



Crusader-1
Deviated Exploration Well
Environment Plan: Summary
February 2010

This summary of the Crusader-1 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 proposes to drill a deviated exploration well, Crusader-1 in permit area WA-35-L in Commonwealth waters. Drilling of Crusader-1 is proposed to commence around 1 March 2010 (weather conditions permitting). This well will be drilled using the *Stena Clyde* semi-submersible drill rig. Crusader-1 is located 45 km north of the nearest mainland, and 28 km north of the nearest Ningaloo Marine Park boundary (**Figure 1**). The surface hole location for Crusader-1 is provided below.

Latitude	21° 24' 16.291" S
Longitude	114° 2' 5.341" E

(GDA 94, Zone 50)

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 Crusader -1 was approved by the DMP, in accordance with the Petroleum (Submerged Lands) (Management of Environment) (PSLMoE) Regulations 1999.

Project Description

The *Stena Clyde* will be moved into position for the Crusader-1 well by work boats and then kept on location with primary and secondary anchors.

All work on the wells will be undertaken in accordance with the regulations and guidelines set out in the *Petroleum (Submerged Lands) Acts Schedule: Specific Requirements as to Offshore Petroleum Exploration and Production – 1995*.

The drilling procedure for the Crusader-1 well will be set a 762 mm x 508 mm (30" x 20") conductor below the seabed and then drill a 406 mm (16" hole) into the Lower Gearle and run and cement a 340mm (13-3/8") casing. At this point the blowout preventers (BOP) and marine riser will be installed and a full BOP pressure test will be conducted. Following this, the well will be displaced to WBM and then the 340mm (13-3/8") casing shoe track will be drilled out and a Leak off Test (LOT) conducted.

It is planned that the 311mm (12.25") hole section will intersect the Barrow Group and penetrate a 300m fault zone. This section will be target depth (TD) and a 244mm (9-5/8") casing will be run when 150m of shale has been seen below the Upper Pyrenees member. This will indicate that the fault zone is finished and can be isolated before progressing to the Macedon.

A 216mm (8-1/2") assembly will drill the 244mm (9-5/8") shoetrack and a LOT will then be conducted. It is planned that the 216mm (8.5") section will intersect the

Macedon sandstone, the primary objective, and TD in the Dupuy. On reaching TD the well will be evaluated using wireline logs and then abandoned appropriately.

Vertical seismic profiling (VSP) will be undertaken as part of this programme. On the completion of the drilling programme the rig will be towed away.

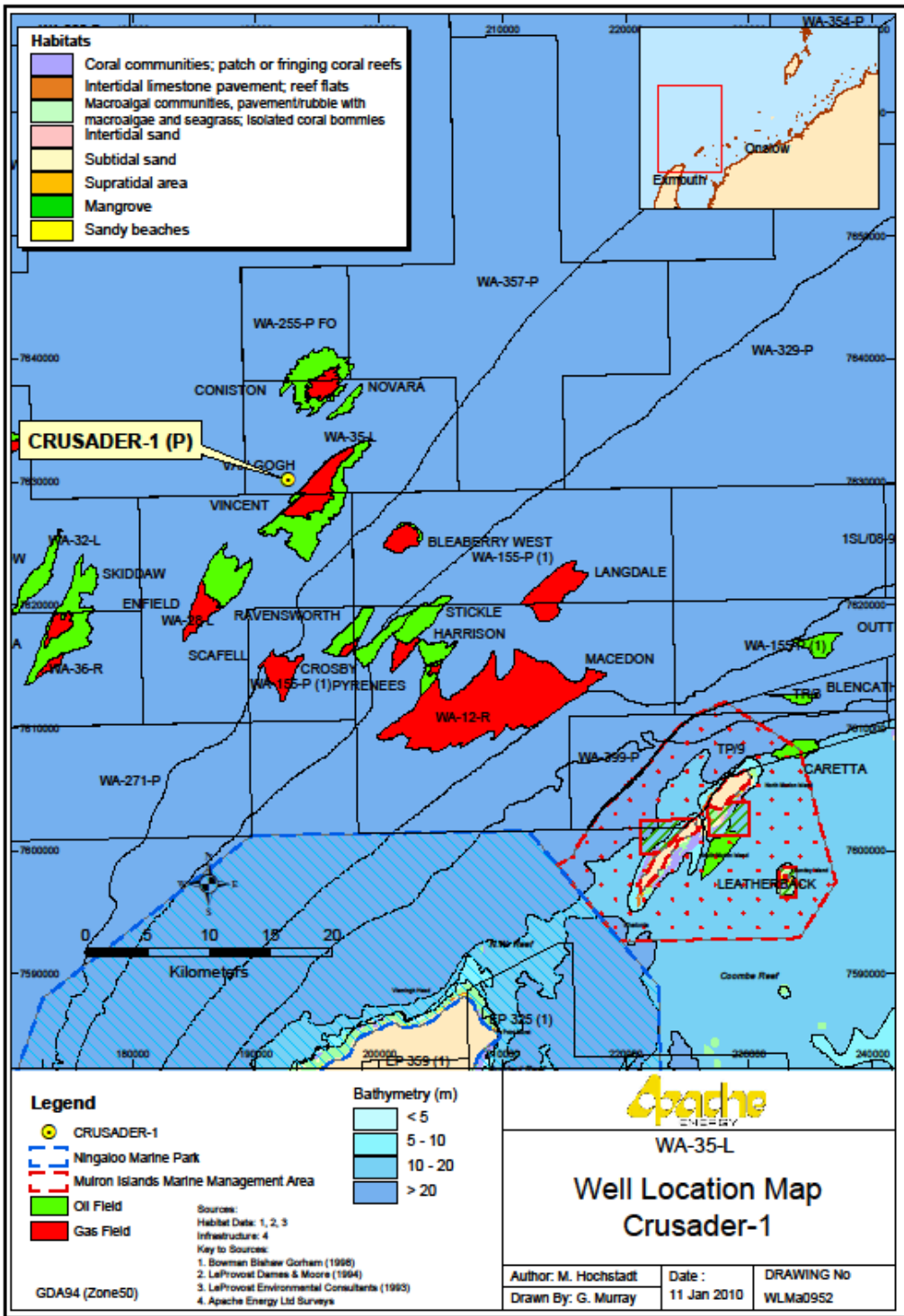


Figure 1 Location of the proposed Crusader-1 drill site

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.

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

The drilling program during March does not coincide with the sea turtle nesting period or the seabird nesting period on the Montebello and Lowendal Island groups. However, it does coincide with the dugong breeding period (see **Table 1**).

The proposed Crusader-1 drilling location is over 40 km distant from the nearest island and therefore it is not expected that dugongs (or turtles and seabirds) will be affected by the drilling program. Helicopters will be routed to avoid flying over sensitive breeding areas.

The drilling of the Crusader-1 well will not coincide with the migration of humpback whales (*Megaptera novaeangliae*) in the Exmouth to Port Hedland region. The humpback whale is a cetacean listed as 'threatened' under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*.

Whale sharks (*Rhincodon typus*) aggregate in and near the waters of the Ningaloo Marine Park during autumn (usually late March to June). Numerous aerial surveys and scientific research indicates that they are generally not spotted in waters deeper than 100 m. As drilling will be undertaken a significant distance north of the marine park and will occur outside of the whale shark migration period, drilling is not expected to impact on whale shark migration or aggregation activities.




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.

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												
Crusader-1												

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 Crusader-1 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 – semi-submersible rig with anchoring to seabed.
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. Crusader-1 is 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 – WBMs used. Studies on NWS reveal few long-term impacts on benthic fauna from WBMs.
Sewage, putrescible and solid domestic wastes	Potential localised reduction in water quality - nutrient enrichment. Modification of feeding habits of local fauna.	Negligible – sewage treatment available 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
Impacts to humpback whales or	VSP is a more benign activity than conventional seismic surveys. Potential short-lived impacts include	Acceptable - VSP carried out in accordance with DMP's guidelines for

Potential hazard (risk)	Potential environmental effect (consequence)	Risk ranking
whalesharks from 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.	minimising acoustic disturbance to fauna.
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 management procedures are in place.

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:

- (former) Department of Industry and Resources (DoIR) (now Department of Mines and Petroleum).
- (former) 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).
- CALM (Environmental Protection) (now DEC).
- WA Fishing Industry Council (WAFIC).

Further notification regarding the proposed start date, duration and location for the Crusader-1 drilling programme will be provided to the following fishing groups prior to the commencement of the programme:

- Australian Fisheries Management Authority (AFMA)
- Commonwealth Fisheries Management Authority (AFMA)
- Western Australian Fishing Industry Council (WAFIC)
- Northern Fishing Companies Association
- Western Australian Northern Trawl Owners Association (WANTOA)
- A Raptis & Son

Further Details

For further information about the Crusader-1 drilling program, please contact:

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