Emersons-1
Vertical Exploration Well
Environment Plan: Summary
October 2010

This summary of the Emersons-1 EP has been submitted to comply with Regulation 11(7)(8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

Introduction

Apache Energy Ltd (Apache) proposes to drill Emersons-1 as a vertical exploration well in permit area WA-356-P in Commonwealth waters. Drilling is proposed to commence mid November 2010 (weather conditions permitting) using the Ensco 109 jack-up drill rig and is expected to take 45 days. This date is, however, subject to change depending on rig availability.

Apache's generic Environment Plan (EP) for its drilling programme on the North West Shelf (NWS) in State and Commonwealth waters will be used to manage the well (EA-00-RI-164). A bridging document to this EP, for Emerson-1 was approved by the DMP on the 7 October 2010, in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment)* Regulations 2009.

Project Description

The Emerson-1 drill site (**Figure 1**) is located approximately 126.2 km southeast of the nearest mainland point (Cape Preston), 68.8 km south-southeast from Varanus Island, and 63.2 km and 38.5 km south-southeast and southeast of the nearest Lowendal and Montebello Islands respectively in approximately 77 m (LAT) water depth. The surface hole location for the programme is 20^0 04' 25.34" S (Latitude) and 115^0 17' 50.06" E (Longitude) (GDA 94, Zone 50).

The drill rig proposed for the Emerson-1 drilling programme is the *Ensco 109* jack-up drill rig - a type of mobile drilling rig which jacks its legs down to the seabed and then hoists its deck and drill floor above the sea surface.

After anchoring the drill rig, drilling of Emerson-1 will commence. 914 mm (36") hole drilled to ~175 m and 762 mm (30") conductor run & cemented and run through to the tensioner deck.

At this time a diverter will be rigged up and a 660 mm (26") vertical hole will be drilled to ~1625 m (Measured Depth Rotary Table) MDRT into the Mandu formation. The diverter will be rigged down prior to 508 mm (20") and a casing run and cemented. At this point the blow-out preventor (BOP) will be installed and a connector integrity and a full BOP pressure test will be conducted.

The well will then be displaced to water based mud (i.e. SW/PHG), a 508 mm (20") casing shoe track drilled out and a leak-off test (LOT) conducted. A 445 mm (17-1/2") vertical assembly will then be used to drill (using water based mud (SW/PHG)) to a section at a total depth (TD) of approximately 3180 m MDRT into the Muderong. A casing of 356 mm by 340 mm (14" x 13-3/8") will be run and cemented in place.

The well will then be displaced to synthetic based mud (SBM) and the 340 mm (13-3/8") casing shoe track will be drilled out and a LOT conducted. A 311 mm (12-1/4") vertical assembly will then be drilled using synthetic based mud to a TD of

approximately 3670 m MDRT into the Barrow Group. The 244 mm (9-5/8") casing will then be run and cemented in place.

A 216 mm (8 ½") vertical assembly will then be used to drill the 244 mm (9-5/8") shoetrack using synthetic based mud (SBM) and a LOT will be conducted. It is planned that the 216 mm (8-½") section will intersect the Barrow Sands (the objectives) and TD will be called in the Dupuy Formation at approximately 4098 m MDRT. On intersecting the targets the well will be evaluated using wireline logs and then abandoned appropriately.

It has been prognosed that Emersons-1 has a potential for intersecting overpressured zones in the Muderong, Barrow Group and Dupuy formations.

In the case that there is not sufficient kick tolerance, a contingent 178 mm (7") drilling liner will be available and the well will be TD'ed in a 152 mm (6") hole.

Vessel Seismic Profiling (VSP) will be performed for the vertical exploration well.

Once the drilling programme is complete the anchors will be pulled up and the drill rig moved off location.

All work on the well will be undertaken in accordance with the regulations and guidelines set out in the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (*OPGGSA*) and the associated *OPGGS(E) Regulations 2009* and *Petroleum (Submerged Lands) Act Schedule of Specific Requirements as to Offshore Petroleum Exploration and Production (2005)*.

Receiving Environment

Physical Environment

A summary of the climatic conditions for the NorthWest Shelf (NWS) region is provided below. The NWS lies in the arid tropics region of Australia, which experiences high summer temperatures and periodic cyclones (with associated rainfall). Rainfall is generally low, with evaporation exceeding rainfall. Mean ocean temperatures range from a minimum of 11ºC in winter to a maximum of 37ºC in summer. Shelf waters are usually thermally stratified at a depth of about 20 m.

In general, wind patterns are monsoonal with a marked seasonal pattern. From October to March, prevailing non-storm winds are from the south-west, west and north-west at an average speed of less than 10 knots. From June to August, winds are generally lighter and more variable in direction than in spring and summer.

Non-storm winds prevail from north-east through to south-east at average speeds of 5-6 knots. Transitional wind periods, during which either pattern may predominate, can be experienced in April, May and September each year.

Biological Environment

The drilling programme (beginning mid November 2010; but prim occurring in December 2010 may coincide with the late southern migration of the humpback whale; turtle nesting, dugong breeding and seabird nesting in the NWS region (see **Table 1**). The potential for and likelihood of impact on the marine fauna is outlined below.

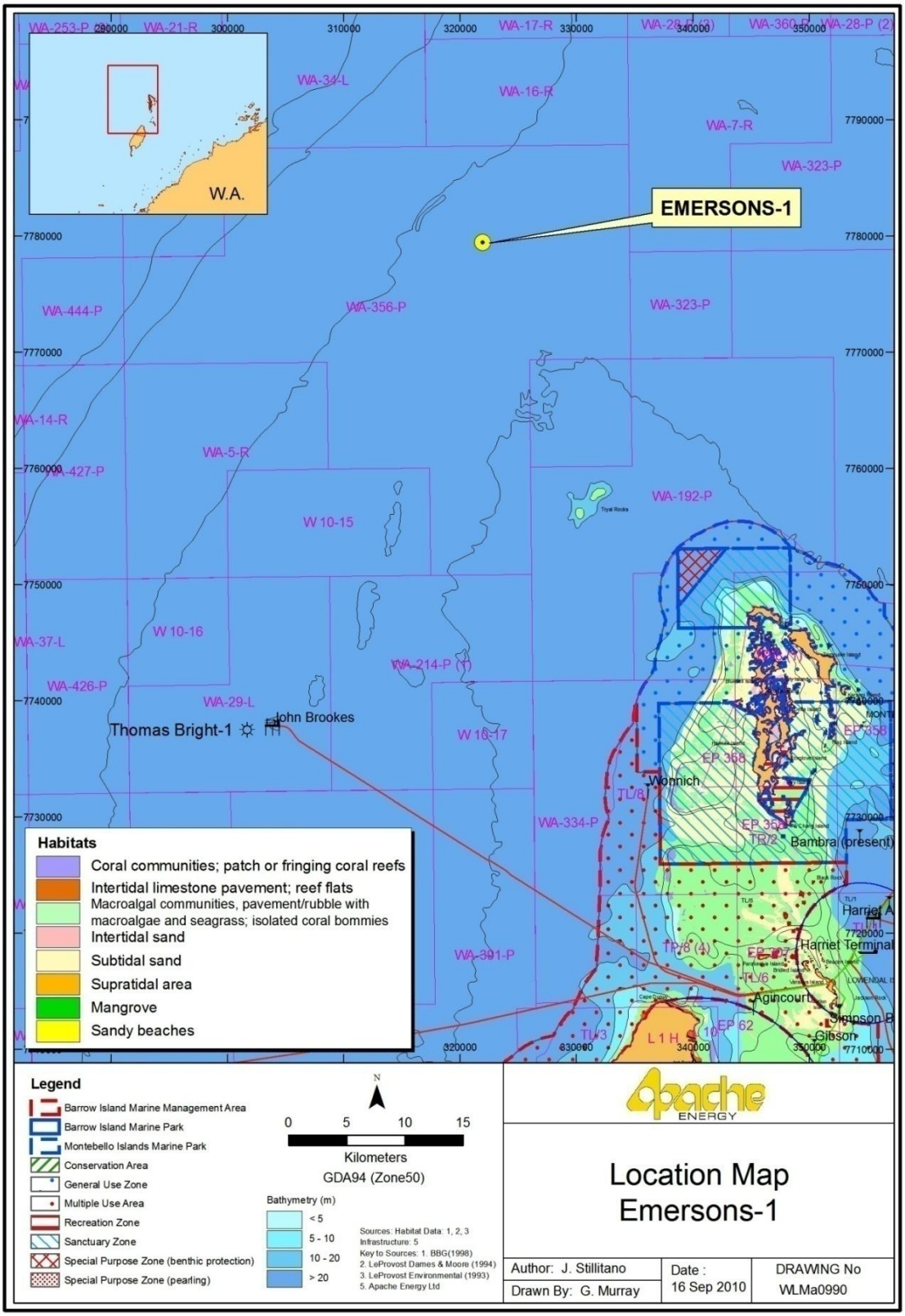

Figure 1: Location of the proposed Emerson-1 drill site

Whales

The drilling programme commencing mid November is expected to occur outside of the peak (northern and) southern migration of humpback whales (*Megaptera novaeangliae*) (see **Table 1**). The humpback whale is a cetacean listed as 'threatened' under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*.

The humpback whale migrates between the Antarctic waters and the Kimberley region of Western Australia. The peak of the northerly migration occurs around June – July, while the southerly return migration peaks around September – October. Northbound whales tend to remain on or within the 200 m contour passing to the west and north of Serrurier Island, westward of Barrow Island and north of the Montebello Islands; whereas the southern migration route is more variable and often in shallower waters to the east of the Montebello/Lowendal/Barrow region.

The location of the Emersons-1 site may overlap with the northern and southern migration routes of the humpback whale (Megaptera novaeangliae) in the Exmouth to Dampier Archipelago region. However due to the timing of the proposed drilling programme (mid November through December), drilling will occur outside of the peak southern migration of humpback whales. Regardless of timing, management measures will be in place throughout the drilling programme to avoid potential impact on cetaceans (see section Environmental Guidelines and Commitments).

Dugongs

Dugongs (*Dugong dugon*) occur across the tropical coastal waters of Australia from Shark Bay to Queensland and are protected under national legislation and international agreements. Dugongs are herbivorous and are generally associated with seagrass beds, upon which they feed. They are commonly found in shallow (less than 5 m water depth) sheltered areas, often near island or large bays and are highly migratory due to their search for suitable seagrass beds or warmer waters (Marsh et al., 2002[1]).

Dugongs are known to occur in the shallow warm waters around the Rowley Shelf such as Barrow Island, the Lowendal Islands and the Montebello islands, although not in the large concentrations seen further south in the Exmouth Gulf or Shark Bay (Prince, 1989; Chevron, 2005; DEC, 2007).

Current knowledge on the size and distribution of dugong populations and their migratory habits in the region between North West Cape and the Dampier Archipelago is limited. Dugongs have been found to breed between September and April. Specific areas supporting Dugongs in Western Australia include Shark Bay, Ningaloo Marine Park and Exmouth Gulf, Pilbara Coastal and Offshore regions (Exmouth Gulf to De Grey River), Eighty Mile Beach and Kimberley Coast (Marsh et al., 2002).

Marine turtles

Four species of marine turtle nest on sandy shore sites of Dampier Archipelago, Montebello Islands, Lowendal Islands, Barrow Island, Airlie Island, Thevenard Island,

[1] Marsh, H., H. Penrose, C. Eros & Hugues, J., 2002. Dugong Status Report and Action Plans for Countries and Territories. United Nations Environment Programme, Nairobi. Referred on the Australian Species Profile and Threats Database via http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=28.

other coastal islands and the Exmouth region. These are the green turtle (*Chelonia mydas*), the flatback turtle (*Natator depressus*), the hawksbill turtle (*Eretmochelys imbricata*), and the loggerhead turtle (*Caretta caretta*). The leatherback turtle (*Dermochelys coriacia*) may also visit the open waters. All five 5 species are listed as either endangered or vulnerable under the EPBC Act.

The survey area is distant to significant nesting areas of green, flatback, hawksbill and loggerhead turtles along the coast and offshore islands. The nearest turtle nesting sites are located about 130 km to the east-south east (nearest island in Dampier Archipelago), and at 38 km to the southeast of the nearest Montebello Islands; and 195 to 220 km to the southwest (Muiron Islands and North West Cape respectively) from the Emersions-1 drill site. The peak turtle nesting and hatching period generally occurs from September to February depending on the species. For all species, hatchling emergence occurs 6 to 8 weeks after the females have nested (EPA, 2010[2]).

The across shelf distribution of turtles is not well known, but does vary among the species. For example, green turtles are herbivores and therefore concentrate over depths of less than 20 m that support benthic plant life. Hawksbill turtles also forage in shallow waters on sponges in areas of coral reef. In contrast, loggerhead, flatback and leatherback turtles are known to feed on mid-water plankton and benthic animals, and can forage in mid-shelf water depths (about 50 m). EPA Draft Guideline No. 5 (EPA, 2010) provides current information on the population size and distribution of turtles off Western Australia. Taking this into account, impacts from the proposed drilling activities on turtle population is considered to be minimal.

Seabirds

Giant petrel are migratory species (i.e. Bonn Convention, JAMBA and CAMBA) and tend to be the most oceanic of all seabirds, opting for land primarily for breeding purposes (Environment Australia, 2001). It is highly unlikely that the survey area covers any habitat critical to the survival of any listed migratory seabird species.

At least 64 species of birds feed and nest on the surrounding waters and islands within the Barrow/Montebello/Lowendal islands region. The main seabird breeding/nesting season occurs between October and January on the island group. As drilling will commence will in offshore waters distant from breeding sites it is highly unlikely that the proposed survey areas cover any habitat critical to the survival of any seabirds in the region.

It is possible that seabird species may fly over the survey area, however it is not anticipated that drilling activities will have any impact on the birds due to their mobility and distance of the survey area from any critical nesting or feeding sites.

Socio-Economic Environment

Dampier and Karratha are the main service and population centres for this region. Local people seeking aquatic recreation such as boating, diving and fishing use the coast and islands of the Pilbara. The open waters of the Commonwealth permit areas do not support significant recreational or tourism activity. Recreational fishing tends to be active within State waters in closer proximity to population centres associated with high number of local visitors and tourism. Commercial fisheries are active along

[2] Environmental Protection Authority (EPA), 2010. Environmental Assessment Guideline No. 5 (Draft) Protecting Marine Turtles from Light Impacts. EPA, Western Australia. Accessed on the WA EPA website during May 2010 via http://www.epa.wa.gov.au/docs/3138_EAG5DraftTurtlelight15310.pdf.

the Pilbara coast; however fishing effort in the open Commonwealth waters is low, with operators favouring the inshore areas.

Further information on recreational and commercial activities that fall under the North Coast Bioregion is addressed in the NWS Generic Drilling EP (EA-00-RI-164).

Table 1: NWS biological and human activity seasons

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Dugong breeding	breeding								breeding			
Hawksbill turtle nesting												
Flatback turtle nesting												
Green turtle nesting												
Loggerhead turtle nesting												
Coral spawning												
Whale migration						north			south			
Whale sharks												
Algae	growing				Shedding fronds				growing			
Seabird nesting												
Prawn trawling												
Tourism												
Emersons-1												

Key

- Peak activity, presence reliable and predictable
- Low level of abundance/activity/presence
- Activity not occurring within the area
- Proposed Drilling Programme

Major Environmental Hazards and Controls

The potential environmental impacts resulting from offshore drilling on the NWS are outlined in detail in Apache's Generic Drilling Programme EP (EA-00-RI-164).
Table summarises the guidelines and environmental commitments for the Emerson-1 drilling programme.

Environmental Management

Extensive environmental management guidelines are prepared for each Apache-drilled well. Apache management documents used to guide the implementation of well-specific environmental management procedures are listed below:

- Environmental Management Policy (February 2010).
- NWS Generic Drilling EP 2007 – 2011 (EA-00-RI-164)
- Contaminated Waste Management Procedure (VI-SA-ON-EN-000).
- Environmental Requirements for Offshore Marine Vessels (AE-91-IQ-202)
- Lighting Management Plan (EA-60-RI-153).
- Refuelling and Chemical Transfer Management Procedure (AE-91-IQ-098)
- OSCP Volume 1 – Operations (NWS) (AE-OO-EF-008/1).
- OSCP Volume 2 – Resource Atlas (NWS) (AE-OO-EF-008/2).
- Hazard Reporting, Incident Notification and Investigation Procedure (AE-91-IF-002).
- Quarantine Procedure (AE-91-IQ-189).
- Vermin Management Plan (EA-60-RI-131).
- Waste Management Plan (EA-60-RI-167).

Table 2: Summary of Apache Environmental Guidelines and Drilling Rig Environmental Commitments for Emersons-1

(Emersons-1 drilled under NWS 2007-2011 Generic Drilling EP: Doc EA-00-RI-164)

Activity	Requirement
Disposal of drilling fluid and drilling cuttings	• Dispose of WBM coatings directly to the seafloor. • Direct SBM cuttings through the Verti-G cuttings dryer to remove and recover synthetic fluid. • Plug the cuttings ditch and use an auger to transport the shaker cuttings directly to the cuttings dryer. Recovered fluid to be returned directly to the active mud system via a transfer pump. Processed cuttings from the dryer to be discharged overboard. • Use a high-efficiency centrifuge to control the SBM solids content, to achieve an average oil-on-cuttings discharge value of less than 10% by dry weight of cuttings per hole section (when combined with dried cuttings). • Follow Apache refuelling procedures (AE-91-IQ-098). • Record volume of drilling cuttings and fluid disposed into the ocean on environmental spreadsheet. Record retort figures for percentage of fluid-on-cuttings and report results to the Apache Environmental Department at the end of the well.
Pipe Dope	• Use pipe dope that has the lowest concentration of heavy metals and hydrocarbons but still meets safety and performance criteria. • Record volume of pipe dope used on location on the environmental spreadsheet. Send results to the Apache Environmental Department at the end of the well.
Deck drainage, chemical storage and management	• Maintain good housekeeping practices. • Store chemicals in bunded areas away from open drains and chemical containers are to be intact. • Use drip trays under all machinery and fuel points and valves. • In the event of a spill, take all actions to control the spill and divert deck drainage to on board containment tanks for treatment through the oil in water separator. • Ensure absorbent material is on board to use in soaking up chemical or oil spills on deck. • Maintain oil water separators regularly to ensure 15 ppm oil concentration alarm is functional. • Report all releases of oil in water > 30 mg/l (over a 24 hour period) to Apache Perth office. • Report all spills > 80 L to DMP within 2 hours either directly by contacting the DMP Duty Inspector on 0419 960 621 or via the Apache Perth office. • Report all spills < 80 L through Apache incident reporting system.
Liquid Discharges	• Discharge excess water from the water maker to sea. • Under routine operating conditions, discharge treated sewage, grey water and main deck drainage at sea level. • Discharge cooling water at barge of hull of drilling rig level to allow for sufficient cooling and oxygenation.
Incident Reporting	• Use the Apache incident reporting system to report incidents within 2 hours as per OPGGS (Environment) Regulations 2009, Sub-regulation 26).
Waste Oil Management	• Drum waste oil and grease and return to mainland for recycling. • Record volume of waste oil taken off rig and forward results to the Apache Environmental Department at the end of the well.

Spillage of diesel fuel or oil	• Follow Apache refuelling procedures (AE-91-IQ-098). • Carry out diesel refuelling during daylight hours only, weather permitting. • In event of a spill take all actions to control it. • Do not use dispersant without AMSA approval. • Report all spills >80L to DMP within 2 hours either directly by contacting the DMP Duty Inspector on 0419 960 621 or via Apache Perth office. • Report all spills <80L through the Apache incident reporting system. • Implement Apache's Oil Spill Contingency Plan (OSCP) if required.
Discharge of combustion products from engines	• Include inspections and tuning of engines and equipment on a regular maintenance schedule. • Optimise combustion or well test fluids and gas.
Solid waste management • Food scraps • Garbage • Litter • Scrap metal and wood etc	• Macerate all food scraps prior to ocean disposal (rig is 38.5 km from nearest island and 126 km from mainland). • Do not dispose of debris, garbage or litter into the sea (skips need covers to prevent wind blown rubbish – especially plastics and cups). • Segregate industrial waste (scrap metals / drums etc) wherever possible for appropriate disposal onshore. • Do not use polystyrene cups. • Reduce, reuse and recycle waste wherever practicable. • Record the volume and type of waste taken off rig and forward to the Apache Environmental Department at the end of the well. • Undertake a ROV survey to check that no rubbish is left on seabed. Remove any debris if found.
Sewage discharge	• Treat sewage to secondary level prior to discharge through the sewage plant (aerates, macerates and chlorinates). This unit meets MARPOL 1973/78 requirements. • Maintain the sewage treatment plant in order to ensure effective treatment.
Light Overspill	• Minimise use of non-essential lighting, while maintaining safety standards on the drill rig and support vessel.
Noise	• Minimise noise emissions when drilling near noise-sensitive environments.
Fishing	• No fishing is permitted from the drill rig whilst it is on location.
Anchoring & Disturbance to the seabed	• Side scan sonar survey results used to select a rig approach and drill site location that avoids sensitive seabed features. No sensitive seabed features in immediate vicinity of the well. • No workboats are to anchor in areas where coral reefs occur; a designated area for mooring will be allocated. No sensitive seabed features in immediate vicinity of the well.
Operational Environmental Awareness	• Through inductions and educational material present on the rig, all personnel are familiar with the environmental requirements of the EP to ensure these guidelines and procedures are being followed. • Ensure all personnel sign off on the rig register book confirming their induction.
Vertical Seismic Profiling (VSP)	• Follow DMP (formerly DoIR) Guidelines on Minimising Acoustic Disturbance to Marine Fauna (1997) when undertaking VSP: – Do not commence VSP unless whales are a minimum distance of 3 km from the rig. – Soft-start over a 20 minute period. – Ensure rig crew is alert for whales during VSP, with a dedicated whale-watcher on post if a whale is sighted with 3-5 km of the rig. – Shut down of VSP if whales are observed within 1 km of the rig.

Large Animal Observations	• Fill in whale and turtle observation data sheets and send to the Apache Environmental Department at the completion of the drilling programme (Appendix in NWS generic drilling EP 2007-2011 (EA-00-RI-164).

Perth Office Commitments

Activity	Requirement
Prior to drilling	• NWS generic drilling EP 2007-2011 (EA-00-RI-164) is available to all personnel involved in drilling programme. • Ongoing consultations are part of each drilling campaign. In preparing the Generic NWS Drilling Programme EP, Apache consulted with numerous stakeholder representatives. Key stakeholders representatives such as fisheries will be notified of the Emersons-1 campaign prior to commencement of drilling.
Discharge of combustion products from engines	• Report greenhouse gas emissions data to Commonwealth Government annually.
Environmental Audit	• Audit drilling rigs every six months whilst under contract to Apache (audit may be scheduled during this campaign). • Review electronic waste and chemical log received from rig at the completion of the drilling programme.

Consultation

Ongoing consultations are part of each drilling campaign. In preparing the Generic NWS Drilling Programme EP, Apache consulted with numerous stakeholder representatives, including:

- Department of Mines and Petroleum (DMP)
- Department of Environment and Conservation (DEC)
- CALM (Marine branch) (now DEC).
- Fisheries WA (now Department of Fisheries (DoF))
- Marine and Coastal Community Network (MCCN)
- Environment Protection Agency (EPA)
- Marine Parks Reserve Authority (MPRA)
- CALM (Environmental Protection) (now DEC)
- WA Fishing Industry Council (WAFIC)
- Australian Fisheries Management Authority (AFMA)

Further Details

For further information about the Emerson-1 drilling programme, please contact:
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