joint venture partner Kuwait Foreign Petroleum Exploration Company (KUFPEC). Apache and KUFPEC are also foundation equity partners in the Chevron-operated Wheatstone Development.

The JDP will be developed over a number of phases commencing with the Brunello reservoir complex, which is closest to the Wheatstone platform. Subsequent phases will be developed over the next 20 years.

The first phase of the JDP includes the installation of:

- Two 22.5 km corrosion resistant alloy (CRA) 18-inch production flowlines from the Brunello cross over manifold to the Wheatstone platform; and
- A 4-inch mono-ethylene glycol (MEG) pipeline and 5.5-inch electric-hydraulic control umbilical.

The JDP production flowlines, MEG pipeline and control umbilical cross the existing Woodside Energy Limit (Woodside) Pluto subsea production pipelines, MEG pipeline and control. This environment plan (EP) summary relates to the installation of subsea rock berm supports on which JDP production flowlines will be placed to cross the Pluto subsea facilities.

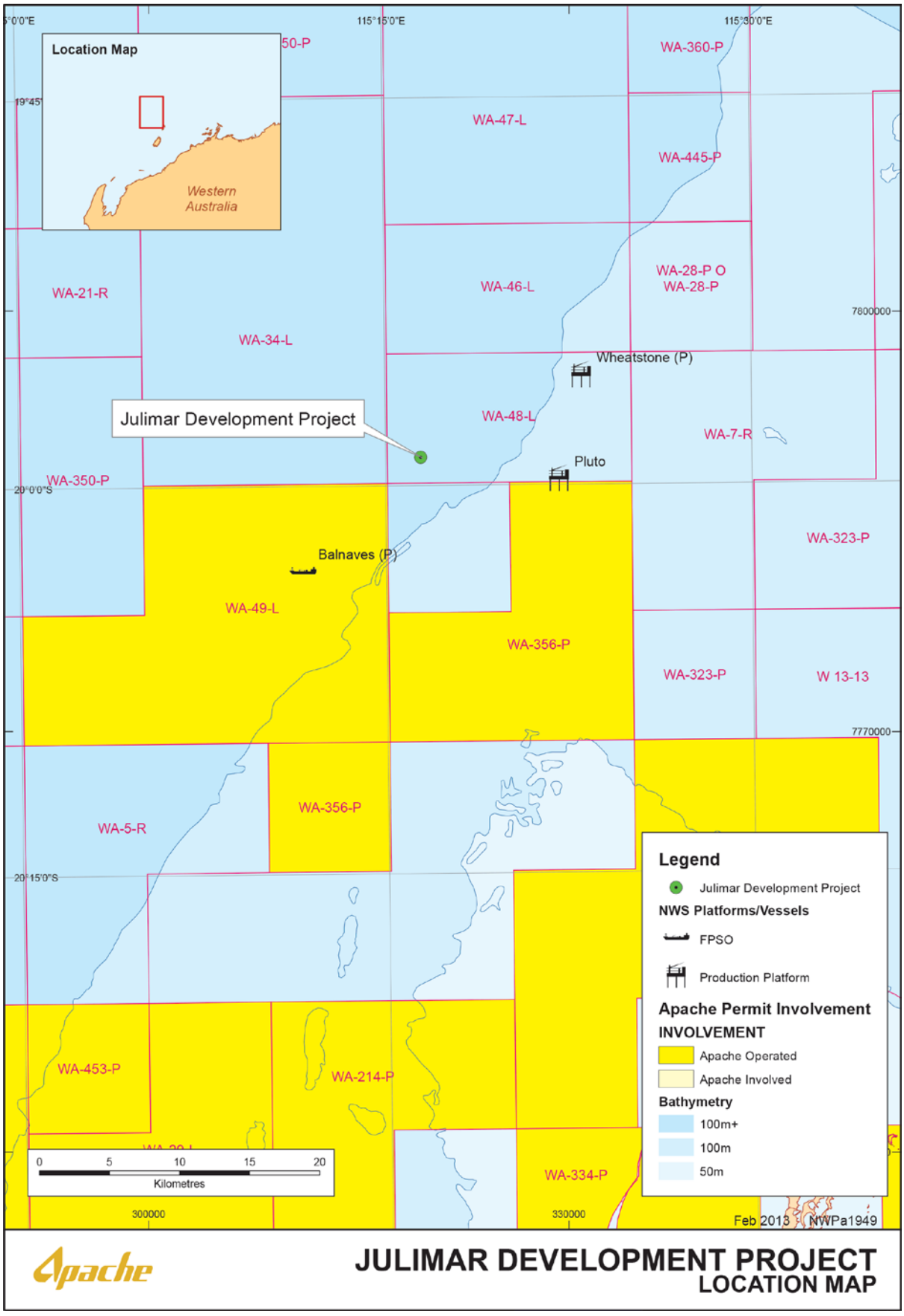

Figure 1-1 Julimar Development Project location

1.1 Schedule

Installation activities will be 24 hours per day, seven days per week. It is envisaged that the overall installation campaign will take about a month to complete. Actual rock berm installation will take approximately 4 to 7 days for each payload. Two to three payloads may be required, i.e. two to three trips to site. Estimated activity durations are subject to rock load-out and weather conditions.

Installation activities are scheduled to occur in a window between July and December 2013, subject to contractor availability from existing commitments, rock supply readiness and receipt of all government approvals.

1.2 Compliance

The proposed Julimar Development Project was referred under the Environment Protection and Biodiversity Conservation (EPBC) Act to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) on the 21st of April 2011 (Ref 2011: 5936). A decision on this action was subsequently provided on the 26th of August 2011, approving the development on the basis that it is 'Not a controlled action if undertaken in a particular manner'.

The Julimar Development Project Rock Berm Supports Installation EP was prepared to comply with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS (E)) under the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) (Cmlth). The EP has been reviewed and accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

This EP summary has been prepared as per the requirements of Regulation 11 (7) and (8) of the referenced OPGGS(E) Regulations.

2. ACTIVITY LOCATION

The rock berms will be installed in permit WA-48-L. Within this permit area, an indicative 'installation area' and larger 'operational area' have been defined (**Table 2-1**; **Figure 2-1**).

Table 2-1: Coordinates of the indicative installation and operational areas

Activity Area	**Latitude**			**Longitude**		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
Installation area	-19	58	52.97	115	16	28.96
	-19	58	54.06	115	16	35.23
	-19	58	58.218	115	16	30.615
	-19	58	57.16	115	16	24.30
Operational area	-19	58	57.499	115	16	5.88
	-19	58	35.847	115	16	29.92
	-19	58	52.946	115	16	49.30
	-19	59	14.598	115	16	25.23

The 'installation area' is defined as the boundary of seabed area within which rock berms may be physically installed to support the JDP production pipelines.

The 'operational area' is defined as the boundary of navigational area necessary for installing rock and conducting vessel operations ancillary to rock berm installation. Activities conducted in the operational area include (but are not necessarily limited to) vessel navigation, fall pipe and equipment deployment and retrieval, installation surveys and vessel on-board preventative maintenance operations.

The water depth within the installation area is approximately 135 metres (m). The water depth within the installation area is approximately 129 m to 138 m.

The operational area is also approximately 168 km west-northwest from the town of Dampier, and 77 km and 48 km northwest from Barrow Island and Montebello Islands respectively.

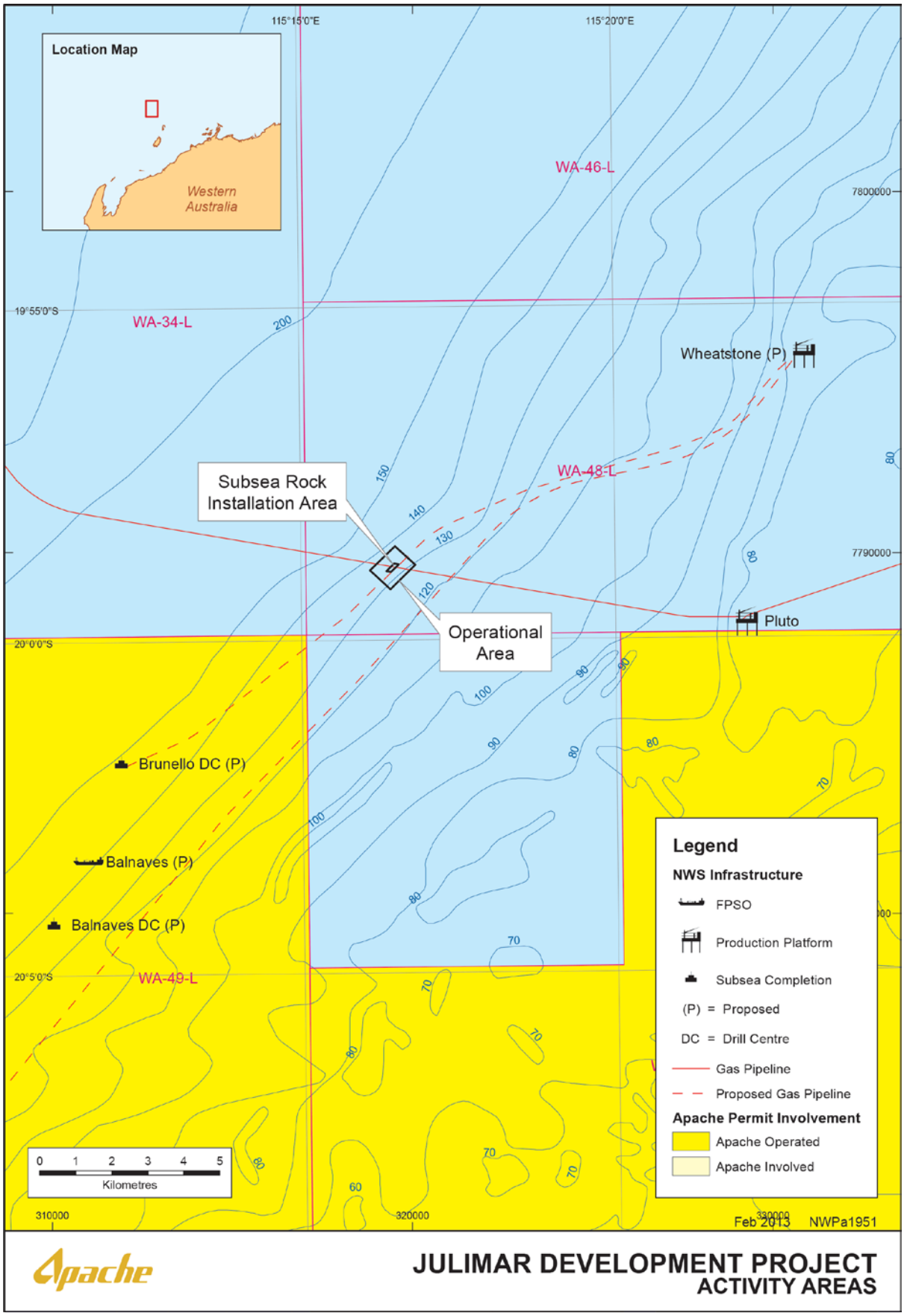

Figure 2-1 Julimar Development Project rock berm installation and operational areas

3. DESCRIPTION OF THE ACTIVITY

The JDP pipeline route requires the subsea production flowlines to cross over the Pluto subsea production flowlines, MEG pipeline and control umbilical. Hence, the objective of this activity is to install subsea rock berm supports to enable future installation of JDP flowlines.

A dynamically positioned fall pipe vessel (DPFPV) will be used to transport and install rock by means of controlled rock placement using a 'fall pipe' to transfer rock from surface to seabed. The DPFPV will be an ocean-going, high powered self-propelled vessel equipped with a fall pipe and fall pipe remote operated vehicle (FPROV). Multiple vessels may be used throughout the rock installation campaign; however, only one vessel will be within the operational area at any time. The offshore rock placement operation is a short campaign, as such no supply vessel activity or at sea crew change is expected.

All rock will be of sound origin, chemically stable, strong, hard and durable as per rock berm design specifications. Rock material will be free from clay, silt, chalk and plant material. Rock size will range between 20 to 180 mm. The estimated volume of rock required to build the berm supports is 45,000 tonnes. The vessel capacities will require two to three vessel payloads of rock.

3.1 Installation activities

The broad activities within the operational area include:

DPFPV mobilisation to and demobilisation from;

- The DPFPV will arrive at the operational area with rock material and all necessary immigration, custom and quarantine documentation. Navigational system checks and mandatory dynamic positioning trials will be performed prior to fall pipe deployment. The vessel will manually manoeuvre into fall pipe deployment position and the dynamic positioning system will be in activation.
- The DPFPV will undergo interim demobilisation from the operational area to reload rock and return to complete the installation, or a total demobilisation upon completion of the installation. All equipment will be sea-fastened prior to departure.

FPROV and fall pipe deployment and retrieval;

- The fall pipe and FPROV will be deployed and retrieved outside of an engineered 'no loading exclusion zone' over the existing Pluto subsea pipelines. Once the DPFPV is in position for deployment of fall pipe, the FPROV will be launched. The connected fall pipes will be lowered through the moon pool and connected to the FPROV near the seabed. Retrieving the fall pipe and FPROV will be performed in reverse order. The fall pipe deployment system includes an actively controlled motion base to compensate the vessel motion. This system allows fall pipe to be safely deployed and recovered in sea conditions appropriate for routine operations.

Seabed rock installation surveys; and

- Once deployed, the FPROV will move to the correct position for rock berm installation. Prior to installation, the FPROV will complete a digital terrain model (DTM) survey at an altitude of approximately 10 to 15 m above the sea bed. Continuous video footage will be recorded during the survey. The purpose of the pre-installation survey is to establish the as-found condition of the rock installation site.
- On completion of rock installation a survey will be performed. The survey data will be compared with the pre-installation survey data to ensure the rock berm supports are constructed to design. If after the post survey it becomes apparent that design specifications have not been fully met, additional localised rock placement profile corrections may be carried out to ensure design compliance.

Controlled subsea rock placement on seabed to form rock berm supports.

- Once the FPROV is in the correct installation position, excavators located in the DPFPV rock bunkers will start feeding the hopper system of the fall pipe tower with the use of a central conveyor belt. A second system of conveyor belts will then feed the fall pipe. The rock placement process will be controlled by the FPROV at the bottom of the fall pipe, which together with the ships dynamic positioning system, determines the position of the placed rock. The volume of rock being placed will be adjusted by controlling the rock conveyor belt feed and the vessel's tracking speed. The quantities of installed rock will be calculated and monitored by means of a weighing device in combination with a speed sensor under the conveyor belt. The fall-pipe operator will monitor the FPROV depth and position at an engineered depth above the seabed to place rock material in a controlled manner to build the rock berm supports. The rock berm will be constructed in multiple layers and in combination of crosswise and lengthwise operations optimising the number of line shifts.

4. DESCRIPTION OF ENVIRONMENT

4.1 Physical Environment

The JDP lies in the arid tropics experiencing high summer temperatures and periodic cyclones. Rainfall in the region is low with evaporation generally exceeding rainfall throughout the year, although intense rainfall may occur during the passage of summer tropical cyclones and thunderstorms (Condie *et al*., 2006). Salinity is relatively uniform at 34-35 parts per thousand (ppt) throughout the water column and across the North West Shelf (NWS). Due to the low average rainfall in the region there is little freshwater run-off from the adjacent mainland (Blaber *et al*., 1985). NWS waters are usually thermally-stratified, with a marked change in water density at approximately 20 m (SSE, 1993). Surface temperatures vary annually, being warmest in March (32°C) and coolest in August (19°C). Vertical gradients are correlated to sea surface temperatures and are greatest during the warm-water season (SSE, 1991).

Wind shear on surface waters generates local-scale drift currents that can persist for extended periods (hours to days). During September-March, the prevailing non-storm winds are from the southwest ranging up to a maximum speed of ~30 knots. Winds from the southwest direction are generally strongest between September and January with wind speed frequently reaching 24 knots and weaker between February and March, with wind speed generally less than 16 knots (APASA, 2011a). During April-August, winds are generally lighter and more variable in direction. Non-storm winds prevail from the east-south quadrant and can attain a maximum speed of up to 30 knots, but are generally less than 16 knots, particularly during April and May (APASA, 2011a). Extreme wind conditions in the area may be generated by tropical cyclones, strong easterly pressure gradients, squalls, tornados and water spouts.

The wave climate is generally composed of locally generated wind waves (seas) and swells that are propagated from distant areas (WNI, 1995; 1996). In summer, seas typically approach from the west and southwest, while in winter, seas typically approach from the south and east. Mean sea wave heights of less than 1 m with peak heights of less than 2 m are experienced in all months of the year (WNI, 1995). Mean swell heights are low at around 0.4-0.6 m in all months of the year. 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 per cent (WNI, 1995).

The dominant offshore sea surface current (typically seaward of the 200 m isobath) is the Leeuwin Current, which carries warm tropical water south along the edge of WA's continental shelf, reaching its peak strength in winter and becoming weaker and more variable in summer (CMAR, 2007; Condie et al., 2006). The Indonesian Throughflow is the other important current influencing the upper 200 m of the outer NWS (Woodside, 2005; CMAR 2007). Modelling indicates that significant east-west flows occur across the NWS to the north of the North West Cape, possibly linking water masses in the area (Woodside, 2005; Condie *et al*., 2006). Due to the complex oceanography of the NWS offshore drift currents comprise a series of interconnected eddies and connecting flows that can generate relatively fast (1-2 knots) and complex water movement. These offshore drift currents also tend to persist longer (days to weeks) than tidal current flows (hours between reversals).

4.2 Biological environment

The JDP is situated within Commonwealth waters of the North-west Marine Region (DSEWPaC, 2008). 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. The operational area is also approximately 1.4 km northwest of the Montebello Commonwealth Marine Reserve.

Key ecological features (KEFs) are components of the marine ecosystem that are considered to be important for biodiversity or ecosystem function (DSEWPaC, 2012a). In a search of EPBC Act

Protected Matters Database, three KEFs were identified that may be impacted by the activity; *The Ancient Coastline at 125 m Contour*, *The Continental Slope Demersal Fish Communities* and *The Exmouth Plateau*. *The Ancient Coastline at 125 m Contour* is a submerged coastline which provides areas of hard substrate and may contribute to higher diversity and enhanced species richness relative to soft sediment habitat (DSEWPaC, 2012k). *The Continental Slope Demersal Fish Communities* has a high level of endemism of demersal fish species compared to anywhere else along the Australian continental slope (DEWHA, 2012k). *The Exmouth Plateau* is a regionally and nationally unique tropical deep sea plateau at depths of 800-4,000 m that may serve an important ecological role by acting as a very large topographic obstacle that modifies the flow of deep waters that generate internal tides.

The expected benthic habitats within the area are soft sediments and outcropping cemented sediments (hard substratum). Benthic primary producer habitat (e.g. areas of hard corals, seagrass, macroalgae or mangroves) is unlikely to be present. The minimum depth of the water is approximately 50 m; at this depth benthic primary production, which relies on photosynthesis for energy production is limited due to insufficient light availability. Soft sediment benthic fauna comprises predominantly mobile burrowing species including molluscs, crustaceans (crabs, shrimps and smaller related species), polychaetes, sipunculid and platyhelminth worms, asteroids (sea stars), echinoids (sea urchins) and other small animals. Cemented sediments provide hard substrate which can be used as attachment points for sessile filter feeding invertebrates such as soft corals, gorgonians and sponges. These areas are also likely to be used by mobile invertebrates such as molluscs, crustaceans (crabs, shrimps and smaller related species), polychaetes, sipunculid and platyhelminth worms, asteroids (sea stars) and echinoids (sea urchins).

The EPBC Act Protected Matters Database identified ten species of marine fauna found in the area which are listed as threatened species (endangered or vulnerable) under the EPBC Act, most of which are also migratory, and a further eight migratory species were also identified. The species listed included three fish, eight marine mammals, five turtles, one seasnake and one seabird.

Installation activities partially overlap the March-June period when whale sharks are likely to be most abundant on the NWS, but given the distance to the Ningaloo Marine Park where they aggregate (approximately 200 km southwest), large numbers are not expected to be encountered. The Department of Fisheries has indicated (through stakeholder consultation) that Rankin cod, pink snapper (*Pagrus auratus*) and Spanish mackerel may be present and spawning in the area at times between May to November. The activity timing also coincides with humpback whale (north and south) migration, although based on the shallower depth range of the southern migration (30-100 m), whales are more likely to be encountered at the operational area (approximately 130-140 m) during the northern migration peaking in July. There are no resting areas that have been identified nearby, with the closest sensitive area likely to be Exmouth Gulf. There is the potential for pygmy blue whales to migrate through the operational area during their northern migration period (April-August). However, the width of the blue whale migration corridor in the region (greater than 200 km) suggests that it is highly unlikely that there will be significant interactions with pygmy blue whales. The nearest turtle nesting sites are the Montebello Islands, Lowendal Islands and Barrow Island (greater than 48 km southeast). Most specimens of the short-nosed seasnake (*Aipysurus apraefrontalis*) have been collected from Ashmore and Hibernia reefs (Minton & Heatwole, 1975), which are not within the area. The Southern giant petrel (*Macronectes giganteus*) may occasionally over-fly the operational area or ZPI when in transit or during foraging, but are not expected to be encountered in significant numbers.

4.3 Socio-economic environment

The operational area is located approximately 168 km offshore from the Port of Dampier. Smaller regional settlements are further away at Onslow, Point Samson and Exmouth. Socio-economic activities that may occur within the area include commercial fishing and oil and gas exploration and production; and to a lesser extent, recreational fishing and tourism.

Offshore and coastal waters in the North-west Marine Region support a valuable and diverse commercial fishing industry, dominated by Pilbara fisheries. Of the state commercial fishing boundaries, the Pilbara Trap Managed Fishery and Pilbara Line Fishery were identified as potentially interacting with the installation activities. The Pilbara Trap Managed Fishery is seaward of the 30-m isobath and landward of the 200-m isobath. The Pilbara Line Fishery licensees are permitted to operate 'anywhere' in Pilbara waters. The North West Slope Trawl Fishery (NWSTF) is the only Commonwealth fishery with historical effort within the area, targeting scampi and prawns. The NWSTF is restricted to depths of greater than 200 m.

Water-based tourism activities undertaken across the NWS include whale watching, recreational boating and fishing, charter boat fishing, snorkeling and diving, and surfing. Given the considerable distance of the operational area from the nearest population centre at Dampier (approximately 168 km away) and the nearest shoreline at Montebello Islands (approximately 48 km away) there is unlikely to be any tourism based activities in the area.

The JDP is in close proximity to the proposed Chevron Wheatstone Development and existing Woodside Pluto Development. During the Wheatstone construction phase, the area surrounding the operational area will experience increased traffic from construction and support vessels.

There are no recognised shipping routes in or near the operational area with the nearest recognised shipping routes located 43 km northwest and 56 km east.

There are no World Heritage properties, National Heritage places, wetlands of international importance or Aboriginal heritage sites located within the area. The closest known historic shipwreck location is at Trial Rocks (approximately 35 km south-southeast of the operational area) where the wreck of the vessels *Trial* and *Tanami* are believed to occur.

5. STAKEHOLDER CONSULTATION

Apache maintains a comprehensive stakeholder database containing fishing interest groups, government and non-government authorities and other stakeholder parties including the community. This database was used to identify stakeholders located, or operating, in the proximity of the activity. Apache has maintained relationships to assist information sharing with key stakeholders for many years and regularly communicates with stakeholders on a variety of activities, always seeking comment and fielding enquiries.

Relevant interested parties for consultation directly relating to the installation activities were identified on the basis of the operational area. Stakeholders identified are listed in **Table 7-1**.

Table 7-1: Summary of stakeholders consulted

Group	Stakeholder
Commercial fisheries	• Australian Fisheries Management Authority (AFMA)[2] • Department of Fisheries (DoF) • Western Australian Fishing Industry Council (WAFIC) • Commonwealth Fisheries Association (CFA) • A Raptis and Sons. • WestMore Seafoods • Shark Bay Seafoods • Austral Fisheries • Jamaclan Marine • Pearl Producers Association • State commercial fishing licence holders
Recreational fisheries	• Recfishwest • Marine Tourism WA
Marine conservation	• Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC)[1]
Tourism	• Marine Tourism WA (formerly Charter Boat Owners and Operators Association)
Shipping safety and security	• Australian Maritime Safety Authority (AMSA) • Department of Defence
Hydrocarbon spill response	• Department of Transport (DoT)[2] • Australian Marine Oil Spill Centre (AMOSC)[2]

1. Department consulted with as part of the EPBC Act referral and assessment.
2. Apache consults with these authorities on regular basis and is only required to submit an electronic copy of the approved OSCP for their records.

5.1 Consultation Summary

On 28 April 2011, Apache referred the Julimar Development Project to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) for public comment and assessment in accordance with the *Environment Protection and Biodiversity Conservation Act 1999*. The project was deemed by DSEWPaC to be 'not a controlled action if undertaken in a particular manner'.

On 12 February 2013 the majority of stakeholders identified in **Table 7-1** were forwarded an information pack detailing the proposed subsea rock berm installation activities. Based on feedback from the Western Australian Fishing Industry Council (WAFIC) and Department of Fisheries (DoF), Apache also forwarded the information pack on 20 March 2013 directly to commercial fishers operating in State-managed fisheries and potentially impacted by the proposed planned events.

On 20 March 2013, Apache also released the Apache Energy Stakeholder Consultation Quarterly Project Update for March 2013 to all stakeholders listed in its comprehensive stakeholder database. The quarterly update has been progressively developed in consultation with interested stakeholders, and includes a summary of Apache's activities for the next six to nine months. The quarterly update is intended to trigger feedback, comments and requests for additional information or consultation opportunities for future activities, and provides an update of the activities that are underway or have previously been consulted on. All feedback and enquiries received regarding the above information have been responded to, addressed

and closed off with the stakeholder in question. Apache will remain available before, during and after completion of the activity to listen to the concerns of stakeholders, as contact details of the relevant project personnel are provided in consultation material.

6. ENVIRONMENTAL HAZARDS AND CONTROLS

Identification of hazards and assessment of risks was determined using a qualitative assessment process defined by the *Apache Environmental Risk Identification Procedure (EA-91-IG-004)*. The Environmental Risk Assessment (ERA) identifies potential and expected hazards and environmental impacts and determines the risk of the impact occurring. For each impact the risk is determined prior to implementation of proposed management controls (inherent risk), and again after management controls have been implemented (residual risk). The control measures adopted are designed to eliminate the risk, or reduce the risk to a level that is tolerable or as low as reasonably practicable (ALARP). This assessment process was undertaken at a risk assessment workshop held on 31 January 2013. This workshop was facilitated by the risk specialist consulting firm Oracle Risk Consultants.

The environmental risk assessment identified eight planned environmental risks and five unplanned environmental risks. The key environmental hazards and control measures to be applied are provided in **Section 9**. These are consistent with Apache corporate and project specific performance objectives, standards and criteria. All commitments associated with these will be used to reduce environmental risk to ALARP and will be of an acceptable level.

7. MANAGEMENT APPROACH

The JDP rock berm support installation activities will be managed in compliance with the *Julimar Development Project Rock Berm Supports Installation Environment Plan (EA-14-EI-01)* 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 the activity during both planned operational activities and unplanned events, 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 for each environmental impact identified (and assessed in the Environmental Risk Assessment) specific performance objectives, standards and procedures and identifies the range of controls to be implemented (consistent with the standards) (**Section 9**) to achieve the performance objectives. The EP also identifies the specific measurement criteria and records to be kept to demonstrate the achievement of each performance objective.

The goals of the environmental implementation strategy as detailed in the EP are to direct, review and manage activities so that environmental impacts and risks are continually being reduced to ALARP, and performance objectives and standards are met. It includes the following:

1. Systems, practices and procedures;
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 and preparedness including oil spill contingency planning; and
7. Reporting.

The reporting requirements for routine activities and environmental incidents (recordable and reportable) and reporting on overall compliance of the activity with the EP (e.g. conformance reports submitted to NOPSEMA within 3 months of completion) are also detailed.

8. CONTACT DETAILS

Further information about the Julimar Development Project Rock Berm Supports Installation activities can be obtained from:

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9. ENVIRONMENTAL IMPACTS AND CONTROLS

The following tables (**Table 9-1** and **Table 9-2**) provide a summary of potential environmental impacts that could be expected from the JDP Rock Berm Support Installation activities. It lists the activities which might give rise to environmental impacts and the subsequent controls and measures which eliminate or ensure the environmental risk is reduced to ALARP.

Table 9-1: Environmental risk summary for planned events.

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Controls
Ballast Water and Biofouling	Bringing project vessels into operational area (from international waters).	Establishment of non-native or marine pests.	• International Maritime Organisation (IMO)-compliant antifouling paint valid as prescribed by the manufacturer. • Vessel biofouling risk assessment conducted in accordance with the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (Commonwealth Government, 2009) and actions implement as required to achieve a risk score of 'low' prior to entering the operational area. • Vessel shall exchange 'high-risk' ballast water, as defined in Australian Ballast Water Management Requirements (DAFF, 2009), outside Australian territorial seas and in water at least 200 m deep. • Quarantine Pre-arrival Report (QPAR) completed and submitted as required by the Australian Quarantine and Inspection Service (AQIS). • Onboard ballast water log completed.
Vessel Movement	The physical presence of project vessels within the operational area.	• Behavioural and physiological effects on marine fauna. • Interference with other marine users	• Binoculars and fauna observation recording sheets available on the vessel. • Apache Marine Fauna Sighting Datasheets are completed and submitted to DSEWPaC. • In accordance with *Part 8 of the EPBC Regulations 2000,* the vessel must not: - Travel at greater than 6 knots within 300 m (caution zone) of a cetacean or whale shark known to be in the area. - Approach closer than 100 m of a cetacean or whale shark known to be in the area. - Change course or speed if a dolphin approaches the vessel or comes within 100 m. • Any vessel collision with an EPBC-listed marine fauna reported to DSEWPaC. • Australian Hydrographic Office (AHO) notified of operational area, activities and durations at least six weeks prior to the activity, which triggers AHO to issue a Notice to Mariners. • Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC) notified of operational area, activities and durations two weeks prior to the activities, which triggered RCC to issue an AusCoast Warning.
Rock Placement	Rock berm supports installation activities.	• Damage / loss to benthic habitat and associated biota. • Sedimentation • Reduction in	• Dynamically positioned fall pipe vessel (DPFPV) used to install rock. • Final rock berm design endorsed by the Apache Project Manager prior to rock installation. • Rocks supplied in accordance with rock supply specifications endorsed by the Apache Project Manager. • Rock installed in accordance with Rock Installation Procedure endorsed by the Apache Project Manager. • Post-installation survey verifies rock berm constructed to design. • As-built drawings of the rock berms prepared within four weeks of completion of installation and supplied

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Controls
		water quality from turbidity.	to AHO for marine chart update.
Artificial light	• Deck and navigational lighting on vessels	• Disorientation or mis-orientation caused by direct attraction to the light; • Increased vessel interactions with animals attracted to the light; and • Altered feeding behaviours, including increased predation risks.	Deck lighting configuration reviewed prior to mobilisation and practicable opportunities to reduce direct light spill to marine waters implemented.
Noise emissions	• Vessel thrusters. • Vessel equipment, e.g. generators. • Rock movement within fall pipe.	Physiological or behavioural effects to fauna.	• Noise emissions minimised by maintaining vessel machinery in accordance with manufacturer specifications. • In accordance with EPBC Regulations Part 8, while the fall pipe is not deployed the vessel will not: - Travel at greater than 6 knots within 300 m (caution zone) of a cetacean known to be in the operational area. - Approach closer than 100 m of a cetacean known to be in the operational area. - Change course or speed if a dolphin approaches the vessel or comes within 100 m in the operational area.
Oily water Emissions	Vessel drainage (e.g. bilge water, machinery space)	• Temporary reduction of water quality in the vicinity of the release point • Potential for toxicological impacts to marine flora and fauna.	• Oily water discharged to marine waters through filtering equipment in accordance with Regulation 15 of MARPOL Annex I: - Oily water discharged to sea after passing through filtering equipment has an oil content not exceeding 15 parts per million (ppm). - Oily water discharged while proceeding *en route*. • Vessel fitted with oil filtering equipment in accordance with Regulation 14 of MARPOL Annex I. • Oil filtering equipment maintained and calibrated in accordance with manufacture's specifications to ensure oil content is not exceeding 15 parts per million (ppm).

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Controls
Liquid and Solid Emissions	• Putrescible food waste. • Sewage. • Brine from the potable water supply system. • Deck drainage from rainfall or wash-down operations.	Temporary and localised water column turbidity, localised nutrient enrichment and toxicity of water, potential negative physiological or behavioural effects to some threatened marine fauna and humans.	• Sewage discharge procedures compliant with Regulation 11 of MARPOL Annex IV. • Sewage treatment system compliant with Regulation 9 of MARPOL Annex IV. • Sewage treatment system maintained in accordance with manufacture's specifications. • Maximum carrying capacity of the sewage system is not exceeded. • Food waste collected, stored, processed and disposed of in accordance with a Garbage Management Plan as required under Regulation 9 of MARPOL. • Food waste disposal procedures compliant with Regulation 3 of MARPOL Annex V. • Macerator capable of reducing food to 25 mm or less is installed and maintained in accordance with manufacture's specifications. • Cleaning agents or additives that will be released to the sea are not 'harmful substances' as defined by MARPOL Annex III. • Water treatment system maintained in accordance with manufacture's specifications. • Machinery maintained in accordance with manufacture's specifications.
Air Emissions	• Operation of machinery and vessels by combustion engines • Incinerator • Refrigeration equipment (Ozone Depleting Substances, ODS)	Temporary and localised decrease in air quality, contribution to greenhouse gas loadings.	• Incinerator meets the requirements of Regulation 16 of MARPOL Annex VI. • Incinerator operated in accordance with Regulation 16 of MARPOL Annex VI. • Sulphur content of fuel oil complies with Regulation 14 of MARPOL Annex VI. • Vessel engines meet NOx emission levels as required by Regulation 13 of MARPOL Annex VI. • Ozone-depleting substances managed in accordance with Regulation 13 of MARPOL Annex VI. • Ozone-depleting substances only handled by a qualified or experienced tradesperson.

Table 9-2: Environmental risk assessment summary for unplanned events

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Controls
Hydrocarbon Spill from Vessel Collision	Significant vessel collision capable of rupturing fuel tanks.	Chemical and physical impacts to marine species.	• No JDP vessel within 1 km of the DPFPV, excluding a supply vessel • Navigational equipment and vessel operations compliant to AMSA: - Marine Orders Part 21: Safety of Navigation and Emergency Procedures. - Marine Order Part 30: Prevention of Collisions. • An International Marine Contractors Association (IMCA) Common Marine Inspection Document (CMID) (or equivalent vessel audit covering navigation equipment and procedures) completed or updated prior to mobilisation. • Vessels equipped with an automatic radar plotting aid (ARPA) system. • Visual vessel bridge-watch 24 hours per day by crew qualified by an accredited trainer. • Australian Hydrographic Office (AHO) notified of operational areas, activities and durations at least six weeks prior to the activity, which triggers AHO to issue a Notice to Mariners. • Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC) notified of operational areas, activities and durations two weeks prior, which triggers RCC to issue an AusCoast Warning. • Shipboard Oil Pollution Emergency Plan (SOPEP or SMPEP) spill response exercise conducted prior to the commencement of the activity. • Oil spill response executed in accordance with Apache Julimar Project Development Rock Berm Supports Installation Oil Spill Contingency Plan (AE-14-EI-02).
Environmentally Hazardous Chemical and Hydrocarbon Release from Woodside Pluto Line Rupture	Pluto pipeline rupture.	• Reduction in water and sediment quality. • Lethal or sub-lethal chemical or physical effects on marine fauna • Asphyxiation of marine fauna exposed to concentrated natural gas. • Reduction in	• Vessel maintained in accordance with the vessel maintenance system. • ROV survey to establish the as-found and as-built condition of the Woodside Pluto lines. • The fall pipe and FPROV will be deployed and retrieved outside of an engineered overboard ‘no loading exclusion zone’ over the Woodside Pluto lines. The zone will be endorsed by the Apache Project Manager and Woodside representative. • Rock supplied in accordance with Pluto Crossing – Rock Supply Specification (JU-14-SL-10009). • Rock berm supports installation activities undertaken in accordance with the NOPSEMA-approved Julimar Development Project Safety Case (JU-00-RF-10004.1). • At least one Woodside representative on the DPFPV. • Adherence to the vessel emergency response plan, which addresses a Woodside Pluto line rupture. The plan endorsed by the Apache Project Manager and Woodside representative. • Communication protocols of the vessel emergency response plan tested prior to DPFPV entering the operational area. Woodside representative to be present during the test. • Oil spill response executed in accordance with Apache Julimar Project Development Rock Berm Supports Installation Oil Spill Contingency Plan (AE-14-EI-02).

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Controls
		local air quality causeed by greenhouse gas emissions.	
Environmentally hazardous chemical and hydrocarbon shipboard spills	Chemicals and hydrocarbons could be spilt or leak on-board or during FPROV deployment, and potentially enter the marine environment.	Chemical and physical impacts to marine species.	• Environmentally hazardous chemicals and hydrocarbons in packaged form carried in accordance with MARPOL Annex III. • Vessel shall maintain a manifest setting forth the environmentally hazardous chemicals and hydrocarbons on board and the location thereof. • Material Safety Data Sheet (MSDS) available for environmentally hazardous chemicals and hydrocarbons onboard. • Environmentally hazardous chemicals and hydrocarbons stored in bunded areas. • Environmentally hazardous chemicals and hydrocarbon storage areas inspected weekly. • Fall pipe installation system and ROV hydraulics maintained in accordance with manufacturer's specifications. • ROV hydraulic hoses and fittings checked prior to deployment. • Clean-up equipment located where environmental hazardous chemicals and hydrocarbons are stored and frequently handled. • Scupper plugs or equivalent deck drainage control measures available where environmentally hazardous chemicals and hydrocarbons are stored and frequently handled on deck. • Environmentally hazardous chemical and hydrocarbon leaks and spills on the vessel immediately cleaned up (including in deck bunds), and contaminated material contained securely onboard. • Shipboard spills and leaks managed in accordance with a SOPEP or SMPEP. • SOPEP or SMPEP spill response exercise conducted prior to the commencement of the activity.

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Controls
Non-hazardous and Hazardous Solid Waste	Solid waste may unintentionally enter the marine environment if not appropriately secured on-board.	• Marine pollution. • Injury or death of marine fauna through ingestion or entanglement	• Waste managed in accordance with a Garbage Management Plan required under MARPOL Annex V. • Hazardous wastes documented, tracked, segregated, labelled and stored onboard with secondary containment. • Incinerator meets the requirements of Regulation 16 of MARPOL Annex VI. • Incinerator operated in accordance with Regulation 16 of MARPOL Annex VI. • Accidental release of waste to the marine environment is reported and investigated, and corrective actions are implemented.
Hydrocarbon Spill Response	Implementation of hydrocarbon spill response strategies.	Hydrocarbon spill, response activities can exacerbate or cause further environmental harm.	Based on the pre-planning net environmental benefit assessment (NEBA), the preferred response strategy for spill scenarios is: 1. Source control; 2. Surveillance – including aerial and vessel surveillance, tracking buoys, spill fate modelling; 3. Containment and recovery; 4. Oiled wildlife response (OWR) activities; and 5. Scientific (Type II) monitoring. The aim of the NEBA is to inform response strategies that have the greatest net benefit to the overall environment and reduce impacts associated with the response strategies to ALARP. Chemical dispersants do not form part of the response strategy.

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