



# Devil Creek Development Project Operations Environment Plan: Summary November 2011

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

## Introduction

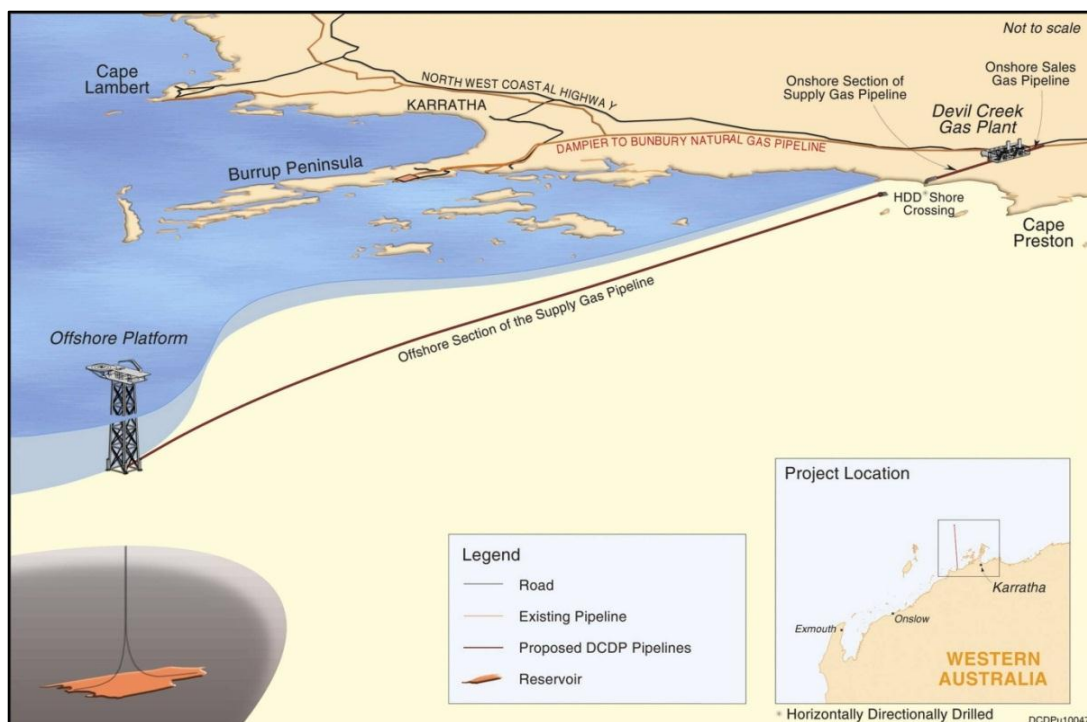
Apache Northwest Pty Ltd (Apache), on behalf of joint venture participants Santos Offshore Pty Ltd, operates a new “green field” domestic gas development which processes gas from the offshore Reindeer gas field, located within Permit WA-41-L in Commonwealth waters (**Figure 1**). The gas field is approximately 80 km northwest of the Port of Dampier in 58 m water depth, and once the gas is processed in the onshore gas plant it is fed into the Dampier Bunbury Natural Gas Pipeline (DBNGP).

This environment plan (EP) covers all facilities and operational, maintenance and minor construction activities (defined as those not requiring a Works Approval under Part V of the Environmental Protection Regulations, 1987) at the:

- Devil Creek Gas Plant (DCGP)
- Reindeer Well Head Platform (WHP)
- Associated gas supply and sales gas pipelines

This EP also addresses the management of routine and non-routine events identified from various environmental hazard assessments undertaken for the DCDP.

**Figure 1 Location of the DCDP Offshore Platform, Pipeline and Onshore Gas Plant**



## Facility Description

Operational activities associated with the DCDP facilities (**Figure 1**) will consist of:

- Reindeer WHP;
- offshore gas supply pipeline subject to pipeline licences TPL20 (Commonwealth Waters), WA18PL (State Waters);
- onshore gas supply pipeline subject to pipeline licence PL81;
- Devil Creek Gas Plant (DCGP) gas processing plant;
- sales gas export pipeline subject to pipeline licence PL86.

### Reindeer WHP

The Reindeer WHP is a small, unmanned offshore gas production platform located in permit area WA-209-P in Commonwealth Waters. The Reindeer WHP lies in the Dampier Sub-basin between 20° 01' 26.76 "S, 116° 18' 35.07 "E on the Northwest Shelf (**Figure 1**).

### Onshore and Offshore Gas Pipeline

The Reindeer offshore pipeline extends approximately 92 km from the Reindeer platform to the commencement of the onshore Pipeline Licence which is defined as mean low water mark (LWM) at -1.65 m AHD (**Figure 1**). It runs in a southerly direction from the offshore platform to the mainland, passing from the Commonwealth Waters boundary into State Waters. It crosses over the Pluto pipeline approximately 21 km to the south of the WHP and then joins the onshore supply gas pipeline via a buried section installed using horizontal directional drilling (HDD), crossing the shoreline at Gnoorea Point at the western end of Forty Mile Beach.

### Devil Creek Gas Plant

The Devil Creek Gas Plant (DCGP) is located adjacent to Forty Mile Beach Road, in close proximity to the intersection of Forty Mile Beach Road with the North West Coastal Highway and is approximately 10 km inland from Gnoorea Point and Forty Mile Beach (**Figure 1**). The gas plant is located on approximately 83 ha of land that was previously part of Mardie Station. The gas plant is a self-contained, manned, stand-alone onshore facility, with a secure perimeter fence. The gas, on arrival at the gas plant, is treated to remove produced water and condensate. The treated gas is then compressed and exported to the DBNGP. Condensate is stabilised and stored for transport by road to other end-users for processing or export (Kwinana or other proposed sites). Produced water is stored within evaporation ponds located on the western side of Forty Mile Beach Road.

## Description of the Receiving Environment

### Physical Environment

#### Existing Terrestrial

The DCDP is located broadly within the Pilbara coastal region. Summers (November to April) are typically very hot with maximum temperatures above 35°. Winters (May to October) are milder with temperatures in the 20° to 30° range. Rain events are uncommon with the 'wet season' between January to July, with heaviest falls occurring early in the season. The Pilbara region is prone to cyclones between November and April resulting in storm surge and flooding of rivers and coastal plains.

The Pilbara coastline is mostly flat and dominated by either mangrove-lined tidal flats or vegetated sand dunes with occasional limestone pavements. The DCDP area falls within the West Pilbara Granite-Greenstone Terrane and is overlain by more recent alluvial deposits,

coastal sand and dune deposits, with coastal limestone, beach conglomerate and occasional granite outcrops.

The nearest waterway to the Devil Creek Gas Plant is Devil Creek. The creek is typical of waterways in the Pilbara, being ephemeral in nature and only flowing following rainfall events. The immediate area and the coastal zone within a few kilometres both north and south of the DCDP are known to contain a shallow aquifer resource.

#### Existing Marine

The offshore infrastructure for the DCDP traverses from Commonwealth Waters on the North West Shelf (NWS) through to the State Waters off the Pilbara Coastline towards the shoreline at Gnoorea Point and Forty Mile Beach.

Tides are semi-diurnal (two high and two low tides within 24 hours), the spring tidal range is approximately 4.5 m. Current velocities measured approximately 2 km off Gnoorea Point were typically 0.15 m/sec up to 3 m/sec. The deeper offshore regions experience significant drift currents.

### **Biological Environment**

#### Existing Terrestrial

##### *Flora*

The vegetation surrounding the DCDP has been modified by previous activities. There is significant weed proliferation, with buffel grass (*Cenchrus ciliaris*) dominant within the onshore gas supply pipeline corridor. No Declared Weeds were found during the environmental assessment phase of DCDP.

Two communities listed on the Priority Ecological Communities (PEC) for Western Australia list, the Roebourne Plains coastal grassland and the Roebourne Plains stony chenopod associations, are represented within the project area. There are no Declared Rare Flora.

##### *Fauna*

The terrestrial fauna habitats found in the vicinity of DCDP are typical of those found in the Pilbara Region. Database information and available literature identified a total of 283 terrestrial vertebrate fauna species that may be expected to occur within the area, with 68 of these recorded during a site survey.

No invertebrates of conservation significance on DEC's threatened fauna list have been sighted in the vicinity of DCDP.

All named species of stygofauna found within the vicinity of DCDP are known to be widely distributed and none of the species collected have high conservation significance in the context of its occurrence there. The likelihood of troglofauna occurring in the DCDP area is considered to be negligible due to the lack of humid, small voids and unsuitable clayey alluvial substrates which lack large enough pore spaces for troglofauna.

#### Existing Marine

##### *Seabed*

Apache commissioned detailed marine survey of the seabed along the pipeline alignment and at the platform location, using a towed video and side scan sonar bathymetry survey. In

shallower waters, divers visually inspected the seabed focussing on any features of significance.

The intertidal and nearshore subtidal habitats were typical of the region and all are widely represented along the coastline. Marine benthic primary producer habitats comprised coral reefs, limestone pavement with macroalgae, seagrass, mud and sandflats and mangroves. The benthic habitat along the pipeline route ranged from isolated coral bombooras and coral patch reef dominated by macroalgae close to shore, to bare coarse sandy substrate at the seaward end of the pipeline route. Patches of seagrass and limestone pavement, with macroalgae and minor filter feeding communities, were also identified at several locations along the pipeline route amongst the predominantly bare sandy substrate.

#### *Finfish*

The demersal habitat of the North West Shelf hosts a diverse assemblage of fish, with up to 1,400 species known to occur, with a great proportion of these occurring in shallow coastal waters. Many of these 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, and game fish such as marlin and sailfish.

#### *Sea Turtles*

Four species of sea turtle nest on sandy shore sites of Dampier Archipelago, Montebello Islands, Lowendal Islands, Barrow Island and other islands on the North West Shelf. 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. The across shelf distribution, abundance and activity of turtle species is varied but not well known. Common to all species is that hatchlings emerge 6 to 8 weeks after the females have nested. Sea turtles are likely to occur in the vicinity of the DCDP offshore works, as foraging turtles and/or breeding migrants swim through the area on their way to remote nesting grounds.

#### *Marine Mammals*

A range of marine mammals occur in the waters of this region, some being seasonal visitors while others occur at low densities all year round. The most common species include the humpback whale, false killer whale, southern bottle-nosed whale, bottle-nosed dolphin, Indo-pacific humpbacked dolphin and Risso's Dolphin.

The following mammal species are listed as either threatened and/or migratory under the EPBC Act as possibly occurring within the DCDP offshore works area.

- Blue whale (listed threatened and migratory)
- Humpback whale (listed threatened and migratory)
- Bryde's whale (listed migratory)
- Dugong (listed migratory)
- Orca (listed migratory)
- Indo-pacific humpback dolphin (listed migratory)
- Spotted bottlenose dolphin (listed migratory)

These species may transit through the area of the DCDP offshore platform. The most commonly sighted whale is the humpback whale. This species migrates between the Antarctic waters and the Kimberly region of Western Australia. In the region of the DCDP offshore platform the peak of the northerly migration occurs around June – July, while the southerly return migration peaks around September – October.

### *Seabirds*

Based on the results of two survey cruises and other unpublished records, the occurrence of 18 species of seabirds has been recorded over NWS waters. These included a number of species of petrel, shearwater, tropicbird, frigatebird, booby and tern, as well as the silver gull. Of these, eight species occur year round and the remaining 10 are seasonal visitors. From these surveys, it was noted that seabird distributions in tropical waters were generally patchy except near islands.

## **Socio-Economic Environment**

### *Heritage Values*

The Dampier Archipelago has been proposed as a marine park, and the area between Cape Preston and the Dampier Archipelago has been proposed as a marine management area.

### *Cultural Values*

The DCDP area lies within two overlapping Native Title claims as registered by the Yaburara and Coastal Mardudhunera people and by the Wong-Goo-Tt-Oo people, groups that retain ties with the project area. A search of the Department of Indigenous Affairs heritage site database showed a total of five previously recorded and registered Aboriginal heritage sites within or in close proximity to the DCDP gas plant.

Buildings and places of European heritage listed on the State Register of Heritage Places nor the Register of National Estate as compiled by the Australian Heritage Commission.

There are no known sites or likely to be sites of Aboriginal or European significance in the vicinity of the offshore pipeline and platform. There are no registered Aboriginal heritage sites in proximity to the offshore pipeline and platform.

### *Commercial Fisheries*

The region supports a valuable and diverse fishing industry, with the offshore and coastal habitats being significant at all life stages for commercial species in the region. Several commercial fisheries operate within the North Coast Bioregion.

### *Recreational Fisheries*

Recreational fisheries are managed by the W.A. Department of Fisheries and the area covered in this EP falls within the North Coast Bioregion. Within the North Coast Bioregion, recreational fishing is experiencing significant growth, with a distinct seasonal peak in winter when the local population increases significantly in Onslow and Dampier Archipelago regions (DOF, 2006).

## **Major Environmental Hazards and Controls**

All aspects of the DCDP operations have been subjected to a comprehensive impact and risk assessment process which allows certain impacts and potential risks to be systematically identified and addressed. The main environmental aspects of the DCDP are outlined in **Table 1**.

## **Environmental Management**

The DCDP will be operated in accordance with all legislative and regulatory requirements to the satisfaction of the Designated Authority. Apache's overall environmental objective is to avoid or minimise environmental risks to levels as low as reasonably practicable (ALARP).

Apache has identified key management and mitigation controls to manage key impacts and risks to ALARP. These are outlined in **Table 1**.

**Table 1 Summary of Environmental Risks and Management/ Mitigation Controls**

Aspect/ Hazard	Potential of Hazard Consequence	Management and Mitigation Controls
Atmospheric Emissions	Atmospheric emissions will add to local and regional airsheds. Contribution to greenhouse gas emissions.	<ul style="list-style-type: none"> <li>• Dry-low NO<sub>x</sub> burners have been installed on the power generation and sales gas compressor gas turbines.</li> <li>• A full train recycle has been provided to return compressed gas to a point downstream of the inlet pressure control valve in each train to minimise flaring during start-up.</li> <li>• The design and selection of processing equipment has been undertaken to maximise energy efficiency and minimise combustion emissions.</li> <li>• Waste heat recovery units (WHRUs) utilise waste heat from the sales gas compressors' gas turbine exhausts to provide the required utility heat in place of the need for conventionally fired heaters.</li> <li>• Pilots are provided on the LP and HP flares to ensure that all gaseous releases are burnt (no cold venting).</li> <li>• Floating roofs are fitted to the two stabilised condensate storage tanks to minimise fugitive emissions.</li> <li>• A fixed-roof storage tank is provided for off-specification condensate. The tank is blanketed with low-pressure fuel gas, and gases vented from the tank are directed to the low-pressure flare relief system for combustion.</li> <li>• During load-out of condensate to road tankers, vapour will be recovered from the tanks and returned by connection to the filling tank, and routed to the low-pressure flare for combustion.</li> <li>• The produced water degasser vessels and buffer tanks are blanketed with low-pressure fuel gas, and gases derived from gas venting are directed to the low-pressure flare relief system for combustion.</li> <li>• LP fuel gas used within the produced water stripping columns to remove soluble hydrocarbons is directed to the low-pressure flare relief system for combustion.</li> <li>• Electric starts on gas turbines prevents the discharge of fuel gas used on start-ups</li> </ul>

Aspect/ Hazard	Potential of Hazard Consequence	Management and Mitigation Controls
		<p>(pneumatic starts).</p> <ul style="list-style-type: none"> <li>• Dry-gas compressor seals are installed so all fugitive emissions from this source are virtually eliminated.</li> <li>• Regular maintenance on combustion and other energy-intensive equipment.</li> <li>• Sealing of access roads within the gas plant area to prevent dust generation.</li> <li>• Water spraying to aid in dust suppression when required.</li> <li>• Traffic speed limits on gas plant site to reduce dust generation.</li> </ul>
Solid domestic wastes	<p>Generation of wastes resulting in incremental impact on existing waste management facilities.</p> <p>Attraction of terrestrial fauna to waste storage areas.</p>	<ul style="list-style-type: none"> <li>• Designated waste storage areas on-site.</li> <li>• Impermeable, bunded waste storage building.</li> <li>• Segregation of incompatible materials.</li> <li>• Storage of wastes in covered containers, where appropriate, to prevent the generation of windblown litter.</li> <li>• Segregation of materials to enable recycling.</li> </ul>
Sewage, putrescible, liquid wastes and oil contaminated water.	Potential impact to local water quality and subterranean fauna.	<ul style="list-style-type: none"> <li>• Secondary treatment system installed (anaerobic chamber; aerobic chamber; clarification chamber - sludge settlement and removal) with additional disinfection (disinfection chamber - contact time with chlorine).</li> <li>• Treated effluent disposed to lined evaporation ponds.</li> <li>• Inspection and maintenance regime.</li> <li>• Monthly sampling and analysis of treated effluent to monitor functioning of system.</li> <li>• Sewage sludge will be removed from the treatment tanks as necessary and disposed of at a licensed facility.</li> <li>• Designated washdown area.</li> <li>• Impermeable concrete containment of washdown area.</li> <li>• Washdown water retained in sump for disposal via the contaminated drainage system.</li> <li>• Groundwater quality monitoring programme.</li> <li>• Drainage system includes facilities to separate any spilled hydrocarbons from</li> </ul>



Aspect/ Hazard	Potential of Hazard Consequence	Management and Mitigation Controls
		<p>rainwater or deck washings and return them to the production system.</p> <ul style="list-style-type: none"> <li>• No disposal of liquid wastes in toilets or hand washbasins.</li> <li>• High pressure water, and potentially rig wash, used to remove bird guano.</li> <li>• Operation of atmospheric sump pump checked during routine platform visits.</li> </ul>
<p>Handling and storage of diesel, oil and chemicals</p>	<p>Potential impact to local water quality.</p> <p>Acute toxicity effects on marine fauna such as marine turtles, fishes and seabirds.</p> <p>Shoreline contamination.</p>	<ul style="list-style-type: none"> <li>• Sealed bunded areas are provided under all liquid storage vessels and equipment which may have liquid discharges due to operation or maintenance activities, e.g. pig receiver, air compressor skid, transformers and generators, lube oils, chemicals, hydraulic fluids, diesel fuel systems.</li> <li>• Fuel, oil and chemical storage facilities have been designed and built in accordance with the relevant Australian Standards and Department of Water, Water Quality Protection Notes.</li> <li>• Apache Oil spill Contingency Plan</li> <li>• Designated washdown area for maintenance operations provided with a dedicated (isolated from surface water drainage system) washdown effluent collection sump.</li> <li>• Impermeable concreted areas for containment or washdown.</li> <li>• Building provided for the storage of chemicals and waste includes integrated spill collection tanks to facilitate collection and appropriate disposal of any spilt liquids.</li> <li>• A network of groundwater monitoring wells to facilitate the detection of any potential groundwater contamination from operations.</li> <li>• Condensate storage tanks have an in-ground leak detection system.</li> <li>• Measures to reduce the likelihood of spillages are covered in environmental procedures and OPG's including: <ul style="list-style-type: none"> <li>• Minimum requirements for fuel, oil, and chemical handling and storage, including provision of secondary containment and access control.</li> <li>• Routine inspection and maintenance of flexible hose assemblies scheduled into the CMMS.</li> <li>• Storage of waste within enclosed containers, and provision of secondary</li> </ul> </li> </ul>

Aspect/ Hazard	Potential of Hazard Consequence	Management and Mitigation Controls
		<p>containment for liquid waste.</p> <ul style="list-style-type: none"> <li>• Procedures for refuelling operations.</li> <li>• Site evacuation procedure, covering the requirement to secure storage areas, in the event of an approaching cyclone.</li> <li>• Spillage response procedure outlines requirements for spill response materials to be readily available on-site, with personnel aware of their location and use. The location of spill response materials is noted on the Devil Creek Onshore Facility Plot Plan Fire and Safety Layout Drawings (DC-40-DF-054 to -063).</li> <li>• Incident drills and exercises include response to hydrocarbon and chemical spillages.</li> <li>• No spillages of chemicals or hydrocarbons outside of contained areas. <ul style="list-style-type: none"> <li>• No spillages of chemicals or hydrocarbons into the ocean.</li> </ul> </li> </ul>
Groundwater Use	Impact to subterranean fauna from groundwater abstraction.	<ul style="list-style-type: none"> <li>• Undertake groundwater abstraction in accordance with DoW approved DCDP Groundwater Operating Strategy (DC-40-RI-017) and licence conditions.</li> <li>• Pump flow rates set within each individual bores hydraulic capacity.</li> </ul>
Fauna	<p>Potential for interaction or collision between vessels and marine fauna.</p> <p>Potential for interaction or collision between vehicles and terrestrial fauna.</p> <p>Entrapment of terrestrial fauna.</p>	<ul style="list-style-type: none"> <li>• Designated speed limits within the gas plant site of 10 km/h.</li> <li>• Personnel associated with Devil Creek Gas Plant to drive below 40 km/h on the section of Forty Mile Beach Road adjacent to the Devil Creek Gas Plant.</li> <li>• Vehicle and personnel movements on the gas plant site along designated access routes only.</li> <li>• Site induction covers speed limits, fauna awareness and interaction rules, such as no feeding of native animals.</li> <li>• Training of gas plant personnel in fauna awareness.</li> <li>• Fencing around gas plant, evaporation ponds and water storage areas.</li> <li>• Evaporation ponds and water storage areas are inspected on a daily basis to check for trapped, injured or dead fauna.</li> <li>• Should trenching and excavations be required during operations, then adherence to</li> </ul>

Aspect/ Hazard	Potential of Hazard Consequence	Management and Mitigation Controls
		Condition 7, Ministerial Statement 795 is required. <ul style="list-style-type: none"> <li>• Adherence to Marine Operations Guide (DC-40-IG-210).</li> <li>• Site survey data and ROV footage to determine location and significance of raised seabed features in the vicinity of the WHP.</li> </ul>
Flora	Introduction and spreading of invasive weed species.	<ul style="list-style-type: none"> <li>• Machinery and equipment brought to the Devil Creek gas plant site is inspected for the presence of vegetative material and cleanliness prior to entry on-site.</li> <li>• Machinery and equipment considered to be carrying vegetative material will not be allowed access on-site.</li> <li>• Vehicle and personnel movements are kept to designated access tracks and working areas.</li> <li>• Monitoring and control (herbicide and hand pulling) of weeds where they can be effectively controlled.</li> <li>• Educational material available on-site regarding the management of vegetation and weeds.</li> </ul>
Noise	Disturbance to terrestrial fauna.	<ul style="list-style-type: none"> <li>• Gas turbines and diesel generators have acoustic enclosures.</li> <li>• Equipment maintenance as 'Work Orders' within the CMMS.</li> </ul>

## Consultation

The following stakeholders have been consulted regarding DCDP during the environmental assessment process and ongoing consultations during the construction phase:

- Users of Forty Mile Beach camping area and boat ramp and surrounding coastal waters (informal discussions, surveys, emailed newsletters and bulletins, radio announcements)
- Local recreational groups such as King Bay Fishing Club, Karratha Visitor Centre, Nickol Bay Sport Fishing Club, RecFish WA, Roebourne Visitor Centre (emailed newsletters and bulletins, radio announcements)
- Aboriginal groups (Wong-Goo-Tt-Oo (WGTO) and Yaburara and Coastal Mardudhunera (Y/M))
- Government departments (DMP Petroleum and Environment, DEC Industry Regulation, DMP Mineral and Title Services, DMP Pipeline Licensing, DMP Resources Safety, DRDL, DoW, MRWA, DoF)
- Mining exploration applicants (Fox Radio Hill Pty Ltd, FMG Pilbara Pty Ltd, PEL Iron Ore Pty Ltd)
- Shire of Roebourne
- Karratha Business Community (presentations at Karratha Chamber of Commerce functions)
- Pastoralists (Mardie Station, Karratha Station)
- WestNet (operate DBNGP)
- Australian Fisheries Management Authority (AFMA)
- Commonwealth Fisheries Association (CFA)
- Northern fishing Companies Association (NFCA)
- Western Australian Fishing Industry Council (WAFIC)
- A Raptis and Sons

Apache will continue to maintain ongoing consultation with relevant stakeholders throughout operation of the DCDP.

## Further Details

For further information please contact:

Libby Howitt

Environment Manager

Apache Energy Ltd,

PO Box 477, West Perth, WA 6872

Phone: 08-6218 7181

Email: [libby.howitt@apachecorp.com](mailto:libby.howitt@apachecorp.com)