

Fossetmaker-2 Appraisal Well

Environment Plan: Public Summary

20 April 2009



This Summary Drilling EP has been submitted to comply with Regulations 11(7&8) of the Petroleum (Submerged Lands) (Management of Environment) Regulations 1999.

Introduction

Nexus Energy Ltd (Nexus) proposes to drill the Fossetmaker-2 appraisal well in Commonwealth waters off the Western Australian coast in Exploration Permit WA-377-P, likely to be using the *Transocean Legend* drill rig. Fossetmaker-2 is located 270 km west of the closest mainland (Figure 1 & Figure 2). A firm date for drilling is subject to drill rig availability, but may take place in May/June or September/October 2009.

Nexus' Environment Plan (EP) for the Fossetmaker-2 Drilling Program will be used to manage the well. This EP was approved by the WA Department of Mines and Petroleum (DMP) in April 2009 in accordance with the Petroleum (Submerged Lands) (Management of Environment) Regulations 1999.

Project Description

There are currently two well locations being investigated for Fossetmaker-2, an 'A' and 'B' option, with only one of these locations to be drilled. The determination of the final well site will be determined closer to the time of drilling (coordinates are provided below). The well will be drilled with water-based mud (WBM) and drill cuttings will be discharged to the seabed.

Well option	Latitude (S)	Longitude (E)	Water Depth
Fossetmaker-2A	13° 39' 30.769"	123° 55' 3.457"	169 m
Fossetmaker-2B	13° 44' 38.061"	123° 45' 32.363"	187 m

The drilling programme for each option is the same. Fossetmaker-2 will be drilled using a 914 mm (36") hole to about 33 m below the seabed with seawater and hi-vis gel sweeps, and then a 762 mm (30") conductor with a low pressure wellhead run in and cemented, followed by the installation of a riserless mud recovery (RMR) system. A 445 mm (17½") hole will then be drilled to a depth of 1,900 m to 2,000 m, taking returns via the RMR with a seawater-polymer mud system. The RMR system will then be retrieved and a 340 mm (13¾") casing run in and cemented with a high pressure wellhead. The blow-out preventer (BOP) and riser will then be installed. After this point, a 311 mm (12¼") hole will be drilled to core point in the Tithonian sandstone with KCl-polymer mud, with about 72 m of core planned to be obtained. Drilling of the 311 mm (12¼") hole will continue to the final total depth of about 3,875 m to 3,975 m. The well will be logged before it's plugged and abandoned.

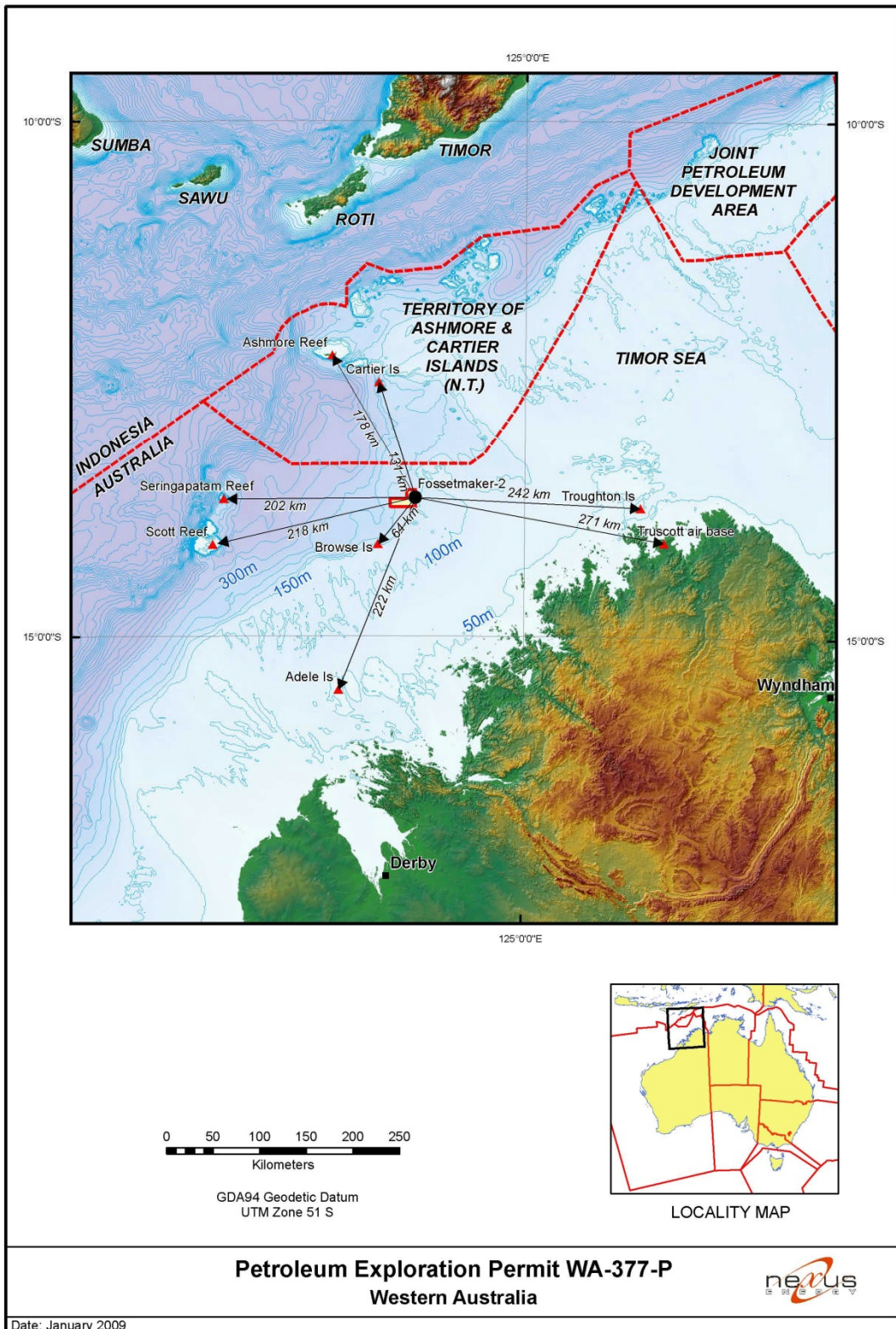


Figure 1 WA-377-P Regional Locality Map

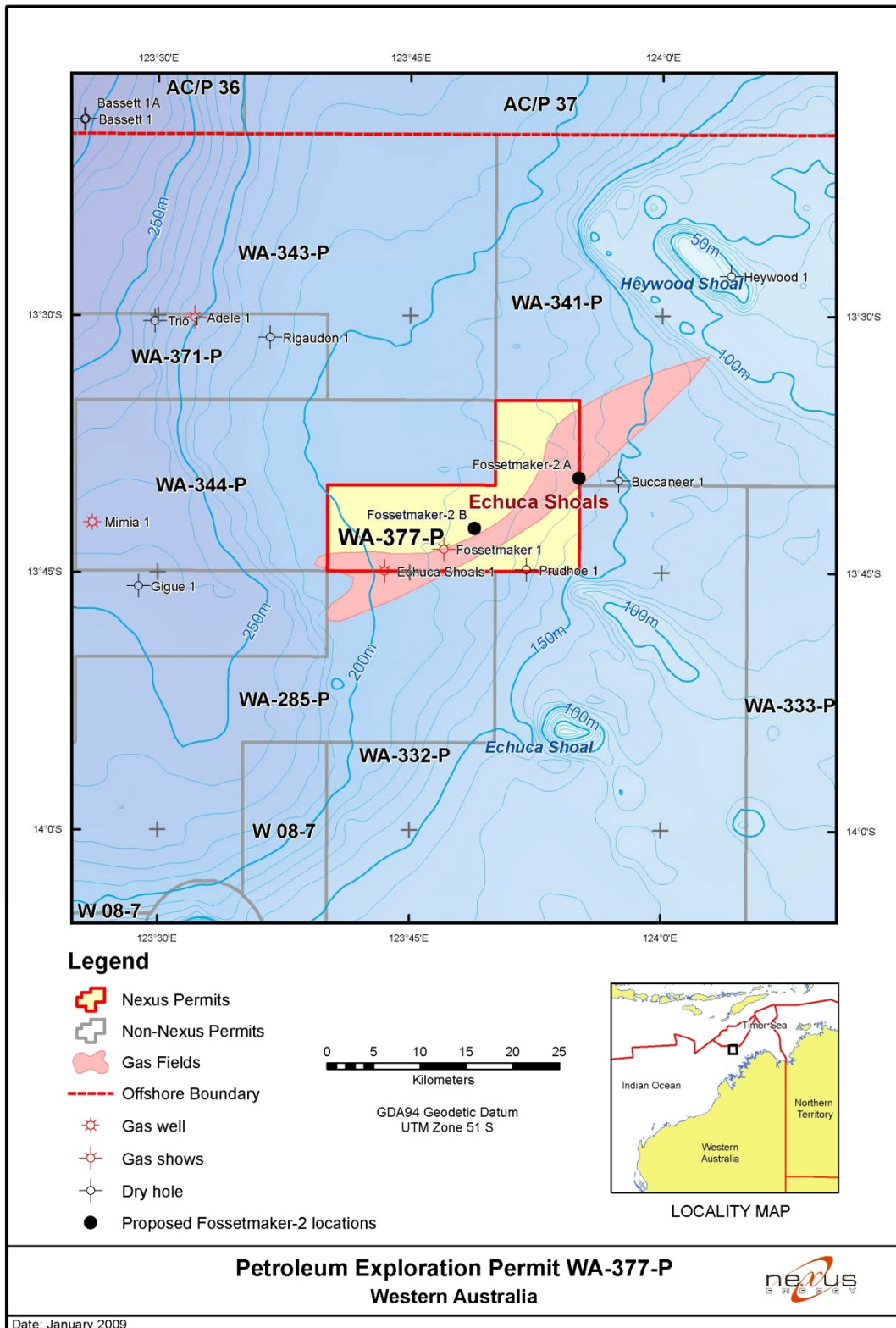


Figure 2 Fossetmaker-2 Detailed Locality Map

Receiving Environment

Physical Environment

The drilling area lies in the Oceanic Shoals IMCRA meso-scale region of Australia, an area of submerged and emergent reefs and cays along the WA/NT outer edge of the continental shelf. The climate is tropical with a distinct wet summer (October to April) and dry winter (May to September). The meteorological conditions of the North West Shelf (NWS) are dominated by the south-east trade winds and to a lesser extent by north-west monsoons. Rainfall is highly variable as a result of the cyclonic systems originating mostly in the Timor Sea and moving in a west or south-west direction parallel to the coastline. Annual average rainfall 622 mm in nearby Derby with most rainfall occurring during the summer months. Mean sea surface temperatures over the NWS range from a minimum of 15°C in winter to a maximum of 33°C in summer.

The Timor Sea is a generation region for tropical cyclones, which contribute to short-lived, severe storm events with strong but variable winds. These storms become more intense as they move southwards, and are capable of producing strong winds in the Echuca Shoals Area. Most cyclones, occurring predominantly between December and April, approach the area from the ENE with an average of 2.6 cyclones per year. Severe cyclones with wind speeds exceeding 100 km/hr occur on average once every 2.6 years.

Tides are semi-diurnal tides, with a typical range of 4 m at springs at 1.8 m at neaps. Ocean currents on the NWS region are driven by wind, sea bed slope and the strength of the thermocline. Monthly averaged currents show considerable variability, averaging between 0 and 0.2 m/s with the strongest flows to the southwest during April.

Biological Environment

No comprehensive mapping of the distribution of marine macroalgae has been undertaken in the WA-377-P permit area. However, significant macroalgae beds have been reported to occur along Adele Island (approximately 212 km SSW of the centre of the permit) and may be expected to also occur at Scott Reef (190 km WSW) and wherever suitable shallow hard substrates are present. Significant beds are not expected to occur in the WA-377-P permit area due to the significantly greater water depth.

About 117 species across 10 phyla (of varying abundance) have been found in the nearby Ichthys field. A range of in-faunal invertebrates are expected to occur in the sediments in the permit area, with polychaetes and crustaceans dominating the infauna of the region. Tropical lobster species found include the ornate (*P. ornatus*) and painted (*P. versicolor*) rock lobsters. The dominant prawn species of the region are the penaeid species: western king prawn (*Penaeus latisulcatus*), Tiger Prawn (*P. esculentus*), banana prawn (*P. merguensis*) and endeavour prawn (*Metapenaeus*

endeavouri). Coral prawns (*Metapenaeopsis* spp) and deepwater scampi (*Metanephrops* spp) also occur.

Whales are not expected to be common inhabitants of the permit area, although a number have broad distributions around Australia. The EPBC Act database lists 20 cetacean species which may occur in the area, six of which are protected under the migratory provisions of the Act and two of the species have threatened status of endangered/vulnerable (Table 1). There are no known breeding, calving or feeding grounds or migratory routes for any listed threatened or migratory whale species within, or in the vicinity of the proposed Fossetmaker-2 appraisal well.

Table 1. Whales with potential distributions in or near the permit area

Species	EPBC Status, Distribution & Habitat
Blue whale (<i>Balaenoptera musculus</i>)	<ul style="list-style-type: none"> • Endangered & migratory • Oceanic • Warm-water breeding (approx 20°S), cold water feeding (60-70°S) • Calving in tropical open oceanic waters but specific areas not identified • Mating: Winter (peak in July) & Calving: Winter (peak May-June)
Humpback whale (<i>Megaptera novaeangliae</i>)	<ul style="list-style-type: none"> • Vulnerable & Migratory • Coastal in Spring • Migration between 15-20°S (warm water breeding grounds) & feeding grounds 60-70°S • Mating Season: June – Oct & Calving Season: June-Oct • Exact breeding locations unknown but occurs in tropical coastal waters
Bryde's whale (<i>Balaenoptera edeni</i>)	<ul style="list-style-type: none"> • Migratory • Tropical and temperate waters (from equator to approx 40°S) • Mating: All year (inshore form) and Autumn/winter (offshore form) • Exact Breeding/calving areas not identified
Sperm whale (<i>Phyeter macrocephalus</i>)	<ul style="list-style-type: none"> • Migratory • All oceans, warm and cold waters • Most common in cooler, deeper waters • Mating: All year & Calving: Variable • No known calving or breeding areas in Australia
Antarctic minke whale (<i>Balaenoptera bonaerensis</i>)	<ul style="list-style-type: none"> • Migratory
Killer whale (<i>Orcinus orca</i>)	<ul style="list-style-type: none"> • Migratory • All oceans, warm and cold waters • Most common in cooler, deeper waters • Mating: All year & Calving: Variable • No known calving or breeding areas in Australia

The seas of tropical Australia support significant and diversified sea snake fauna, with a strong endemic component. Of the 55 species of sea snake recorded worldwide, 32 species are recorded from tropical Australia and nearly 50% of these are endemic. There are 16 protected species of sea snake listed under the EPBC that may inhabit the permit area.

Five species of marine turtle are either listed as threatened under the EPBC Act and are likely to occur in the permit area. These species, together with preferred habitat type are provided in Table 2. Browse Island, located approximately 52 km southwest of the centre of the permit, is an important turtle nesting site, particularly for green turtles (*Chelonia Mydas*). Ashmore Reef and Cartier Islet (both located more than 100 km from the permit area) are also known breeding areas for large numbers of turtles. Although some species may migrate through or forage in the permit area, the permit area does not have significant concentrations of turtles nor any recorded nesting sites.

Table 2. Turtles with potential distributions in or near the permit area

Species	EPBC status	Habitat presence and significance
Green turtle (<i>Chelonia mydas</i>)	Vulnerable Migratory	<ul style="list-style-type: none"> Species/species habitat may occur in permit area. Forages in shallow habitats (< 20 m) containing seagrasses and algae including coral or reefs. Most widespread species of turtle in WA. Nesting at Ashmore Reef & Cartier Island in summer.
Leatherback turtle (<i>Dermochelys coriacea</i>)	Endangered (upgraded from vulnerable in January 2009) Migratory	<ul style="list-style-type: none"> Species/species habitat may occur in permit area. Pelagic feeder and can forage in cooler waters. No known nesting sites in WA.
Flatback turtle (<i>Natator depressus</i>)	Vulnerable Migratory	<ul style="list-style-type: none"> Species/species habitat may occur in permit area. Inhabits soft bottom habitat, feeding in shallow turbid waters usually in depths 10-40m. Nests on sandy beaches. No recorded rookeries in proximity to permit area.
Loggerhead turtle (<i>Caretta caretta</i>)	Endangered Migratory	<ul style="list-style-type: none"> Species/species habitat may occur in permit area. Nesting on subtropical beaches near North West cape and on Ashmore Reef. Feeds on benthic invertebrates in water depths up to 55m.
Hawksbill turtle (<i>Eretmochelys imbricata</i>)	Vulnerable Migratory	<ul style="list-style-type: none"> Species/species habitat may occur in permit area. Benthic foraging on coral or reefs. No recorded rookeries in proximity to permit area.

Fish species in the region are entirely tropical with most having an Indo-Pacific distribution. Tropical ecosystems exhibit high species diversity with over 500 fish species recorded as common from trawling conducted at depths between 30-150 m and 1,000 species recorded from emergent reefs such as Ashmore Reef-Cartier Islet.

Offshore islands, coral reef systems and continental shelf waters provide homes to many members of the demersal sea perch families such as scarlet sea perch and red emperor, coral and coronation trout, trevally, tunas, mackerels, billfish and sharks.

The whale shark (*Rhincodon typus*), listed as vulnerable under the EPBC Act, may occur in the permit area. Whale sharks are also listed as a migratory species under the EPBC database and have been observed in the waters around Ashmore Reef. The permit area is not recognised as a seasonal aggregation site.

The Timor province has been found to be an important bioregion due to the presence of many endemic fish species, with two distinct demersal community types; those associated with the upper slope (225 – 500 m water depth) and mid-slope (water depths of 750 – 1,000 m). It is also likely that southern bluefin tuna travel through the region on their way to and from spawning grounds between Java and Australia, and that blue whales may move between Scott Reef and Browse Islands during July (northern migration) and again from October to November (southern migration).

Socio-Economic Environment

At the 2006 census, the North-west Marine Region had a population of 91,841 people, an increase of 5.3% on the previous 2001 census, with the coastal towns of Broome, Karratha and Port Hedland containing the largest populations. A large Aboriginal population is based in the region, with significant populations in Roebourne, Derby and Wyndham. In the Pilbara sub-region, there was a 14% increase in the population between 2001 and 2006, attributable largely to the expanding petroleum and minerals industries, with the town of Karratha having the largest increase (25%).

The major commercial shipping route through the Timor Sea passes well to the west of the permit area, which relate mainly to oil tanker and iron-ore bulk carrier vessel movements between the ports of Dampier and Port Hedland and Asia (northeast-southwest tracking).

The permit area is situated in Browse Basin, a region recognised for offshore petroleum exploration. It is estimated that the basin contains reserves of 30 trillion cubic feet (Tcf) of gas. The value of the petroleum produced in the North-west Marine Region (including the productive Carnarvon Basin) was over \$16 billion in 2006-07. The Browse Basin includes the yet-to-be-developed Torosa (Scott Reef), Brecknock, Calliance and Icythys gas fields.

The only Commonwealth commercial fishery likely to operate in the WA-377-P permit area is the North West Slope Trawl, which trawls muddy bottoms just outside the 200 m isobath, in the vicinity of reefs (Scott & Ashmore) and Rowley Shoals (small scale, economically marginal) for deepwater prawns. State-managed fisheries operating in the area include the Northern Demersal Scalefish Managed Fishery, operating from Broome to the NT border in water depths ranging between 30-200 m, fishing primarily for goldband, snapper and red emperor and the

Kimberley Prawn Fishery, trawling for banana prawns east of 123°45'E longitude and west of 126°58'E longitude.

There is no record of any previous indigenous archaeological assessment of the seabed within the proposed drilling area. No portion of the seabed beyond 3 nm of the present coastline was unsubmerged at any time during indigenous occupation of Australia, thus no artefacts-making activity could have occurred.

The proposed Fossetmaker-2 well is located inside the 'MOU74 Box', an area of approximately 50,000 km² within the Australian Fishing Zone (AFZ) where Indonesian traditional fishermen are allowed to fish under the provision of Memorandum of Understanding (MOU) signed between Australia and Indonesia in 1974. Traditional fishers are allowed access to the reefs of Cartier Island, Scott Reef, Seringapatam Reef and Browse Island, and visit Ashmore Reef for access to fresh water and to visit graves. The MOU recognised the long history of traditional Indonesian fishers, enabling them to continue their customary practices and target species such as trepan (sea cucumber), trochus, abalone, sponges, green snail, molluscs and shark. As a result, it is possible that Indonesian fishing vessels will move through the permit area. Fishing effort is difficult to estimate however in 1998, 89 Indonesian fishing vessels were recorded anchored in Scott Reef, 203 km west of the centre of the permit area.

Major Environmental Hazards and Controls

The potential environmental impacts resulting from drilling the Fossetmaker-2 well in the offshore Perth Basin are outlined in detail in the Fossetmaker-2 Drilling EP. Table 3 summarises the potential impacts of the proposed drilling program.

Table 3. Summary of potential environmental impacts from Fossetmaker-2 drilling

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.	Low – rapid infilling of furrows.
Artificial lights from drill rig (must be kept on 24 hrs due to safety regulations)	Disorientation of fauna by lights at night, especially turtle hatchlings. Short-term duration.	Low – no turtle nesting locations near drilling location.
Impacts to marine species from noise generated by the drill rig and	Short-term physiological effects or disruption to behaviour patterns of cetaceans, birds, turtles, fish and other marine life.	Low – observations have shown whales resting and swimming in close proximity to operating rigs. Not close to whale

support vessels		aggregation areas.
Drill cuttings and fluid discharges	Disposal of drill cuttings and fluids will increase turbidity, will bury and smother benthic fauna and may lead to toxicity and bioaccumulation to marine organisms.	Low –WBM used, low volumes. Few long-term impacts on benthic fauna from WBM. No sensitive locations nearby.
Sewage, putrescible and solid domestic wastes	Localised reduction in water quality - nutrient enrichment. Modification of feeding habits of local fauna.	Low – sewage treatment used on rig. Rapid dilution and dispersion of liquid discharges. Solid wastes removed to shore for disposal.
Waste oil, chemicals and oil-contaminated drainage water	Localised reduction in water quality. Localised chronic/acute toxicity effects on fauna.	Low – decks kept clean during operations, oily-water separator collects any spilled material. Waste oil collected and taken ashore for recycling or disposal.
Cooling water and atmospheric emissions	Localised and temporary reduction in water quality due to higher temperature water. Emissions of greenhouse gases. Potential localised reduction in air quality.	Low – discharged above water line to allow cooling and oxygenation. Rapid dilution and dispersion (air and water). Equipment maintained at optimal efficiency.
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.	Low – high energy, sandy environment not conducive to colonisation by exotic benthic species. Adherence to AQIS procedures.
Vessel collision	Oil spill – damage to marine habitats and death or injury to marine life.	Low – maritime standards, 500 m safety exclusion zone, rig well lit, use of radar, 24 hr visual watch by tender vessels. Oil Spill Contingency Plan (OSCP) in place.
Well blow-out	Oil spill – damage to marine habitats and death or injury to marine life.	Low – numerous measures in place to prevent spills. Spill modelling completed – no impact to nearby shoals.

		BOP in place and tested.
Displacement of other marine users	Disruption to commercial fishing. Temporary restriction in fishing area.	Low – short-term activity. Little or no commercial fishing in permit area. Plentiful similar fishing grounds in the region.

Environmental Management

Extensive environmental management guidelines are prepared for each Nexus-drilled well, guided by Nexus' Health, Safety, Environment and Community (HSEC) Policy (April 2006) and associated standards and procedures. Nexus management documents used to guide the implementation of well-specific environmental management procedures will be provided to all relevant contractors.

Consultation

When the timing and exact location of drilling of the Fossetmaker-2 Drilling Programme EP are confirmed, Nexus will consult with numerous stakeholder representatives in line with its standard consultation practices, including:

Commonwealth Government

- Australian Quarantine Inspection Services (AQIS).
- Commonwealth Fisheries Association.
- Australian Maritime Safety Authority (AMSA).
- Australian Fisheries Management Authority (AFMA).
- Border Protection Command.

Western Australian Government

- Dept. Mines and Petroleum (DMP).
- Dept. of Planning and Infrastructure (DPI) (Marine Safety).
- Dept. of Fisheries (DoF).

Fisheries organisations

- WA Fishing Industry Council (WAFIC).
- Tuna West.
- Kimberley Professional Fishermen's Association.

Further Details

For further information about the Fossetmaker-2 drilling program, please contact:

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