



Reindeer-2, -3, -4 Development Wells Environment Plan: Public Summary July 2008

This summary of the Reindeer wells EP 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 drill the Reindeer-2, -3, -4 development wells in Commonwealth waters off the Western Australian coast in Exploration Permit WA-209-P using the *Ensco 106* jack-up drill rig. The Reindeer wells are located 60 km northwest of the nearest shoreline, being Rosemary Island (Figure 1). Drilling is scheduled to commence in mid- September 2008.

Apache's generic Environment Plan (EP) for its drilling program 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 the Reindeer wells was approved by the DoIR, in accordance with the Petroleum (Submerged Lands) (Management of Environment) (PSLMoE) Regulations 1999.

Project Description

The proposed wells drill site is located at 20° 01' 26.76" S, 116° 18' 35.07" E (GDA 94, Zone 50) in a water depth of 62 m. Water-based mud (WBM) will be used to drill the top hole sections and drill cuttings will be discharged to the seabed. Synthetic based mud (SBM - Novaplus) will be used for the remaining sections with procedures in place to minimise the quantity of SBM discharged to the seabed.

The wells will be batch drilled and the drilling procedure for each well will be to:

- drill a 914 mm hole with seawater and gel sweeps and run and cement a 762 mm conductor
- drill a 406 mm hole with seawater and gel sweeps and run and cement 340 mm casing
- drill a 311 mm hole with SBM and run and cement 244 mm casing
- drill a 216 mm hole through to the reservoir using SBM
- run and cement a 178 mm liner
- set suspension plugs.

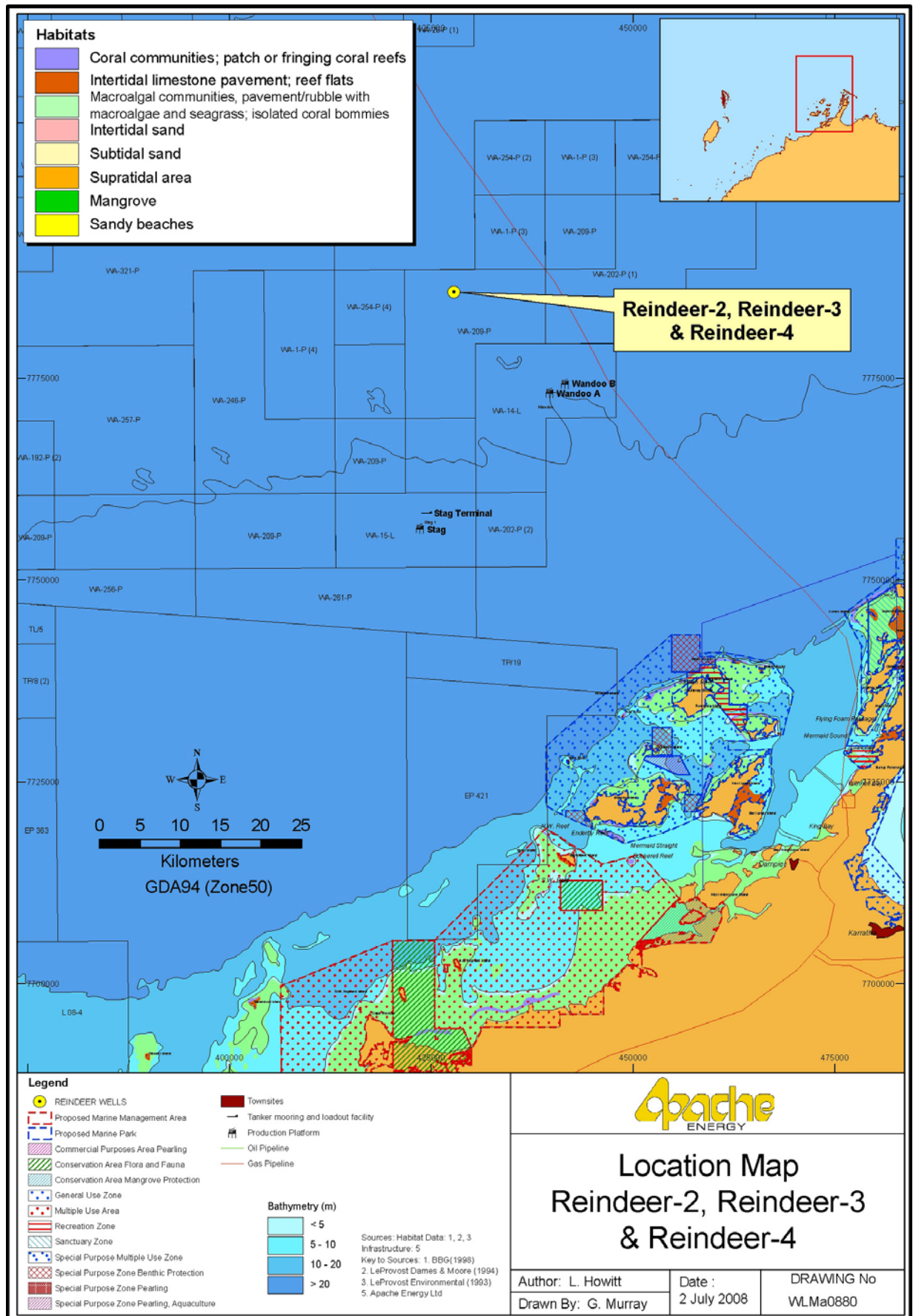
The wells will be drilled through a subsea template to aid in the precision of positioning the wells and in the future, to centre the platform during installation. Once the wells are drilled and suspended, the posts of the template will sit 5.5 m above the seabed on the western side of the template and 3.5 m on the eastern side. The wells will be completed at a later date after the Reindeer platform is installed.

Receiving Environment

Physical Environment

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 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.

Figure 1 Location of the proposed Reindeer-2, -3, -4 drill site



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 coriacea*) 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 around the Reindeer wells location.

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 drilling 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. The proposed Reindeer wells are located within the migration routes of humpback whales (*Megaptera novaeangliae*) in the Exmouth to Dampier Archipelago region.

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 southeast of the drill site (see Figure 1).

Table 1 summarises the biological and socio-economic features of the NWS.

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													
Reindeer-2, -3, -4													

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 offshore drilling on the NWS are outlined in detail in the Generic Drilling Program EP. Table 2 summarises the potential impacts of the Reindeer wells drilling program.

Table 2. Summary of potential environmental impacts from offshore drilling on the NWS

Potential hazard (risk)	Potential environmental effect (consequence)	Risk ranking
Drill rig and vessel anchoring	Localised disturbance to seabed, such as shallow furrows, dependent on seabed type. Effects are temporary.	Negligible – rapid infilling of furrows.
Artificial lights from drill rig (must be kept on 24 hrs due to safety regulations)	Potential disorientation of fauna by lights at night, especially turtle hatchlings.	Negligible – wave direction and magnetic cues are primary influences on turtle hatchlings once they have left the beach. Reindeer wells are distant from nesting beaches.
Impacts to marine species from noise generated by the drill rig and support vessels	Potential short-term physiological effects or disruption to behaviour patterns of cetaceans, birds, turtles, fish and other marine life.	Negligible – observations have shown whales resting and swimming in close proximity to operating rigs.
Drill cuttings and fluid discharges	Drilling activities and disposal of drill cuttings and fluids will produce suspended sediments in the water column increasing turbidity, will bury and smother infauna and epifauna and may lead to toxicity and bioaccumulation to marine organisms.	Acceptable –WBM used and management measures in place to minimise quantity of SBM discharged to seabed. Studies on NWS reveal localised impact on benthic fauna and recovery within years.
Sewage, putrescible and solid domestic wastes	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	Potential localised reduction in water quality.	Negligible – decks kept clean during operations, oily-water separator collects any spilled material.
Cooling water and atmospheric emissions	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.
Introduction of foreign marine organisms from drill rig and support vessels	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.	Negligible – <i>Ensco 106</i> rig has been operating on the NWS waters for several years prior to this drilling programme.
Impacts to humpback whales from	VSP is a more benign activity than conventional seismic surveys. Potential short-lived impacts include	VSP not likely to be required. If VSP is required, it will be carried out in accordance

vertical seismic profiling (VSP) noise	disruption to navigation and communication, with some research indicating no disruption from normal activities when seismic activity is occurring several kilometres away.	with DoIR guidelines for minimising acoustic disturbance to fauna. It will also be carried out in accordance with Part A Standard Management Procedures of the EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales, using the 1km low power zone during VSP operations between 20 July and 1 October (EPBC Manner Specified Condition (2007/3917)).
Oil or diesel spills	Severe damage of marine habitats (e.g., coral reefs, mangroves, beaches) and death or injury to marine life (e.g. birds, mammals).	Acceptable – oil spill modelling indicates spills would be unlikely to reach land.

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 (April 2006).
- Contaminated Waste Management Procedure (VI-SA-ON-EN-000).
- Incident Reporting Procedure (AE-91-IF-002).
- Lighting Management Plan (EA-60-RI-153).
- 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.
- Vermin Management Plan (EA-60-RI-131).
- Waste Management Plan (EA-60-RI-167).

Consultation

In preparing the Generic NWS Drilling Program EP, Apache consulted with numerous stakeholder representatives, including:

- DoIR.
- Department of Environment (DoE) (now Dept of Environment & Conservation).
- CALM (Marine branch) (now DEC).
- Fisheries WA.
- Marine and Coastal Community Network (MCCN).
- Environment Protection Agency (EPA).
- Marine Parks Reserve Authority (MPRA).
- DEC (Environmental Protection).
- WA Fishing Industry Council (WAFIC).

Further Details

For further information about the Reindeer wells drilling program, please contact:

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