



John Brookes & Rosella Off-bottom Cable
(OBC) Seismic Survey
Environment Plan: Public Summary
March 2008

This summary has been submitted to comply with Regulation 11(7)(8) of the Petroleum (Submerged Lands) (Management of Environment) [P(SL)(MoE)] Regulations 1999.

Introduction

Apache Energy Limited (Apache) proposes to undertake an off-bottom cable (OBC) seismic survey in Commonwealth waters off the Western Australian coast within parts of Western Australian Production Licence WA-29-L and Western Australian Exploration Permits WA-214-P(1)(2), WA-355-P and Western Australian Retention Lease WA-33-R, covering an area of approximately 562 km² in Commonwealth waters (Figure 1). The project is referred to as the John Brookes and Rosella OBC seismic survey.

Apache submitted an Environment Plan (EP) to the Department of Industry and Resources (DoIR) for the survey in compliance with the Petroleum Submerged Lands Management of Environment (P(SL)(MoE)) Regulations 1999. The EP was subsequently approved on the 25th February 2008. Apache also referred the proposal to the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) on the 14th of January, which was exhibited on the DEWHA website for 10 working days before being determined as 'not a controlled action if undertaken in a particular manner' on the 27th of February 2008.

Project Description

The OBC survey is proposed to commence in late-March 2008, taking 90 days to complete based on a 24 hour a day operation (though data acquisition will not take place all the time). The survey is estimated to conclude by late-June 2008, however any delays to the start date of the survey or adverse prevailing sea and weather conditions during the survey could potentially extend the finish date.

At its closest point, the survey is 95 km from the nearest mainland and 28 km from Barrow Island. The proposed survey covers an area of approximately 562 km² and is located within water depths ranging from 50 m to 150 m.

Geokinetics (Australia) Pty Ltd has been contracted to undertake the John Brookes and Rosella OBC seismic survey. The survey will be using three vessels varying in length from 40 to 58 metres to undertake the actual survey program, and are generally multi-purpose vessels. Vessel names and operational purposes of each vessel are listed in Table 1.

Geokinetics will be chartering all three vessels from Mermaid Marine Pty Ltd. All the vessels are new or near-new, and will be operated with Australian crews by Mermaid Marine when they arrive in Australian waters for their long-term charter to Geokinetics.

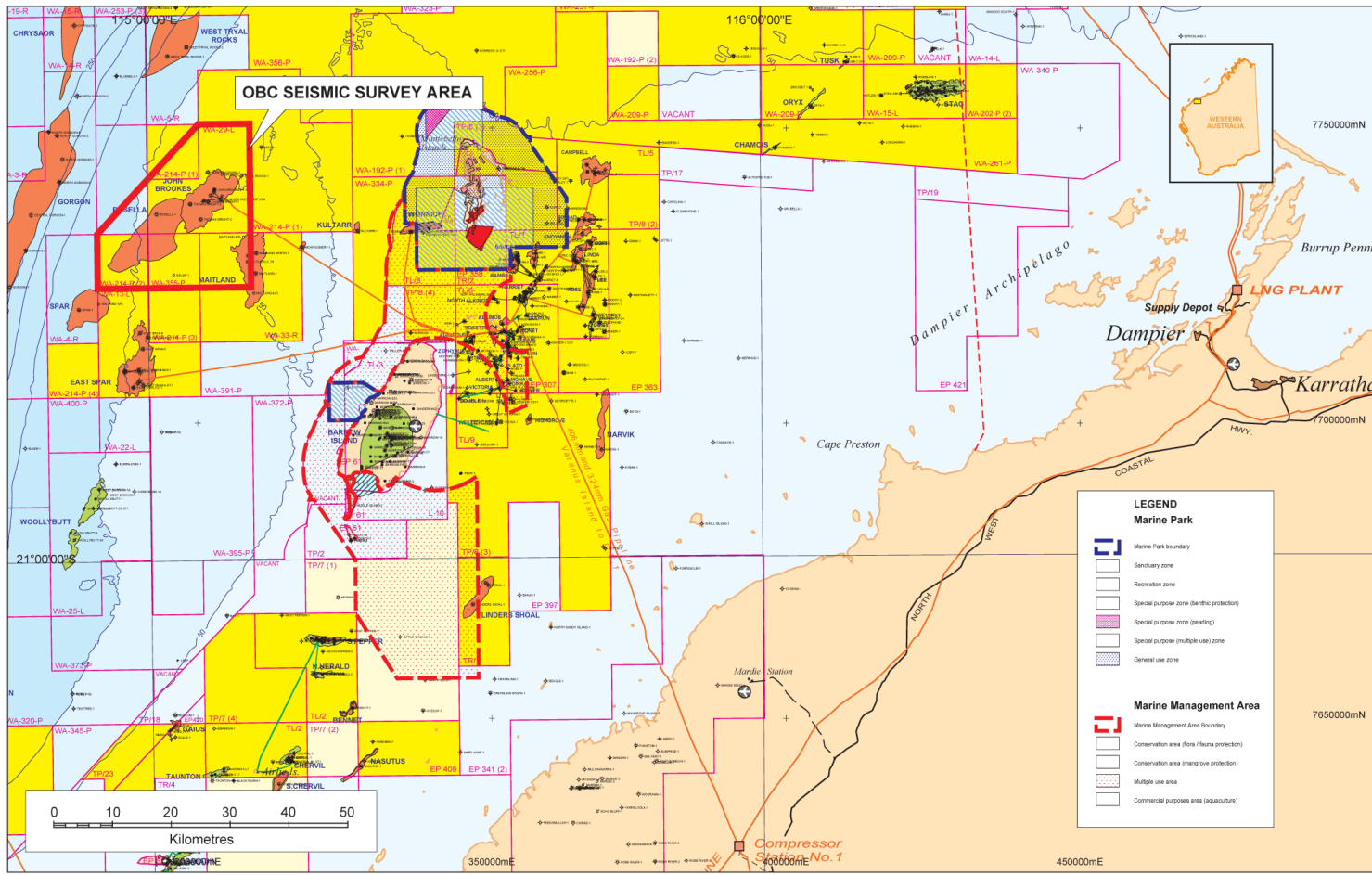


Figure 1. Location of the proposed John Brookes and Rosella OBC seismic survey area

Table 1. Vessel functions for the proposed John Brookes and Rosella OBC seismic survey

Vessel name	Length	Vessel type	Main function	Operations
<i>Swifto Sovereign</i>	40 m	Anchor handling vessel	Source vessel – contains compressors and airguns.	24 hours a day
<i>Jaya Mermaid 3</i>	49 m	Anchor handling vessel	Cable handling vessel – carries all cable, fitted with hydraulic deployment and retrieval equipment. Never stationary.	24 hours a day
<i>Discovery</i>	58 m	Anchor handling vessel	Recording, QC, crew management, administration and technical workshops – connects the cables to seafloor and will be anchored at the end of each swath while that swath is being shot. Vessel will move 2-3 times per day.	24 hours a day

Unlike a conventional acoustic seismic survey, the OBC survey will require smaller vessels, listed above. For an OBC survey the solid core receivers (that do not contain any hydrocarbon fluids) are laid out on the bottom of the ocean rather than towed behind the seismic vessel. An acoustic source or air gun array is used with the source vessel transiting over the area perpendicular to where the receivers have been installed. The receivers are connected to a recording vessel that anchors off to the side of the survey area. The seismic survey source vessel will complete long-axis acquisition transects of the survey area by sailing in an east-west orientation across three receivers on the seafloor (that are laid in a north-south orientation). It will carry a 5,000 psi compressor, capable of maintaining air to an acoustic source airgun. The acoustic source will comprise one source array consisting of six air guns with a combined capacity of 900 cubic inches, operating alternately at approximately 15 second intervals (with the vessel moving at 4 knots). The source generates a pressure wave pulse that travels as a seismic signal down through the geological layers into the underlying seabed and sedimentary strata. The pulse is then reflected back from the boundaries separating the rock layers in the subsurface. The reflected signals travel through the seabed cables to the hydrophones and geophones located within a customised aluminium bronze casting, known as a “flatpack”, also placed on the seabed. The cables and flatpack are connected to the stationary seismic recording vessel (the Discovery), returning the signal to the vessel's onboard computers for subsequent processing and analysis. The return times and character of the signals are used to plot the underlying geological strata. The cables will be continuously deployed and retrieved. It is anticipated that about 6 km² of data will be acquired each day. Details of the seismic array are provided in Table 2.

Each receiver is 9.2 km long and spaced 400 m apart, orientated in a north-south direction. Following acquisition of this data, the cables will be recovered and re-laid by the deployment vessel and the process repeated to cover the 562 km² area. Detailed bathymetry obtained from previous seismic surveys undertaken over the area coupled with the fact that the receivers contain no fluids will ensure minimal disturbance occurs to the seabed and that the risk of an oil spill from receiver damage is negligible.

All personnel involved with the survey will be housed on the Discovery vessel, fitted with housing for 40 persons and workshop facilities. This vessel will be anchored outside the survey area, approximately 2-5 km from the perimeter of the active survey lines.

Table 2. Details of the seismic array

Number of seismic source arrays	1
Total volume of seismic source arrays	900 cui
Operating pressure of seismic source arrays	2,000 psi
Depth of seismic source array	3 m
Interval between sound pulses	15 secs
Peak source of sound pulse	Peak to Peak (239 dB re 1 micro Pascal at 1m)
Frequency range	5 - 230 Hz

Receiving Environment

Physical Environment

The North West Shelf (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 11°C in winter to a maximum of 37°C in summer. Shelf waters are usually thermally stratified at a depth of about 20 m.

Wind patterns are monsoonal with a marked seasonal pattern. From October to March, the 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

Diverse assemblages of benthic fauna are likely to exist at the site, especially if unconsolidated sediments are present. Mobile burrowing species that may be present include crustaceans (crabs and shrimps), worms, sea stars, sea urchins and other small animals. Spatial and seasonal distribution of such species depends on factors such as substrate composition, season, water depth and temperature.

The demersal habitat of the NWS hosts a diverse assemblage of fish, many of which are commercially exploited by trawl and trap fisheries, for example the genera *Lethrinus* (emperor) and *Lutjanus* (snapper). Pelagic fish in this area include tuna, mackerel, herring, pilchard and sardine. The inshore habitats in this region are not considered to be significant nursery grounds for commercially important deeper-water fish species.

Whale sharks (*Rhincodon typus*) are oceanic and cosmopolitan in their distribution; however, they aggregate in and near the waters of the Ningaloo Marine Park during autumn, around the Exmouth region. They are occasionally observed from Apache's offshore oil and gas facilities on the NWS such as the Stag platform.

Four species of marine turtle nest on sandy shore sites of the Dampier Archipelago, Montebello Islands, Lowendal Islands, Barrow Island, and other coastal islands in the Exmouth region. These are the green turtle (*Chelonia mydas*), flatback turtle (*Natator depressus*), hawksbill turtle (*Eretmochelys imbricata*), and the loggerhead turtle (*Caretta caretta*). All four species are on the National List of Threatened Species. The leatherback turtle (*Dermochelys coriacia*) may also visit the open waters of the shelf. The loggerhead, flatback and leatherback turtles are known to feed on mid-water plankton and benthic animals, and can forage in continental shelf waters, so may occur through the survey area.

The nationally threatened dugong (*Dugong dugong*) occurs across the tropical coastal waters of Australia from Shark Bay to Queensland. They are herbivorous and are generally associated with seagrass beds, upon which they feed. Dugongs are commonly found in shallow sheltered areas (less than 5 m deep), often near islands or large bays. They are highly unlikely to be present around the proposed survey location.

Dolphins are relatively common in the region. Species known to occur in the region are the bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), Indo-pacific humpback dolphins (*Sousa chinensis*) and the striped dolphin (*Stenella coeruleoalba*). A number of whale species, including the short-finned pilot whale (*Globicephala macrorhynchus*), false killer whale (*Pseudorca crassidens*), tropical byrdes whale (*Balaenoptera edeni*), southern minke whale (*Balaenoptera acutorostrata*) and humpback whale (*Megaptera novaeangliae*), also occur in the region, the most commonly sighted of these being the humpback whale. This species migrates between the Antarctic waters and the Kimberly region of Western Australia. The peak of their northerly migration between the Exmouth Gulf and the Dampier Archipelago occurs around late July to early August, while the southerly return migration peaks around late August to early September. While the proposed survey area is located within the migration routes of humpback whales (*Megaptera novaeangliae*) in the Exmouth to Dampier Archipelago region, it will occur outside of the aforementioned peak migration periods.

Eighteen species of seabird have been recorded over the NWS waters. These include petrels, shearwaters, tropicbirds, frigatebirds, boobies and terns, and silver gulls. Of these, eight species occur year round and the remaining 10 are seasonal visitors.

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.

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

The Montebello/Barrow Islands Marine Conservation Reserves are located to the east and southeast of the survey area (see Figure 1).

Table 3 summarises the biological and socio-economic features of the NWS.

Table 3. 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												
OBC survey												

Key

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

Major Environmental Hazards and Controls

The potential environmental impacts resulting from the OBC seismic survey on the NWS are outlined in detail in the EP. Table 4 summarises the potential impacts of the seismic survey.

Table 4. Summary of potential environmental impacts from the John Brookes and Rosella OBC seismic survey on the NWS

Potential hazard (risk)	Potential environmental effect (consequence)	Risk ranking
Disturbance to marine fauna from seismic pulses	<ul style="list-style-type: none"> Pathological and physiological effects to marine biota. Disruption to behaviour patterns of marine fauna. Avoidance of acoustic source. 	B - compliance with DEWHA Policy Statement for avoiding interference with cetaceans during seismic surveys.
Displacement of other marine users.	<ul style="list-style-type: none"> Temporary reduction in recreational or commercial activities. 	B - consultation with commercial fishermen prior to seismic program. Notice to Mariners issued.
Vessel anchoring. Cable laying and retrieval.	<ul style="list-style-type: none"> Localised temporary disturbance to seabed. 	Negligible – rapid infilling of disturbed areas.
Artificial lights from vessels (must be kept on	<ul style="list-style-type: none"> Potential disorientation of fauna by lights at night, especially turtle hatchlings. 	Negligible – wave direction and magnetic cues are primary influences on turtle

24 hrs due to safety regulations)		hatchlings once they have left the beach. Survey is distant from nesting beaches.
Sewage, putrescible and solid domestic wastes	<ul style="list-style-type: none"> • Potential localised reduction in water quality - nutrient enrichment. • Modification of feeding habits of local fauna. 	Negligible – sewage treatment used on rig.
Waste oil, chemicals and oil-contaminated drainage water	<ul style="list-style-type: none"> • Potential localised reduction in water quality. 	Negligible – decks kept clean during operations, oily-water separator collects any spilled material on the deck.
Cooling water and atmospheric emissions	<ul style="list-style-type: none"> • Potential localised reduction in water quality. • Emissions of greenhouse gases. • Potential localised reduction in air quality. 	Negligible – discharged above water line to allow cooling and oxygenation. Engines maintained to operate at maximum efficiency.
Introduction of foreign marine organisms from vessels	<ul style="list-style-type: none"> • Competition with local marine life and absence of natural predators can alter ecological balance of flora and fauna communities, favouring the introduced species and resulting in loss of flora and fauna diversity and abundance. 	B – Full ballast water exchange of vessel at sea prior to entry into Australian waters. Visual checks and cleaning if necessary of marine gear (streamers and sources) prior to entry into Australian waters.
Diesel spill during refuelling	<ul style="list-style-type: none"> • Severe damage of marine habitats (e.g., coral reefs, mangroves, beaches). • Death or injury to marine life (e.g., birds, mammals). 	B – oil spill modelling indicates spills would be unlikely to reach land. Refuelling only during suitable weather and sea-state conditions, discretion of both skippers, integrity checks on equipment etc).

- Unacceptable – changes to design or procedures are required (hazardous discharge or large volumes or close to sensitive resources).
- A – risk reduction measures are required.
- B – acceptable risk, risk reduction measures should be considered depending on proximity to sensitive resources.
- Negligible – acceptable risk (small volumes or discharge innocuous or remote from sensitive marine resources or no impact expected).

Environmental Management

Extensive environmental management guidelines are prepared for all of Apache's exploration and production activities. Apache management documents that will be used to guide the implementation of environmental management procedures for this survey are listed below:

- Environmental Management Policy (April 2006).
- Contaminated Waste Management Procedure (VI-SA-ON-EN-000).

- Incident Reporting Procedure (AE-91-IF-002).
- OSCP Volume 1 – Operations (NWS) (AE-OO-EF-008).
- OSCP Volume 2 – Resource Atlas (NWS) (AE-OO-EF-008/2).
- Quarantine Procedure (AE-91-IQ-189).
- Refuelling Management Plan (DR-91-IG-001).
- Refuelling Operational Procedure Guide.
- Waste Management Plan (EA-60-RI-167).

Consultation

The following organisations have been contacted and informed of Apache's proposed seismic program:

- Western Australian Fishing Industry Council (WAFIC).
- Tuna West.
- Department of Fisheries.
- Marine and Coastal Community Network.

Further Details

For further information about the proposed John Brookes and Rosella OBC seismic survey, please contact:

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