Browse Drilling Campaign (WA-274-P)
Environment Plan Summary

July 2012

(BREA-2000-SUM-0001)

This Environment Plan summary has been prepared to comply with Regulations 11(7) and 11(8) of the Offshore Petroleum & Greenhouse Gas (Environment) Regulations 2009.

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1. Introduction

Coveyork Pty Ltd, a wholly-owned subsidiary of Santos Ltd (Santos), is proposing to drill and test two gas exploration wells (Crown-1 and Treasury-1) in petroleum permit WA-274-P in Western Australia's Browse Basin. These activities are collectively referred to as the Browse Drilling Campaign.

The wells will all be drilled by the Jack Bates semi-submersible mobile offshore drilling unit (MODU), with a scheduled commencement date in July 2012, subject to weather and rig availability. Each well will take approximately 85 days to drill. Drilling of the Treasury-1 well will commence about July 2013.

The proposed drill sites are located 488 km north of Broome and 432 km to the north-northeast of Derby, and 50 km to the northeast of Seringapatam Reef and 71-101 km to the northeast of Scott Reef (North and South reefs, respectively) (Figure 1).

The geographic locations of the proposed wells are (GDA 94, AMG Zone 51):

	Longitude			Latitude		
Well	**degrees**	**minutes**	**seconds**	**degrees**	**minutes**	**seconds**
Crown-1	122	30	0.881	13	35	6.373
Treasury-1	122	38	44.09	13	32	39.47

The Environment Plan (EP) for the drilling campaign was approved by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on the 25th of July 2012 in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009. This EP Summary has been prepared in accordance with Regulation 11(8) of the Regulations.

2. Proponent

Coveyork is the Operator appointed by the Joint Venture participants of WA-274-P in accordance with the provisions of the Joint Venture Operating Agreement. Coveyork is appointed by the Titleholders as the Operator in accordance with Regulation 31 of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009. Coveyork has arrangements in place that Santos shall assist in the supply of requisite personnel, facilities and equipment necessary to ensure required levels of preparedness to implement and manage the EP are available and maintained throughout the drilling campaign. Coveyork is thus referred to as Santos throughout this document.

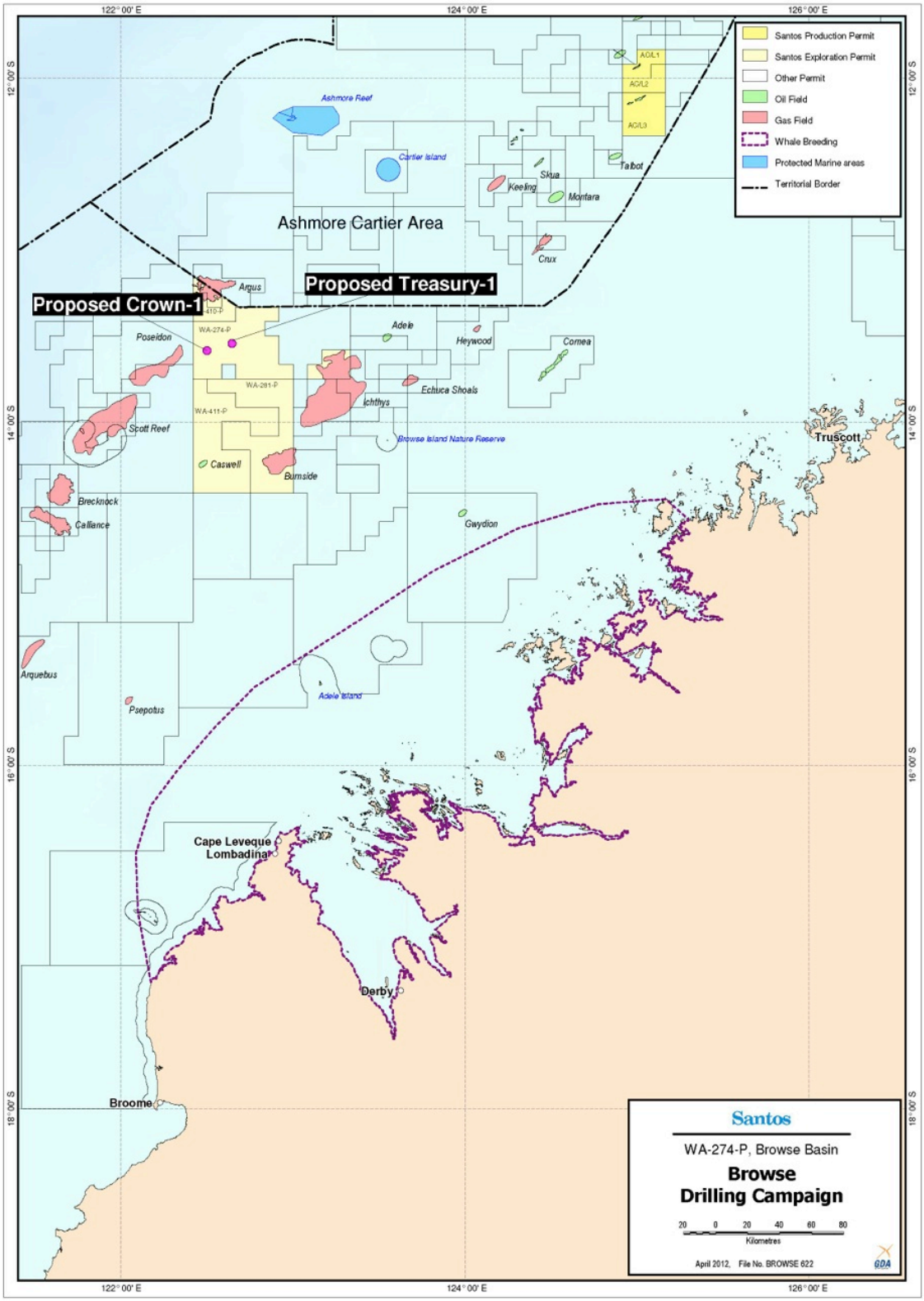

Figure 1. Location of the proposed gas exploration wells

Santos is the designated operator of the permit with a 30% interest, with Chevron Australia (WA-274-P) Pty Ltd holding 50% and Inpex Browse Ltd holding the remaining 20% interest.

Santos was established in 1954 and is an active oil and gas exploration and production company, having interests and operations in every major Australian petroleum province and in Indonesia, Papua New Guinea, Vietnam, Bangladesh, India and central Asia. Santos has been actively producing hydrocarbons for the over 50 years, operating in Western Australia offshore waters for the last 20 years. Additional information regarding Santos can be obtained from its website at: www.santos.com.

3. Project Description

The wells will be drilled by the *Jack Bates* semi-submersible MODU. The drilling campaign will be supported by at least two anchor handling, tug and supply (AHTS) vessels working from the Port of Broome.

During the drilling campaign the AHTS vessels will be traversing to and from port for provisions and equipment to support the drilling operations. The vessels will return to port for refuelling – there will be no at-sea refuelling for these vessels unless required in an emergency situation. These vessels use dynamic positioning systems that enable them to remain on location using bow thrusters rather than anchoring.

The MODU has been operating in Australian waters for some time and has been towed to the first drill site (Crown-1) from the North West Shelf by pumping water out of the four buoyancy tanks ('pontoons'), allowing the MODU to float and then be towed using one or more of the AHTS vessels.

Drilling will take place 24 hours a day, and is expected to take about 85 days for each well. The drilling procedure for each well will follow a similar design, consisting of:

1. Installation and cementing of the conductor casing.
2. Drilling of the top-hole section using seawater and pre-hydrated bentonite sweeps.
3. Installation and cementing of the surface casing.
4. Testing and installation of the blow out preventer.
5. Installation of the marine riser.
6. Drilling of the 17½'' intermediate hole section with water based mud (WBM).
7. Undertaking logging activities.
8. Installation and cementing of the intermediate casing.
9. Drilling of 12½'' intermediate hole section with synthetic based mud (SBM).
10. Undertake logging activities.
11. Installation and cementing of the production casing.

12. Drilling of the production hole section with SBM.
13. Undertake logging activities.
14. Conduct well testing operations in ‘success’ case.
15. Plugging and abandoning the well.

The drilling programme will use a combination of seawater with gel sweeps and SBM. Seawater will be used for drilling the top sections of each well (17½ inches and above), and consists of approximately 90% sea water, with the remaining 10% made up of drilling fluid additives that are either completely inert in the marine environment, naturally occurring benign materials or readily biodegradable organic polymers with a very fast rate of biodegradation in the marine environment. Drilling additives typically used include sodium chloride, potassium chloride, bentonite (clay), gel, guar gum, barite and calcium carbonate.

The use of SBM is required for the lower sections of each well (typically the 311 mm [12¼”], 216 mm [8½”] and 171 mm section [6¾”] bore sections), as WBM is not well suited for these sections. Synthetic-based mud provides significant improvement in wellbore stability, in addition to providing better lubricity (reducing the friction factor, reducing the incidence of stuck pipe), high temperature stability, and low mud weight (important in highly fractured formations). Shell NeoFlo 2-48 has been chosen as the base oil for the SBM system, which is a synthetic olefin and paraffin-based drilling fluid that is non-toxic in the water column and biodegrades in aerobic and anaerobic conditions.

During the riserless drilling (914 mm and 661 mm sections), cuttings (ground rock fragments) and drilling mud adhered to it are carried back up to the MODU via a riserless mud return (RMR) system. For the remaining sections of the well, drill cuttings are carried back up the borehole by the circulating drilling mud, and on the MODU the cuttings are separated from the mud by the shale shakers (a sequence of vibrating screens). The recovered mud is pumped to the mud tanks for reuse and the cuttings are discharged overboard via a chute. The cuttings typically contain some residual mud that adheres to the surface of the cuttings piles. Santos will ensure that less than 10% oil-on-cuttings (OOC), as dried weight, is achieved prior to discharge for the SBM sections of the wells, in accordance with the Western Australian Department of Mines and Petroleum (DMP) Drilling Fluids Management (2006) guidelines.

No whole SBM will be discharged overboard. Any unused or recovered SBM will be shipped back to the Port of Broome and inspected by the mud systems contractor. If the properties of the recovered SBM do not meet a minimum standard (following onshore treatment), then the SBM will be disposed of to an authorised landfill site.

Table 1 provides a summary of the drilling campaign.

Table 1. Drilling campaign summary

	Crown-1	Treasury-1
Permit area	WA-274-P	
Basin	Browse	
Surface hole location - degrees (GDA 94, Zone 51)	13° 35' 6.373" S 122° 30' 0.881" E	13° 32' 39.47" S 122° 38' 44.09" E
Surface hole location - meters (MGA 94, Zone 51)	8,498,103 mN 445,935 mE	8,502,643 mN 461,651 mE
Type of well	Exploration, vertical	
Target	Gas	
Water depth (LAT)	440 m	452 m
Earliest commencement	July 2012	July 2013 (estimated)
Campaign period	85 days	85 days
Drill rig	*Jack Bates* semi-submersible MODU	
Proposed total depth (MDRT)	5,525 mRTMD	5,525 mRTMD
Drill Fluids		
914 mm (36") hole	Seawater and gel sweeps	
661 mm (26") hole	Viscosified seawater and gel sweeps	
445 mm (17½") hole	Viscosified seawater and gel sweeps and WBM	
356 mm (14") hole	WBM	
311 mm (12¼") hole	SBM	
216 mm (8½") hole	SBM	
171 mm (6¾") hole (*contingency*)	SBM	
Volume of fluid disposed with cuttings (estimate only)	3,005 m^3 (WBM) 94 m^3 (SBM)	3,005 m^3 (WBM) 94 m^3 (SBM)
Volume of cuttings (estimate only)	1,028 m^3	1,028 m^3
Production testing	Yes	Yes
Vertical seismic profiling and/or Seismic Vision LWD	Yes	Yes
Shore base	Broome	
AHTS vessels	*Far Sword* and *Far Sound*, third vessel possible (14 days only)	
Helicopter flights	Estimated 6-8 return trips per week	

4. Stakeholder Consultation

Santos has consulted with various stakeholders for the Browse Drilling Campaign, all of whom have expressed no concerns with the activity. Various agencies involved in oil spill preparedness and response have contributed to the development of the Oil Spill

Contingency Plan (OSCP) for the drilling campaign. More than 30 government, commercial and recreational fishing, environment and industry organisations have been consulted about the drilling campaign. All correspondence with stakeholders is recorded and will be on-going as required.

5. Receiving Environment

5.1 Physical Environment

Climate. The region has a tropical climate with hot and humid summers and warm winters. There are two distinct seasons: the 'wet' usually from December to March and the 'dry' for the remainder of the year. The median annual rainfall is 532 mm. Over 75% of the average annual rainfall events from January to March are associated with thunderstorms and tropical lows or cyclones. From October to April maximum ambient air temperatures average over 33°C while overnight minima are typically 26°C, with the temperature rarely rising above 40°C. Winters are milder, with July average maximum and minimum temperatures being 26.9°C and 12.0°C respectively. Mean sea temperature ranges are reported to range between 22-27°C in winter and 26-30°C during summer.

Winds. The two main broad scale influences are the band of high pressure known as the sub-tropical ridge well to the south, and the monsoon that delivers moist air from the warm tropical waters to the north. During the warmer months, a heat-trough forms over the inland Kimberley. These combine to produce a general south-easterly wind regime for much of the year. Tropical cyclones capable of strong winds, high seas and heavy rain can be experienced during the months from November to April, but are most common in January and February.

Ocean currents. Ocean currents in the Northwest Shelf Transition bioregion are dominated by the southward-flowing warm surface Indonesian Throughflow that flows from the tropics to the waters of southwest Western Australia and dominates most of the water column. The Indonesian Flowthrough generally flows westwards and its strength varies seasonally in conjunction with the Northwest Monsoon. During the wet season (December to March), monsoon winds push some of the waters of the current eastwards, extending as far as the Gulf of Carpentaria. At the end of the Northwest monsoon (March-April), the pressure gradient is released, which releases a south-westerly flow of water across the shelf during autumn and winter, known as the Holloway Current.

Tides. The Kimberley region has some of the largest tides along a coastline adjoining an open ocean in the world. Tides increase in amplitude from south to north corresponding to the increasing width of the North West Shelf. Tides are semi-diurnal (two high tides and two low tides each day) and generally quite large; up to 10 m during spring tide and less than 3 m in the neap tides for the Kimberley region.

Bathymetry. Geomorphically, the WA-274-P permit area lies within the Continental Slope, while physiographically, it lies within the Outer Shelf and Slope of the North West marine region. The Kimberley system is characterised by a number of shelf-edge atolls (i.e., Scott Reef, Seringapatam Reef, Mermaid Reef, Ashmore Reef and Rowley Shoals). The Kimberly Slope sub-region has a unique and diverse range of geomorphologic features, including islands, reefs, banks, shoals, canyons and deep holes. These features, together with changes in the bathymetry, currents and water masses, provides for several distinct habitats and biological communities, often in close proximity to each other (e.g., shallow reef with associated localised upwelling compared to adjacent deeper water and a muddy seabed habitat).

5.2 Biological Environment

Benthic Invertebrates. While it is known that an upper slope demersal community type (biome) exists in water depths of 225-500 m (in addition to a mid-slope biome), there is little or no information regarding the slope's benthic fauna. Seabed surveys conducted by Inpex in the southeast of the WA-285-P permit around the Ichthys gas field (near Browse Island), located about 100 km to the southeast of the Crown-1 drill site and in water depths of about 250 m, found a low cover (<40%) of filter-feeding communities with sponges, gorgonians (sea whips and sea fans), soft corals, hydroids, bryozoans, fan worms and other polychaetes.

Given the depth of water and sedimentary seabed, few significant benthic resources are expected to be located across the permit area as mobile sediments do not favour the development of diverse epibenthic communities. The depth of water limits the occurrence of algae, seagrasses, corals and some fish and reptile species.

Marine Mammals. 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*), bryde's whale (*Balaenoptera edeni*) 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 (feeding) and the Kimberly region of Western Australia (breeding).

The peak of their northerly migration to the Camden Sound region occurs around mid- to late July to early August, while the southerly return migration peaks from late August to early September. Humpback whales use the Kimberley coast (Camden Sound and King Sound in particular) as calving grounds between June and mid-November (270 km southwest of the proposed drill sites). The highest numbers of cows/calf pairs are present from the mid-August to mid-September.

Fish. The North West marine region supports a diverse assemblage of fish, particularly in shallow water near the mainland and around islands. The Timor Province bioregion has 408 fish species, 64 (15%) of which are endemic, and 198 of which occur in water depths greater than 200 m. Most fish have tropical distributions and are well distributed throughout the Indo-West Pacific region.

Reptiles. Six species of marine turtles are listed as threatened and migratory under the EPBC Act and may occur in the permit area. Four of these species, the green, flatback, loggerhead, and hawksbill turtles, nest on sandy shore sites south of the region around the Dampier Archipelago, Montebello Islands, Lowendal Islands, Murion Islands, Barrow Island, Airlie Island, Thevenard Island, other nearby coastal islands and the Exmouth region. All species except the green turtle have mid-shelf or deep water habitats, with the green turtle generally found in water depths less than 20 m. It is not known if, or to what extent, turtle nesting occurs on island or mainland beaches in the Kimberley region, however, the Lacapede Islands just north of Broome are known to support a large rookery for the green turtle (*Chelonia mydas*).

The main turtle nesting and hatching period occurs from November to March with a peak in December. Hatchlings emerge 6 to 8 weeks after females have nested. Turtle hatchlings, after leaving the nesting beaches at night, undertake a seaward migration to offshore oceanic regions, travelling within oceanic currents. Following mating and nesting most adult turtles leave the area and return to their feeding grounds. There are no biologically important areas in or around the WA-274-P permit area for any of these turtle species.

Twenty-five species of sea snakes are recorded in WA waters, however little is known of the distribution of individual species, population sizes or aspects of their ecology. Sea snakes are widespread through tropical waters in offshore and near-shore habitats.

Coral. Coral reef habitat occurs to the southeast (Scott, Seringapatam), north (Ashmore Reef) and the northeast (various shoals) of the permit area, but not within it. These reef systems are regionally important for their high biodiversity, and support a high biomass of fish species, including tropical reef fish, small pelagic fish such parrotfish and groupers, and larger species such as trevally, coral trout, emperors, snappers, dolphinfish, marlin and sailfish, as well as crustaceans.

Birds. Only one species of seabird is known occur within a 10-km radius of the proposed drill sites, this being the streaked shearwater (*Calonectris leucomelas*).

5.3 Socio-economic Environment

Settlements. The proposed drilling sites are located approximately 488 km northeast of Broome, which has a population of about 15,800 and is the main service and population centre for the Kimberley region. The shire's main industries are tourism, pearling, fishing, aquaculture, pastoralism and horticulture.

The proposed drilling sites are located approximately 432 km northwest of the township of Derby, located on the edge of King Sound. Derby has a population of 4,500 people.

The open waters of the Commonwealth permit areas do not support significant recreational or tourism activity.

Marine Conservation Reserves. The conservation of natural and anthropological heritage in Commonwealth marine areas is grouped into the following categories, with the nearest sites to the proposed drill sites listed:

- Commonwealth marine reserves – Scott Reef and Seringapatam Reef (also listed on the Commonwealth Heritage List).
- World heritage – Ningaloo Coast.
- Commonwealth heritage places – Mermaid Reef-Rowley Shoals and the Commonwealth waters of the Ningaloo Marine Park (also listed on the Commonwealth Heritage List).
- National heritage – West Kimberley.
- Ramsar sites – Roebuck Bay and Eighty Mile Beach.

The final boundaries of nine new Commonwealth marine reserves within the North-west Marine Region were announced in June 2012, and stretch from near the WA/NT border south to Shark Bay. The Kimberley Marine Reserve is the closest to the WA-274-P permit area and comprises a Marine National Park, Habitat Protection Zone and a Multiple Use Zone. Like other established Commonwealth marine reserves, petroleum exploration is a permissible activity within the Multiple Use Zone.

Commercial Fisheries. Consultation with the Australian Fisheries Management Authority (AFMA) and the Department of Fisheries (DoF) indicates that there has been no fishing around the proposed drilling sites for the last 3-5 years, even though several state- and Commonwealth-managed fisheries have jurisdiction to fish in the area.

The proposed drill sites lie within the ‘MoU Box’ – the Memorandum of Understanding between Australia and the Republic of Indonesia in 1974 to allow traditional Indonesian fishing within Australian waters. This access was granted in recognition of the long history of traditional Indonesian fishing in the area. The MoU allows fishing within the reefs of Cartier Island, Scott Reef, Seringapatam Reef and Browse Island. The MoU defines traditional fisherman as fishers who have traditionally taken fish and sedentary organisms in Australian waters using traditional fishing methods and non-motorised sailing vessels. Target species include trochus, sea cucumber, abalone, green snail, sponges, molluscs and finfish, including sharks.

Petroleum Exploration and Production. While there is currently no petroleum production from the offshore Browse Basin, several projects are in development or under consideration (Ichthys and Browse LNG). The Browse Basin is one of Australia's most hydrocarbon-rich basins.

Southwest of the proposed drill sites on the North West Shelf (mainly the waters between Exmouth and Dampier) is Australia's most prolific oil and gas production region, resulting in Western Australia accounting for 77% of the country's oil and condensate production and 55% of the country's gas production (2010 figures).

Shipping. The ports of northwest Australia (Onslow, Dampier, Cape Lambert, Port Hedland and Broome) handle large tonnages of iron ore and petroleum exports, resulting in very busy shipping routes through the area. The closest port to the WA-274-P permit is Broome, which is the largest deep-water port in the Kimberley region. It supports livestock export, offshore oil and gas exploration supply vessels, pearling, cruise liners, fishing charters and general cargo. In 2006-07, 80% of the imported tonnage to the port related to the servicing the petroleum exploration and development industry. Consultation with the Maritime Operations Division of AMSA indicates that there are no shipping routes in close vicinity of the proposed Browse drill sites.

Maritime Heritage. The Australian National Shipwreck Database lists 4 shipwrecks registered within the vicinity of the proposed drill sites, but none in the permit area. There are no historic shipwreck protected zones in the permit area. The Western Australian Shipwrecks Database indicates there are no shipwrecks in or near the permit area, with the nearest wreck being the *Yarra* at Scott Reef.

6. Environmental Impact Assessment

The known and potential environmental impacts resulting from the proposed Browse drilling campaign are outlined in detail in the EP. Table 2 provides a summary of the detailed environmental impact assessment and examples of the mitigation measures that will be put in place. The potential risks have been assessed and reduced to as low as reasonably practicable (ALARP).

Table 2. Summary environmental impact assessment for the proposed Browse drilling campaign

Potential risk	Potential consequences	Key avoidance, mitigation & management measures	Residual risk ranking
Physical impacts			
MODU and AHTS vessel anchoring	Temporary and localised seabed disturbance, shallow seabed	• No anchoring by support vessels is planned. • MODU positioning procedure in place. • No listed shipwrecks in permit area.	Minor

	depressions.		
Underwater vessel noise	Temporary physiological impacts on sensitive fauna, such as cetaceans. Disruption to migration, feeding or breeding patterns.	• Drilling not undertaken in key migration path of threatened cetaceans. • VSP to be undertaken only for a few hours per well using recognised industry standards. It will be undertaken in accordance with the DSEWPC EPBC Act Policy 2.1 (Part A).	Minor
Artificial lighting	Attractant to fauna, temporary increase in predation rates on fauna attracted to lights. Nuisance to fishers.	• Few light-sensitive species in vicinity of drilling locations. • Lighting managed in accordance with maritime safety standards. • Lights directed downwards to the water will be minimised. • Well clean-up activities (involving flaring) will be kept to the minimum time possible (intermittent over 1-2 days per well).	Negligible
Atmospheric emissions	Temporary and localised reduction in air quality.	• Marine-grade (low sulphur) diesel used. • All engines and machinery maintained in accordance with maintenance systems. • Well clean-up activities (involving flaring) will be kept to the minimum time possible (intermittent over 1-2 days per well) using an 'EverGreen' burner. • No waste incineration on board MODU or AHTS vessels.	Minor
Introduction of foreign organisms from vessel hulls and/or ballast	Establishment of foreign species to open ocean and/or seabed, competing with and displacing native species.	• MODU and AHTS vessels are already working in Australian waters and have been cleared by AQIS. • MODU and AHTS vessels have current hull clearance certificates in place. • MODU had a hull inspection in March 2012 with no visible signed of biofouling. • MDU and AHTS vessels will comply with the Australian Ballast Water Management Requirements (AQIS, 2011) and National Biofouling Guidance for the Petroleum Production & Exploration Industry (AQIS, 2009).	Negligible
Routine liquid and solid discharges			
Discharge of WBM- and SBM-coated cuttings	Temporary and localised smothering/burial and disturbance of immediate seabed area. Temporary and localised loss of	• Only drilling additives ranked highly under the CHARM North Sea OCNS will be used. • Use of low-toxicity SBM base fluid for the lower sections of the wells. • No disposal of whole muds overboard. • SBM Management Plan in place. • Use of a containment specialist company	Minor

	water quality from suspended sediments.	(QTEC) on board to manage SBM fluids discharge and ensure than <10% oil-on-cuttings is achieved. • Benthic fauna likely to rapidly recolonise. • No sensitive seabed features at drill sites. • Use of experienced mud engineers.	
Overboard discharge of contaminated deck drainage	Temporary and localised reduction in water quality.	• Oil-in-water (OIW) treatment systems in place, with no discharge over 15 ppm oil-in-water. • Oil captured from the OIW treatment system will be transferred to shore for disposal. • Chemical storage and fuel transfer areas bunded. • MODU and AHTS vessels have current International Oil Pollution Prevention Certificates. • Spills to decks cleaned immediately. • Decks cleaned with biodegradable detergents.	Negligible
Overboard discharge of sewage and putrescible waste	Temporary and localised reduction in water quality. Modification of fauna feeding patterns.	• MARPOL-approved sewage treatment plants used on MODU and AHTS vessels. • No discharge of sewage and putrescible waste within 12 nm of land. • Putrescible waste macerated to < 25 mm in size prior to discharge. • Biodegradable cleaning detergents will be used. • Non-food galley wastes will be bagged and shipped to shore for disposal. • Garbage Records Books will be maintained.	Minor
Cooling water discharge	Localised elevation in surface water temperature.	• Cooling water will be discharged from above sea level to facilitate cooling and oxygenation before hitting the sea surface.	Minor
Brine water discharge	Localised elevation in surface water temperature and salinity levels.	• Scale inhibitors used in the desalination water treatment systems are suitable for human consumption and therefore not toxic to the marine environment. • Brine water will be discharged from above sea level to facilitate cooling and oxygenation before hitting the sea surface.	Minor
Cement discharges	Temporary and localised loss of water quality from suspended sediments. Smothering of benthic habitat and fauna.	• Minor volumes of cement released at seabed during grouting of upper bore casing. • Cement hose flushing and minor releases rapidly diluted and dispersed by ocean currents. • Only cement additives ranked highly under	Negligible

		the CHARM North Sea OCNS will be used. • Minimisation of left over product through inventory control and well planning. • The volume of concrete mixed will be accurately calculated to ensure only that which is necessary for drilling requirements is mixed.	
Non-hazardous solid waste discharges	Marine pollution.	• Solid wastes bagged and sent ashore for disposal. • All bins secured to deck and covered with lids. • Waste streams will be sorted on board according to shore-based recycling capabilities. • MODU Waste Management Plan and procedures in place. • Garbage Records Books will be maintained. • Use of licensed shore-based waste contractors.	Negligible
Hazardous waste discharges	Temporary and localised reduction in water quality.	• Drilling additives and other chemicals with the highest environmental performance only are selected. • Only small volumes of chemicals kept on board. • Chemical drums will be stored in secured drums in bunded areas away from open drains. • Bunded areas drain through a closed system, processed through the OIW separator. • Material Safety Data Sheets (MSDS) available in appropriate locations throughout the MODU. • Shipboard Oil Pollution Equipment Plan (SOPEP) kits available on board for rapid clean-up response. • Garbage Records Books will be maintained. • Use of licensed shore-based waste contractors.	Negligible
Non-routine impacts			
Interference with commercial fishing	Temporary loss of fishing grounds from drill rig safety exclusion zone, resultant loss of income. Collision risk. Snagging on	• Consultation with AFMA and DoF indicates very low fishing effort around the permit area. • No shipping lanes located in close proximity to the drill sites. • Notice to Mariners will be issued. • A 500-m radius safety exclusion zone around the MODU will be gazetted.	Negligible

	anchors and anchor lines.	• Standard maritime safety measures will be in place (e.g., 24-hr visual, radio and radar watch).	
Vessel collision	Fuel spill.	• As above. • MODU diesel tanks located well above water line with minimal risk of vessel impact.	Negligible
Refuelling spill	Temporary marine pollution.	• Use of marine-grade diesel rather than heavy fuel oil. • AHTS vessels will only refuel in port. • Drain scuppers used in fuel transfer area to contain spills. • Transocean refuelling procedures in place, with specifications including: o Use of dry-break couplings. o Job Hazard Analysis (JHA) and Permit to Work (PTW) undertaken prior to refuelling. o Visual watch on hoses. o Use of new hoses for Santos campaign. • OSCP and Emergency Response Plan (ERP) in place and ready for implementation.	Minor
Loss of well control (i.e., blowout)	Marine pollution. Tainting of commercial fisheries species (e.g., shellfish). Injury and death of species such as seabirds. Pathological effects on fish larvae and plankton. Pollution of shoreline habitats such as sandy beaches and cliff faces.	• Adherence to Well Operations Management Plan (WOMP), Well Control Bridging Document, Vessel Safety Case Revision and Santos Drilling & Completions Management System. • No shallow gas risks identified. • BOP will be inspected, installed and pressure-tested. • Well bore casing is pressure tested. • Well control training undertaken by relevant crew. • Appropriate drilling fluid weight will be used specific to known reservoir pressures. • OSCP and ERP in place and ready for implementation.	Minor
Hydrocarbon spill during flaring	Short-lived, widespread surface slick of light oil with temporary decrease in water quality.	• The wells are expected to contain gas condensate, which will evaporate and weather quickly if spilled. • Adherence to rig safety case and well test safety case revision (and test package Scope of Validation and HAZOP). • An experienced and qualified well testing contractor (Schlumberger) will be used. • Well flows will be initiated during suitable weather conditions as defined by pre-start	Negligible

		checks. • The early flow will be directed to separator tanks. • An 'EverGreen' burner will be used to reduce liquid (condensate) drop-out risks. • A flare watch will be used for immediate system shutdown in the event of a drop out being observed. • Multiple accessible emergency shutdown (ESD) stations will be installed prior to well testing.	

7. Environmental Management

Santos manages the environmental and safety impacts of all its activities and operations, both existing and planned, through implementation of its Environment, Health and Safety Management System (EHSMS). The EHSMS is certified against ISO 14001 (Environmental Management Systems) and meets the requirements of AS4801-2001 (Occupational Health and Safety Management Systems). The EHSMS includes 18 management standards and 30 hazard standards.

An environmental implementation strategy for the Browse drilling campaign is detailed in the EP. This strategy involves a crew training and awareness program, environmental audits, routine government reporting, environmental monitoring and recording, and incident reporting.

8. Hydrocarbon Spill Preparedness and Response

The Browse Drilling OSCP (accepted with the EP) is the primary reference document to be used in the event of a large-scale hydrocarbon spill (> 10 tonnes) (e.g. spill of diesel or blowout of gas condensate).

Strategies for oil spill responses outlined in the OSCP are focused on protection of the sensitive natural resources within the Zone of Potential Impact (identified through oil spill modelling for the Browse wells) rather than open oceanic waters. These strategies are specifically tailored to the nature of the oil (a light, highly evaporative gas condensate).

Santos, in consultation with agencies including the Australian Maritime Safety Authority (AMSA), the WA Department of Transport (DoT) and the Australian Marine Oil Spill Centre (AMOSC), has determined that in the event of a large-scale diesel or gas condensate spill, the order of preference for spill response is:

1. Natural recovery.
2. Monitor and evaluate.

3. Application of dispersant if human health or safety is at risk (with the zone of application being restricted to within a 1-km radius of the MODU).

Factors taken into consideration in determining these strategies include:

- The long distance between the proposed drill sites and sensitive environments.
- The light, highly evaporative nature of gas condensate and diesel, especially in warm waters.
- The health and safety risks of deploying containment and recovery equipment in high seas and remote locations, for hydrocarbons that are difficult to capture due to their composition (i.e., rapid spreadability).
- Dispersant application and other intervention measures may cause greater harm to sensitive environments than the hydrocarbons themselves.

9. Further Information

For further information about the Browse drilling campaign, please contact:

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