

PYRENEES FACILITY OPERATIONS ENVIRONMENT PLAN SUMMARY

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INTRODUCTION

BHP Billiton Petroleum Pty Ltd (BHP Billiton) is operator of the Pyrenees Production Facility, located in Commonwealth waters in Production Licences areas WA-42-L and WA-43-L, approximately 45 km northwest of Exmouth, The Pyrenees Facility produces crude oil from the Rayensworth, Crosby, Stickle, Tanglehead, Wild Bull and Moondyne reservoirs via a single stand-alone Floating Production Storage and Offloading facility (the Pyrenees FPSO). Crude oil produced from the reservoirs is processed on the FPSO, and the processed stabilised crude oil is then offloaded to offtake tankers direct for export. Working interests for the Pyrenees Facility are BHP Billiton 40%, Apache 31.5% and Inpex 28.5%.

Production from the Pyrenees Facility commenced in 2010.

The Environment Plan (EP) was prepared in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Environment Regulations) and accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on 17 January 2014.

This EP summary document has been prepared as per the requirements of the Environment Regulations r. 11(7) and 11(8). It summarises the findings and conclusions of the environmental risk assessment undertaken for ongoing operation of the Facility, and the relevant preventative and mitigation measures developed and implemented to ensure any adverse impacts are eliminated or managed to as low as reasonably possible.

To satisfy requirements of conditions of approval of the Pyrenees Development under the Environmental Protection and Biodiversity Act 1999 (EPBC Act) (EPBC 2005/2034), this EP was also submitted to the Department of Environment, and acceptance of the EP was received from the Minister's delegate on 6 January 2014.

LOCATION OF THE FACILITY

The Pyrenees Facility is located in Commonwealth waters in Production Licences areas WA-42-L and WA-43-L, approximately 45 km northwest of Exmouth (refer Figure 2-1). The Facility is located in approximately 200 m water depth.

The closest sensitive environmental receptors to the Pyrenees Facility are the Muiron Islands Marine Management Area located 15 km to the southwest, the northern boundary of the Ningaloo Marine Park boundary (Commonwealth Waters) located 11 km to the south, and the north-west of North West Cape of Western Australia located 27 km to the south southeast (refer Figure 2-1).

The coordinates of the FPSO and each of the wells is provided in Table 2.1.

Table 2-1 - Pyrenees Facility - FPSO and well locations (GDA94)

Well name	Well name Well Type		Easting ¹	Northing
			Latitude	Longitude
Pyrenees FPSO	-	-	201 300	7 615 200
Lat/Long			21º 32' 28.08581"	114 ° 6' 58.63669"
Ravensworth - 3H1	Horizontal	Producer	197 962	7 615 393
Ravensworth - 4H2	Horizontal	Producer	197 977	7 615 420
Ravensworth - 5H3	Horizontal	Producer	198 004	7 615 472

Well name	Well Type		Easting ¹	Northing
Wen name		турс	Latitude	Longitude
Ravensworth - 6H4	Horizontal	Producer	198 004	7 615 494
Ravensworth - 7H5	Horizontal	Producer	198 028	7 616 370
Ravensworth - 8H6	Horizontal	Producer	S 21° 31' 46.283"	E 114° 05' 06 999"
Crosby - 3H1	Horizontal	Producer	199 117	7 614 700
Crosby - 4H2	Horizontal	Producer	199 057	7 614 700
Crosby - 5H3	Horizontal	Producer	199 757	7 616 510
Crosby - 6H4	Horizontal	Producer	199 696	7 616 510
Stickle - 4H1	Horizontal	Producer	200 590	7 617 171
Stickle - 5H2	Horizontal	Producer	200 544	7 617 218
Stickle - 6H3	Horizontal	Producer	200 527	7 617 235
Stickle - 8H4	Horizontal	Producer	200 649	7 617 159
Ravensworth - 9WI	Vertical	Water Injector	199 047	7 619 423
Crosby - 7WI	Vertical	Water Injector	202 300	7 619 850
Stickle - 7WI	Vertical	Water Injector	204 186	7 619 526
Macedon - 6H1*	Horizontal	Gas Injector	206 600	7 612 350
Wildbull 1H1	Horizontal	Producer	S 21° 31' 12.51596"	E 114° 5' 5.52662"
Tanglehead 1H1	Horizontal	Producer	S 21° 31' 21.39754"	E 114° 7' 26.48749"
Tanglehead 2H2	Horizontal	Producer	S 21° 31' 21.61401"	E 114° 7' 27.73348"
Moondyne 1H1		Producer	S 21° 32' 5.45830"	E 114° 9' 17.97923"
Moondyne 2H2		Producer	S 21° 32' 5.48793"	E 114° 9' 19.71530"
Moondyne 3WI	Horizontal	Water Injector	S 21° 32' 5.45830"	E 114° 9' 17.97923"

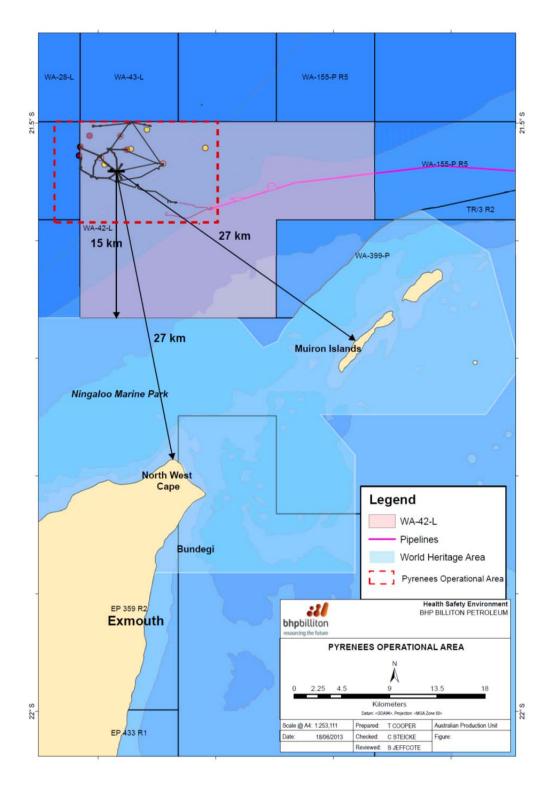


Figure 2-1. The Pyrenees Facility Location and Operational Area

DESCRIPTION OF THE ACTION

The operational area applicable to the scope of this EP is shown in Figure 2-1.

The Pyrenees Facility produces crude oil from the Ravensworth, Crosby, Stickle, Tanglehead, Wild Bull and Moondyne reservoirs via a single stand-alone Floating Production Storage and Offloading facility (the Pyrenees FPSO). Crude oil produced from the reservoirs is processed on the FPSO, and the processed stabilised crude oil is then offloaded to offtake tankers direct for export. Surplus gas to fuel and lift gas requirements is reinjected into the Macedon Reservoir via a bi-directional well (see Table 2-1).

Infrastructure in the operational area included in the scope of this EP is as follows:

- Pyrenees Floating Offloading, Production and Offloading (FPSO) facility;
- All subsea infrastructure associated with production from the reservoirs, and reinjection of gas into the Macedon reservoir, including:
 - Flowlines:
 - Risers:
 - Manifolds:
 - Subsea trees:
 - Umbilicals; and
 - Mid water and spider buoys.
- Support vessels and helicopters operating within the operational area.

Activities associated with the above included in the scope of this EP are as follows:

- Routine production;
- Crude oil offloading;
- Routine inspection, maintenance and repair of all infrastructure listed above; and
- Non-routine and accidental activities and incidents.

Key operational and support activities related to the production of crude oil at the Facility include:

- Operational and emergency flaring. Under normal operating conditions gas is used for fuel and surplus gas is reinjected into the reservoirs as gas lift or disposed of to the Macedon reservoir;
- Treatment and reinjection of produced formation water in normal operating conditions, or disposal to the marine environment when the reinjection system is not available;
- Use of utility systems such as lighting and power generation;
- Discharge to the marine environment in accordance with legal requirements of:
 - Heated seawater used in cooling water systems on the Facility;
 - Brine from the production of freshwater;
 - Treated sewage, greywater and macerated food scraps.
- Lifting operations;
- Transfer of supplies from vessels including food, equipment, fuel and chemicals; and
- Helicopter operations for transporting personnel and freight as required.

3.1 Timing

The Pyrenees Facility commenced production in 2010. The Facility operates 24 hours per day 365 days per year. Supporting activities take place as required.

4 DESCRIPTION OF RECEIVING ENVIRONMENT

4.1 Natural Environment

The Pyrenees Facility is located in the North West Marine Region (North West Province bioregion), as defined in the Department of Environment (DoE) Marine Bioregional Plan for the North-west Marine Region (DoE, 2012). The Pyrenees FPSO is located within an area identified as Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula. These features contribute to upwelling and modify deepwater flows.

The North West Province bioregion consists entirely of continental slope and is characterised by muddy sediments and water depths which predominantly range between 1,000 to 3,000 m (DEWHA, 2008). The Exmouth Plateau is the dominant topographical feature within the province and is an important feature as it modifies the flow of deep waters and contributes to uplifting of deeper, more nutrient-rich waters. The province represents a transitional zone between tropical and temperate marine species and has a high level of endemism in demersal fish communities on the slope.

The two main elements of the continental shelf in this region are the Dirk Hartog Shelf to the west of North West Cape and Rowley Shelf to the northeast. The Dirk Hartog Shelf varies in width from 40 km wide to the south of North West Cape, to only 9 to 15 km wide on a direct line between the Pyrenees Facility operational area and the Cape. Approaching the coastline, the Dirk Hartog Shelf rises abruptly to the outer Ningaloo Reef, which consists of limestone and coral.

A continuation of the North West Cape, the Muiron Islands are low dome-shaped, limestone islands separated by a deep navigable channel. The continental shelf is much broader to the northeast of the Cape, sloping away from the Muiron Islands to the shelf break some 30 km seaward. The western shores of the islands are characterised by limestone cliffs fronted by sandy beaches, reef flats and inter-tidal limestone pavements and rubble deposits. The eastern shores of the islands comprise sandy beaches backed by low dunes.

The climate of the region experiences an arid sub-tropical climate and a distinct summer monsoonal "wet" season from November to February, followed by a typically cooler winter "dry" season (ANRA, 2013). Cyclones can bring vast amounts of rain to the area, with strong swell and rough seas common during these events.

The average Sea Surface Temperature (SST) within the area ranges from 20°C to 24°C during winter and 24°C to 28°C during summer (BOM, 2012c). The oceanography of the region is strongly influenced by the warm, low salinity waters of the Indonesian Through Flow (ITF), which influences the upper 1,250 m of the water column (DEHWA, 2007). Tides in the region are semi-diurnal (i.e. there are two high tides and two low tides each day). Spring tides (the highest tidal range each month) are about 1.6 m, while neap tides (the lowest tidal range) are about 0.6 m. The largest total waves (sea waves combined with swell) occur from June to September, with April and May the calmest months. Tropical cyclones generate extreme swells. generally from the north-northeast.

The western half of the Pyrenees Facility area (190 to 260 m depth) is characterised by gravely fine to coarse carbonate sands, while the seabed sediments in the eastern part of the area (190 to 200 m depth) are comprised of soft, fine sediments, mainly carbonate silts and clays.

4.2 Biological Environment

No Critical Habitats or Threatened Ecological Communities, as listed under the EPBC Act, occur within the Pyrenees Facility operational area.

Seabed communities in the Pyrenees Facility area are relatively sparse, with diversity and abundance tending to decrease with increasing depth, except where occasional areas of exposed or outcropping rock occur resulting in localised increases of abundance and diversity. Soft sediment communities are dominated by invertebrate infauna, including polychaetes, crustaceans, molluscs, echinoderms and sponges. Exposed or outcropping rocky areas are dominated by sponges, soft corals and gorgonians, with various finfish, ascidians, crustaceans, echinoderms, polychaetes and molluscs also occurring.

A number of different pelagic fish occur in the deeper offshore waters of the region. Pelagic fish species are seasonally abundant and may pass through the area during annual migrations. The most notable species of deep water pelagic fishes in the area are the billfish, which include sailfish, marlin and swordfish.

Five species of sea turtle are known to possibly occur in the region. These are Green turtles, Loggerhead turtles, Hawksbill turtles, Flatback turtles and Leatherback turtles.

The most common whale species in the North West Shelf region is the Humpback whale, which moves through the region during their migration along the Western Australian coast. In addition to the Humpback whale, the Blue whale, Minke whale and several other toothed whales may be sighted in the vicinity of the operational area. The abundance of the whales present in the Pyrenees area is likely to vary seasonally. from low numbers during December to May and low to moderate abundance from June to November.

The region also supports diverse and abundant shark and ray populations. Sharks are the most numerous and diverse, occurring in a wide range of habitats such as intertidal (Black-tip reef shark), offshore reef dropoffs (Grey reef shark) and deep ocean areas (Oceanic white-tip). The Whale shark is also known to frequent the region.

Dolphins are common inhabitants of the offshore waters of the region. Spinner dolphins and striped dolphins are expected in deeper waters while Bottle-nosed dolphins are common in shallow water areas of the North West Shelf.

A large number of seabird species migrate across the region, and may pass through the area, including ten species of migratory seabirds protected under international agreements. The Southern giant petrel and the Soft plumaged petrel, which are listed Threatened species, may be sighted in the vicinity of the Pyrenees Facility.

4.3 Socio-Economic Environment

There are no conservation reserves or parks located within the WA-42-L and WA-43-L permit areas. The closest sensitive environmental receptors to the Pyrenees Facility is the Muiron Islands located 27 km to the southwest, the northern boundary of the Ningaloo Commonwealth Marine Reserve boundary located 15 km to the south, and the north-west of North West Cape of Western Australia located 27 km to the south southeast (see Figure 2-1).

No state-managed fisheries overlap with the Pyrenees Facility operational area (DoF, 2011). There are the following three Commonwealth commercial fisheries operating in the Pyrenees Facility area:

- Western Deepwater Fishery;
- Western Tuna and Billfish Fishery; and
- North West Slope Trawl Fishery.

Due to the water depths and distance offshore, recreational fishing is unlikely to occur in the Pyrenees Facility operational area. Fishing vessels are subject to a 500 m petroleum safety zone around the Facility. There are no national heritage places or shipwrecks within the Pyrenees Facility operational area, and there are no other known sites of non-indigenous heritage or archaeological significance within the vicinity of the Pyrenees Facility.

The Pyrenees Facility is outside the main shipping fairways in the area.

MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS

BHP Billiton has undertaken an analysis of the environmental risks associated with activities at the Pyrenees Facility. The risk assessment methodology was consistent with the procedures outlined in the Australian and New Zealand Standards AS/NZS ISO 31000:2009 (Risk Management – Principles and Guidelines).

These risks, potential impacts and preventative and mitigative controls are summarised below. All management and mitigation measures associated with risks will be used to reduce environmental risk to ALARP and will be of an acceptable level.

Risk	Impacts	Management and Mitigation Measures			
Planned Activities	Planned Activities				
Physical presence	Interference with/obstacle to other marine users (fishing and shipping). Attraction (or displacement of) species to or from the area.	 Maintenance of safety zones and navigational aids; Control of activities within the operational area; and Stakeholder engagement. 			
Seabed disturbance	Minor impact to seabed with small area of direct damage and associated communities.	 ROV inspections prior to seabed disturbance to prevent disturbance to sensitive benthic habitats; and Control of anchoring and lifting activities. 			
Light emissions	Low impact with attraction and/or disorientation of seabirds and turtles. Low level visual and aesthetic amenity impact due to flaring.	Restriction of lighting to levels necessary for safe working practices and navigation.			
Noise emissions	Moderate impact with avoidance behaviour by marine fauna and disruption of migratory patterns over time. Minor impact to residents associated with helicopter noise.	 Adherence to EPBC Act Regulations for marine fauna interaction and the DEC Whale Shark Code of Conduct; Marine fauna awareness training conducted for core crew; Implementation of sighting and recording procedures; and Management of stakeholder feedback/concerns. 			
Atmospheric emissions	Low impact to the environment based on the individual greenhouse gas contribution to the greenhouse effect (N ₂ O, CO ₂ , CH ₄) in comparison to the global contribution.	 Monitoring and reporting of emissions in accordance with targets; Equipment selection and maintenance to maximise combustion efficiency; Reinjection of surplus gas and maintenance of gas reinjection equipment; Use of low sulphur diesel; and 			

Risk	Impacts	Management and Mitigation Measures
		Records of use of ozone depleting substances.
Waste management	Low impact to marine animals via solid or hazardous waste ingestion and minor water quality impacts due to breakdown in organics. Disposal of waste causing environmental impact through surface water, ground water and soil contamination.	 Waste management plan to be implemented for the Facility in accordance with waste management hierarchy and best practice, and records maintained of waste transport and disposal onshore; and Records of loss or discharge to sea of waste.
Discharge of produced formation water, deck drainage and slops discharged overboard.	Discharge overboard causing changes in water quality (hydrocarbon/chemical/temperature) leading to environmental impacts to biota within the operational area.	 Maintenance of produced water injection equipment to ensure maximum availability; Discharge of produced formation water to the marine environment in accordance with the Environment Regulations; Monitoring of volumes of produced water and slops production, reinjection and discharge overboard; All chemicals used in produced water system evaluated prior to use, with preference for products with least environmental impact (e.g. OCNS Gold or Silver; non-CHARMable Group D or E); Drainage and bunding standards implemented to prevent overboard release of chemicals or hydrocarbons; and Implementation of surface water quality monitoring, including parameters to measure contaminants in produced water, slops water and deck drainage.
Discharge of food waste, sewage and greywater	Localised in nutrients and decrease in water quality.	 Waste discharge in accordance with Protection of the Sea (Prevention of Pollution from Ships) Act 1983 – Part IIIB; FPSO and support vessels to hold current International Sewage Pollution Prevention (ISPP) certificate; Sewage treatment plants on FPSO and support vessels certified under MARPOL; and Implementation of surface water quality monitoring, including parameters to measure nutrient enrichment.
Discharge of subsea chemicals or hydrocarbons by actuation of valves or during subsea operations and activities.	Potential for toxic effect to fauna in close association with release point causing changes in water quality (hydrocarbon/ chemical/ temperature) leading to environmental impacts to biota within the operational area.	All subsea chemicals are evaluated prior to use, with preference for products with least environmental impact (e.g. OCNS Gold or Silver; non-CHARMable Group D or E).

Risk	Impacts	Management and Mitigation Measures
Discharge of cooling water and brine from the FPSO.	Discharge overboard causing changes in water quality leading to environmental impacts to biota within the operational area.	 All chemicals used in cooling water and potable water system evaluated prior to use, with preference for products with least environmental impact (e.g. OCNS Gold or Silver; non-CHARMable Group D or E); and Implementation of surface water quality monitoring, including parameters to measure salinity and temperature.
Unplanned Activities	S	
Interference to marine fauna	Avoidance or attraction behaviour by marine fauna and disruption to migratory pathway over time. Mortality or injury of protected marine species.	 Adherence to EPBC Act Regulations and the DEC Whale Shark Code of Conduct; and Marine fauna awareness training conducted for core crew.
Introduced marine species	Introduction of invasive marine species to area leading to major impact to native species. Moderate short term toxicity to marine organisms from antifouling treatments.	 Adherence to requirements under: Quarantine Act (1908) Regulation B-4 Ballast Water Exchange; National Biofouling Management Guidance for the Petroleum Production and Exploration Industry; MARPOL 73/78 Annex I, International Maritime Organisation Ballast Water Management Convention; and International Convention on the Control of Harmful Anti-fouling Systems on Ships (IOM, 2001).
Release of hydrocarbons: crude oil – transfer/offtake	Release of stabilised crude oil leading to direct impact of marine biota at surface and indirect effects due to changes in water quality.	 Compliance with critical equipment and non-equipment Performance Standards to ensure maintenance of structural integrity of the Facility, pressure containment and relief, watertight integrity and stability, navigational aids and communications, operational control equipment, surface engineering and contractor management; and Compliance with offtake operations procedures, including maintenance of a terminal handbook and tanker vetting procedures.

Risk	Impacts	Management and Mitigation Measures
Release of hydrocarbons: crude oil – bulk storage	Release of stabilised crude oil leading to direct impact of marine biota at surface and indirect effects due to changes in water quality.	 Compliance with critical equipment and non-equipment Performance Standards to ensure maintenance of the Facility safety shutdown systems, pressure containment and relief, structural integrity, communications systems, operational control, surface engineering management, and management of contractors; Maintenance of petroleum safety zones around the Facility; Compliance with offtake operations procedures, including maintenance of a terminal handbook and tanker vetting procedures; and Implementation of storage tank and ballast tank pump operations as required.
Release of hydrocarbons: crude oil – turret operations	Visual pollution (i.e. slicks and sheens) and potential localised acute toxic response.	 Compliance with critical equipment and non-equipment Performance Standards to ensure maintenance of key equipment on the Facility, pressure containment and relief, safety shutdown systems, watertight integrity and stability, operational control of equipment and surface engineering management; Implementation of turret mooring and disconnection procedures; and Implementation of well integrity management procedures.
Release of hydrocarbons: crude oil – subsea infrastructure	Release of unstabilised crude oil leading to direct impact of marine biota within water column and indirect impact to biota due to water quality impact.	 Compliance with critical equipment and non-equipment Performance Standards to ensure maintenance of pressure containment and relief of the Facility, safety shutdown systems, watertight integrity and stability, navigational aids and communications, operational control of equipment and surface engineering management; Maintenance of petroleum safety zones around the Facility; Implementation of well operations and integrity management procedures; and Management of simultaneous operations.
Release of hydrocarbons: crude oil – loss of well containment	Release of unstabilised crude oil leading to direct impact of marine biota within the water column and indirect impact to biota due to water quality impact.	 Compliance with critical equipment and non-equipment Performance Standards to ensure maintenance of pressure containment and relief, safety shutdown systems, navigational aids, operational control equipment and surface engineering management; Maintenance of petroleum safety zones around the Facility; and Implementation of well operations and integrity management procedures.

Risk	Impacts	Management and Mitigation Measures
Release of hydrocarbons: diesel – bunkering	Visual pollution (i.e. slicks and sheens) and potential acute toxic response over moderate area.	 Compliance with critical non-equipment Performance Standards to ensure maintenance of adequate management of operational control and contractors; and Compliance with bunkering procedures and controls.
Release of hydrocarbons: diesel – bulk storage	Potential area of acute effect over localised area and visual pollution.	 Compliance with critical equipment and non-equipment Performance Standards to ensure maintenance of structural integrity of the facility, navigational aids and communications systems, operational control equipment, and management of surface engineering and contractors; Maintenance of petroleum safety zones around the Facility; and Management of simultaneous operations.

6 MANAGEMENT APPROACH

The Pyrenees Facility will be managed in compliance with the EP accepted by NOPSEMA under the regulations and the BHP Billiton HSEC Management System framework.

The objective of the EP is to ensure that potential adverse impacts on the environment associated with the Pyrenees Facility operations during both routine and non-routine operations are identified, reduced to ALARP and of an acceptable level.

Specifically, the EP details the performance objectives, controls and performance standards to be implemented for each environmental risk identified and assessed for the Facility, as well as specific measurement criteria that will be used to demonstrate that the performance objectives are achieved.

The implementation strategy details the management system framework in place to achieve the performance objectives, including systems for maintenance and inspection, planning, implementation and operation, monitoring and record keeping, and improvement and change. The EP also details reporting requirements for environmental incidents (recordable and reportable incidents) and reporting overall compliance of the Pyrenees Facility with the EP.

CONSULTATION

BHP Billiton has been actively involved in stakeholder engagement in the region since a community reference group was first established in Exmouth during preparation of the Stybarrow Development Environmental Impact Statement (EIS) in 2004. The community reference group meetings were expanded in 2005 during preparation of the Pyrenees Development Draft EIS to encompass the Pyrenees Development. Today, these community reference group meetings continue to be conducted quarterly, and include relevant information and updates in relation to the Pyrenees Facility operations.

An Exmouth Sub-basin Stakeholder Engagement Management Plan (SEMP) has been in place since November 2010. The SEMP is reviewed and updated annually. The stakeholder list contained within the Exmouth Sub-basin SEMP is updated each time a new activity is planned within the region or an EP is to be submitted.

Relevant stakeholders are also consulted directly to communicate any material change to the Pyrenees Facility operations. This contact includes:

- Issuing notices to mariners;
- Distribution of a fact sheets to Exmouth and regional recreational and commercial marine users;
- Face-to-face meetings on selected issues:
- Follow-up telephone calls to solicit comments or questions relating to activities; and
- A toll-free 1800 number and email address for gueries.

The following issues are considered most relevant to stakeholders in the region:

- Potential disruption to marine animals:
- Potential risk of sea pollution (which is assessed as very low) due to loss of containment of chemicals or hydrocarbons; and
- Potential impact of temporary disruption of commercial and recreational vessels.

8 CONTACT DETAILS

For further information about this activity please contact BHPB Petroleum Government and External Affairs Team on 1800 110 258 or send an email to bhppetexternalaffairs@bhpbilliton.com.