Patricia Baleen Asset
(Vic/L21, Vic/PL31 & Vic/PL31V)
Operations Environment Plan Summary

July 2013

(PB-STO-2050-007)

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

Basin Oil Pty Ltd, a wholly-owned subsidiary of Santos Ltd (Santos), owns and operates the Patricia and Baleen gas fields, located in Licence Area Vic/L21, offshore from East Gippsland, Victoria, in the eastern waters of Bass Strait (Figure 1). The wells in these fields (Patricia-2 and Baleen-4) are now depleted and shut in.

The gas pipeline (Vic/PL31 & Vic/PL31V, operated by Santos (N.T.) Pty Ltd, also a fully owned subsidiary of Santos Ltd) is now used to transport gas and condensate from the Longtom-3 and Longtom-4 wells to the Patricia Baleen (PaB) Gas Plant for processing.

The Longtom gas field, pipeline, electrical system and associated control systems are outside the scope of the Environment Plan (EP), as Nexus Energy Ltd is the operator of the Longtom gas field.

The offshore facilities, collectively known as the Patricia Baleen (PaB) Asset, consist of:

- Two subsea wells (Patricia-2 and Baleen-4); both wells are depleted and unable to flow.
- A 24 km subsea pipeline connecting the offshore wells (Patricia-2 and Baleen-4) to onshore facilities.
- A 24 km subsea umbilical cable connecting the Patricia-2 and Baleen-4 wells to the PaB Gas Plant.

This EP Summary provides an identification and assessment of environmental impacts associated with the operation of the offshore facilities and maintenance activities associated with the PaB asset.

The EP for the operation of the PaB asset was approved by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on the 15th of July 2013 in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

2. Location

The Patricia and Baleen wells are located in water depths of approximately 54 m in Vic/L21, approximately 25 km off the coast from Marlo in East Gippsland, Victoria, in the eastern waters of Bass Strait (see Figure 1). The coordinates of the Patricia and Baleen wells are provided in Table 1.

As the pipeline traverses Victorian state waters, the EP was also submitted to the Victorian Department of State Development, Business and Innovation (DSDBI) and is awaiting acceptance.

Table 1. Coordinates of PaB Infrastructure

Infrastructure	Location (GDA 1994 – Degrees Minutes Seconds)	
	Latitude	Longitude
Patricia-2	38° 1' 34.111" S	148° 27' 2.480" E
Baleen-4	38° 0' 15.419" S	148° 26' 39.008" E
Patricia Baleen Pipeline Outer End (tie in location with Longtom pipeline)	38º 01' 34.38" S	148º 27' 2.7" E
PaB Gas Plant	37º 47' 50" S (NE corner)	148º 27' 07" E (NE corner)
Main Umbilical Termination Assembly (MUTA)	38º 00' 15.68" S	148º 26' 38.56" E

3. Proponent

Basin Oil Pty Ltd (Basin Oil) is appointed by the Titleholders as the Operator of Vic/L21 in accordance with Regulation 31 of the Offshore Petroleum and Greenhouse Gas Storage (OPGGS) (Environment) Regulations 2009. Basin Oil is the Operator of the two subsea wells Patricia-2 and Baleen-4 located within permit area Vic /L21.

Santos (N.T.) Pty Ltd is appointed by the Titleholders as the Operator of Pipeline Licence Vic /PL31and Vic /PL31V in accordance with Regulation 31 of the OPGGS (Environment) Regulations 2009. Santos (N.T.) Pty Ltd is the Operator of the 24 km subsea pipeline and a 24 km subsea umbilical cable connecting the offshore wells (Patricia-2 and Baleen-4) to the onshore facilities at the PaB Gas Plant. The offshore end of this pipeline terminates at the Pipeline End Manifold (PLEM), where the Vic/PL31 pipeline ties in to the Nexus Vic/PL38 pipeline. The umbilical cable terminates at the MUTA, where it ties in to the Nexus Vic/PL38 umbilical cable.

Basin Oil Pty Ltd and Santos (N.T.) Pty Ltd are both fully controlled and wholly owned subsidiaries of Santos Ltd (Santos), and are herein referred to as Santos.

Santos was established in 1954 and has been operating in Western Australia offshore waters for the last 20 years. Santos 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 last 50 years. Additional information regarding Santos can be obtained from its website at: www.santos.com

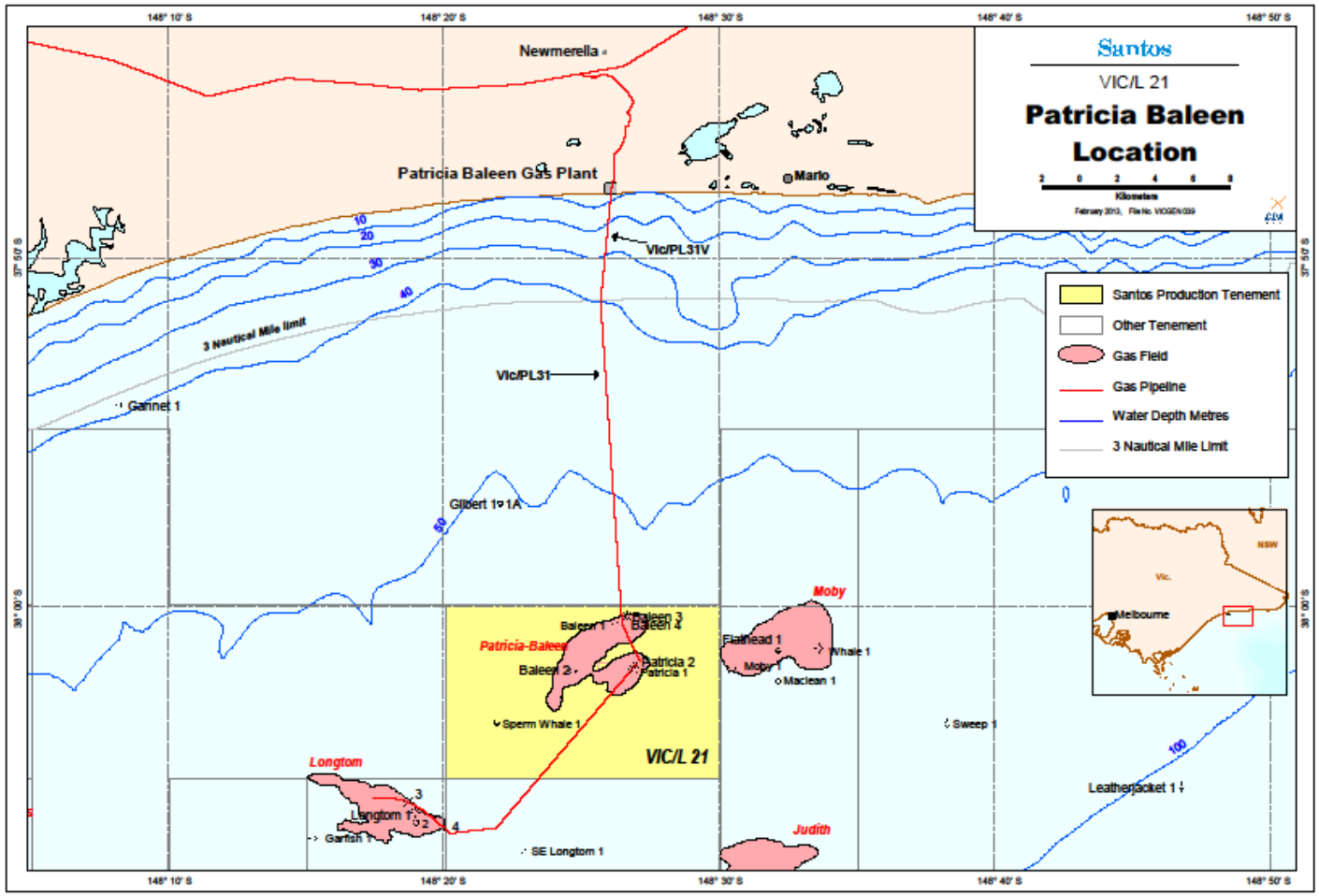

Figure 1. Location of the PaB asset

4. Project Description

4.1 Overview

The PaB Gas Field Development was commissioned in 2003 and comprised two subsea wells, an offshore pipeline carrying gas to the PaB Gas Plant for processing, and an onshore sales gas export pipeline. The Patricia and Baleen wells were shut in around mid-2008 when flow from the wells could not be sustained. Gas and condensate flowed to the gas plant again after the Longtom wells were commissioned in mid-2009.

4.2 Field Characteristics

The condensate of the Longtom reservoir is classified as a Group 1 (non-persistent oil). It has a density of 777 kg/m^3 at 25°C (API gravity of 51.2), a dynamic viscosity of 1.081 cP (at 20°C) and a pour point of -9°C (when fresh). The condensate is highly evaporative when released into the environment, with estimated residual (persistent) components of 3.1%.

4.3 Wells and Pipeline

The Patricia and Baleen wells are situated in a water depth of approximately 54 m. These wells tie in to the 300 mm (12 inch) pipeline via short carbon steel jumper spools. The Horizontal Directional Drill (HDD) exit point for the pipeline lies approximately 100 m south of the high water mark adjacent to the PaB Gas Plant.

Fixed to each wellhead are subsea trees, fitted with production chokes, chemical injection facilities, Subsea Control Modules (SCMs) and instrumentation.

Control and monitoring of the wells is via a multiplex, electro-hydraulic control system supplied via umbilicals that connect the wells to the onshore facilities. Offshore, the umbilical terminates in a MUTA adjacent to Baleen-4. The MUTA has provision for four well tie-ins for electro-hydraulic and chemical injection services.

Patricia-2 is connected to the Baleen-4 MUTA via an umbilical. This interface is via two separate Inter-field Umbilical Termination Assemblies (IUTAs) and interconnecting jumpers. The IUTAs are gravity-based structures with provision for one well tie-in for electro-hydraulic and chemical services.

The SCM is mounted on the tree and controls the tree valves, choke and Surface Controlled Subsurface Safety Valve (SCSSV). The SCM also monitors the Pressure Transmitter, Pressure/Temperature Transmitter, Corrosion Monitor, Erosion Monitor and Choke Position. Data from the SCM is sent to the onshore Master Control System (MCS) at the PaB Gas Plant for display. The Subsea Accumulator Module (SAM) is mounted on the tree and supplies sufficient pressure and volume to the SCSSV and other tree valves.

The SCM directs hydraulic pressures, flows and vents for the SCSSV, tree valves, and choke in order to control them in response to communications signals from the shore.

The SCM also transmits data from internal and external transducers to the shore and is retrievable by guidelines or Remotely Operated Vehicle (ROV).

The PaB pipeline is connected to the Longtom pipeline via the Pipeline End Manifold (PLEM). This sits in a separate skid and consists of a manual valve and a T-junction available for future connections. The T-junction has double isolation. The PLEM itself has removable spools at both the Longtom and PaB ends.

During routine operations, there is no need to isolate the Longtom pipeline from the PaB pipeline. However if isolation is required, it is achieved by the use of an ROV to close the PLEM valve. If required, the entire subsea pipeline (PaB and Longtom) could be de-pressured via the PaB Gas Plant flare.

4.4 Longtom Development

The Longtom field consists of two subsea wells, produced via a pipeline that connects to the existing PaB offshore pipeline and the PaB Gas Plant. The development comprises the following:

- Two subsea production wells – Longtom-3 and -4, with facilities to allow the tie-in of a future third well.
- A 17 km 300 mm DN pipeline starting at the Longtom-3 well and connecting into the offshore end of the PaB pipeline.
- A High Integrity Pipeline Protection System (HIPPS) to protect the PaB pipeline against overpressure from the higher-pressure Longtom wells.
- A subsea umbilical extension connected to the existing PaB umbilical line that provides electrical, hydraulic and chemical services to the Longtom wells and Longtom and Patricia Baleen pipelines.

Gas from the Longtom wells initially flows through the Longtom pipeline, which is rated up to 27.6 MPa (g). As the PaB pipeline is rated to 10 MPa (g), the HIPPS system, located between the Longtom and PaB pipelines, provides high integrity shut off in the event that pipeline pressure approaches 10 MPa(g) in order to protect the PaB pipeline. The PaB pipeline then carries the gas and condensate to the PaB Gas Plant.

The design of the HIPPS ensures that any process upset breaching the high pressure closure limit of the HIPPS, loss of electrical or hydraulic power or malfunction of the HIPPS itself will result in closure of the HIPPS Pressure Isolation Valves (PIVs).

An umbilical installed from the end of the existing PaB umbilical to the Longtom wells and the HIPPS provides chemicals (corrosion inhibitor, MEG and methanol), hydraulic and electrical power and control services to the Longtom wells and to the HIPPS. The existing

PaB umbilical originating at the PaB Gas Plant has sufficient capacity for these additional services.

A SCM is installed on the HIPPS skid for the control of the HIPPS and the nearby Longtom-4 wellhead and a Subsea Control Unit (SCU) is installed adjacent to Longtom-3 for the control of the Longtom-3 wellhead.

Control of the Longtom wells and HIPPS is from the PaB Gas Plant.

4.5 The PaB Gas Plant

The PaB Gas Plant is located in Newmerella, approximately 10 km south of Orbost in eastern Victoria. The plant receives fluids from the Longtom field and processes the raw gas into sales quality gas for delivery into the Eastern Gas Pipeline (EGP), which transports gas from producing fields in the offshore Gippsland Basin to markets in Sydney and regional markets along the pipeline route.

The PaB Gas Plant includes facilities for separation of hydrocarbon liquids, hydrocarbon dew point control, dehydration, gas compression and mercury removal for gas and condensate. The PaB Gas Plant Control Room monitors and controls the PaB facilities, which is manned by trained and competent operators on a 24-hour basis.

4.6 Maintenance and Intervention Activities

Inspection, maintenance and intervention activities on the PaB gas pipeline are conducted on an as-needed basis. Intervention work may be carried out to inspect and make repairs to subsea infrastructure from time to time. This may involve, but is not limited to, the following:

- Pipeline span rectification.
- Repair of subsea infrastructure.
- Inspection and repair work using ROVs.
- Inspection and repair work utilising Field Support Vessels (FSVs).
- Diving (air, saturation and hard suit diving) could be conducted from a Dive Support Vessel (DSV) operating under its own Safety Case.

5. Stakeholder Consultation

Santos has been actively involved in stakeholder engagement since taking over ownership of the PaB asset. This is facilitated through a Community Advisory Committee (CAC). The CAC provides a forum for information exchange between Santos and stakeholders regarding PaB operations. CAC meetings are generally held in Orbost twice a year, and are advertised in the Snowy River Mail newspaper.

Presentations and meeting minutes are available to all stakeholders and the general public through the Santos website (http://www.santos.com/exploration-acreage/production-processing/patricia-baleen.aspx).

Other external communications on environmental matters may arise in response to complaints or incidents. Any complaints that are received are reported in the Santos EHS Toolbox Incident Management System and actions are assigned appropriately and tracked to ensure full implementation and closure. Since the submission of the PaB Operations EP in 2009, no complaints regarding offshore activities have been received by Santos.

6. Receiving Environment

6.1 Physical Environment

Climate. The region's climate is cool temperate, with cool wet winters and cool summers. It is influenced by rain bearing cold fronts that move from south-west to north-east across the region, producing strong winds from the west, north-west and south-west.

Bass Strait is located on the northern edge of the westerly wind belt known as the Roaring Forties, and wind speeds in the project area are typically in the range of 5 – 25 km/hr. The average annual rainfall is 710 mm, with the highest totals falling in November and the least in February.

Oceanography. Bass Strait is a sea strait separating Tasmania from the southern Australian mainland. The strait is a relatively shallow area of the continental shelf, connecting the southeast Indian Ocean with the Tasman Sea.

Tides are semi-diurnal with some diurnal inequalities, generating tidal currents along a north-east/south-west axis, with speeds generally ranging from 0.1 to 2.5 m/s.

Currents in Bass Strait are primarily driven by tides, winds and density driven flows. During winter the South Australian current moves dense, salty, warmer water eastward from the Great Australian Bight into the western margin of the Bass Strait. In winter and spring, waters within the strait are well mixed with no obvious stratification, while during summer the central regions of the strait become stratified.

Bass Strait is a high-energy environment exposed to frequent storms and significant wave heights. Storms may occur several times a month resulting in wave heights of 3 to 4 m or more.

Coastal environment. The coastline of eastern Victoria is dominated by largely uninterrupted wide sandy beaches with tall, vegetated sand dunes (the Ninety Mile Beach). These sandy beaches and dunes provide nesting sites for shorebirds that are found along many parts of the Victorian coastline including the hooded plover and little

tern. Many of the river estuaries are only intermittently open (usually during spring flooding as a result of snow melts) that also provide nesting, roosting, and feeding sites for colonies of shorebirds. Intertidal and sub-tidal rocky reefs are intermittently found along the coastline, becoming more common east of Point Hicks.

6.2 Biological Environment

Marine migratory species with broad distributions such as cetaceans, fish, sharks, marine turtles and seabirds may traverse the PaB offshore asset.

A search of the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) Protected Matters Search Tool (DSEWPaC 2012a) identified 32 EPBC Act-listed threatened species (of which 26 are threatened) within a 10 km buffer around the offshore pipeline (Table 2). No Threatened Ecological Communities or critical habitats for any species were identified.

Table 2. EPBC Act-listed marine fauna that may occur around the PaB asset

Fauna group	Details
Fish	5 species, including 4 shark species that are all migratory.
Mammals	7 species of marine mammals, including 6 whale species that are migratory. The blue, southern right and humpback whales are threatened.
Reptiles	2 turtle species classed as migratory and endangered.
Birds	18 species of albatross, petrel and giant-petrel. All are migratory. Eleven are threatened (vulnerable or endangered).

Iconic species such as the Australian fur seal and little penguin are also present in waters around the PaB asset.

6.3 Socio-economic Environment

Fisheries. Consultation with fisheries groups indicates that the only Commonwealth-managed fisheries likely to operate in the area are the Southern and Eastern Scalefish and Shark (SESS) fishery and the Eastern Small Pelagic fisheries. The only Victorian-managed fishery likely to operate in the area is the Abalone Fishery. Most fishing vessels operating in eastern Bass Strait operate from Lakes Entrance, although not exclusively.

Recreation. Marine-based tourism and recreation in the Bass Strait is primarily associated with recreational fishing and boating. Typically, recreational fishing targets snapper, King George whiting, flathead, bream, sharks, tuna, calamari, and Australian salmon. Recreational fishing and boating is largely confined to nearshore coastal waters due to the unpredictable seas of Bass Strait.

Petroleum exploration and production. Australia's first discoveries of gas were in Bass Strait in the mid-1960s. In 1996, the Gippsland Basin produced over 40% of Australia's total crude oil and nearly half of Victoria's natural gas requirements. As of 2011, Victoria (mostly the offshore Gippsland Basin), accounts for 14% of Australia's oil and condensate production, and 17% of Australia's gas production, second behind WA. Oil and gas reserves from the Gippsland Basin are currently on the decline. However, the Kipper Tuna Turrum gas development (currently under construction) in the mature Gippsland Basin, and the relatively unexplored Sorell and Bass Basins, indicate that there may be future production potential in the region.

The Gippsland Basin has 13 exploration permit areas and 25 current offshore production licenses and a total of 22 offshore platforms have been installed in Bass Strait since first production was established (excluding subsea production wells).

Shipping. Bass Strait is one of the busiest shipping regions in Australia, consisting of both passenger and cargo vessels travelling between mainland Australia and Tasmania as well as between Australia and New Zealand. An 'Area to be Avoided' exclusion zone exists around the operating oil and gas platforms in the Gippsland Basin, whereby unauthorised vessels larger than 200 gross tonnes are excluded. This 'Area to be Avoided' is located to the immediate west of the PaB pipeline. A traffic separation scheme is located about 65 km south of the PaB pipeline.

Marine conservation reserves. The nearest Commonwealth Marine Reserve (CMR) is the Beagle CMR, located about 100 km south of the PaB pipeline. It contains the Kent Group Marine Reserve, as well as the Hogan and Curtis Island groups. These areas contain unique aquatic ecosystems such as beds of encrusting, erect, and branching sponges, and other sea floor dwelling fauna. The reserve is also located near the Hunter group of islands that support a breeding area for the fairy prion, shy albatross, silver gull, short tailed shearwater, black faced cormorant, Australian gannet, common diving petrel, and little penguins.

Beware Reef Marine Sanctuary, located approximately 5 km southeast of Cape Conran and 31 km east of the PaB offshore pipeline, is the closest Victorian marine park. It comprises a granite outcrop covering an area of 220 ha and rises from a depth of approximately 28 m, and is 1 km long. It is exposed at low tide, providing a resting area for Australian fur seals. The reef is covered by outcrops of bull kelp (*Durvillaea* sp.) and supports a diverse range of marine life, including seahorses and leafy seadragons and boarfish, morwongs, trumpeters and wrasses, with wobbegong and Port Jackson sharks found in the sandy hollows. The reef contains the remains of three shipwrecks.

7. Environmental Impact Assessment

The known and potential environmental impacts resulting from the operation of the PaB asset are outlined in detail in the EP. Table 3 provides a summary of the detailed environmental impact assessment and mitigation measures that are in place, which have been assessed to be as low as reasonably practicable (ALARP).

Table 3. Summary environmental impact assessment for the PaB asset

Hazard	Impacts	Key avoidance, mitigation & management measures	Residual risk ranking
Planned events – operations and maintenance			
Discharge of control fluids	Localised and temporary decrease in water quality.	• Use of low-toxicity fluids. • Valves are designed to minimise leakage.	Low
Seabed disturbance	Localised turbidity, temporary disturbance to habitats, habitat smothering.	• Regular inspections by ROV. • Implementation of the Integrity Management Plan (IMP). • Design of installation footprint to minimise area of disturbance. • Campaign-specific risk assessments undertaken. • Preference given to dynamically positioned vessels over anchored vessels (for vessels with gross tonnage >400 t). • Vessel anchoring procedure.	Very low
Planned events – routine vessel emissions and discharges			
Underwater noise	Temporary physiological impacts on sensitive fauna, such as cetaceans. Disruption to migration, feeding or breeding patterns.	• Each vessel has a specific vessel planned maintenance system (PMS) that ensures engines and thrusters are maintained for optimum performance. • Adherence to Part 8 of the EPBC Regulations 2000. • The Australian Guidelines for Whale and Dolphin Watching (2005) for sea-faring activities is incorporated into Santos's Marine Operations Manual.	Low
Air emissions	Temporary and localised reduction in air quality.	• Marine-grade (low sulphur) diesel is used. • All engines and machinery maintained in accordance with vessel PMS.	Low
Light emissions	Attractant to fauna, temporary increase in predation rates on fauna attracted to lights.	• Lighting managed in accordance with maritime safety standards.	Low
Sewage and grey water	Temporary and localised increase	• MARPOL-approved sewage treatment plants used by vessels.	Very low

	in surface water nutrient levels. Modification of fauna feeding patterns.	• No discharge of sewage within 12 nm of land.	
Putrescible waste	Temporary and localised increase in surface water nutrient levels. Modification of fauna feeding patterns.	• Vessel galley macerator macerates food scraps to a diameter of at least 25 mm before being disposed of overboard, in compliance with MARPOL Annexes IV and V. • If the macerator fails, no un-macerated food waste will be disposed overboard. All food waste will be bagged and sent ashore for disposal. • Macerated food waste is not discharged overboard within 12 nm of any shoreline. • All non-food galley wastes (e.g., cooking oils, grease, packaging) is collected in containers and transported back to shore for recycling or disposal.	Very low
Deck drainage and bilge water	Temporary and localised reduction in water quality.	• Vessel equipment is arranged to minimise the likelihood of discharge overboard (i.e., permanent rotating machinery (engines, generators) and the ROV spread are located in bunded areas so any spills are not lost overboard). These areas are drained to the bilge tank and discharged via the oily water separator (OWS). • The OWS is set to ensure no greater than 15 ppm oil-in-water (OIW) is discharged. • Treated bilge water volumes is recorded in the Oil Record Book. • Chemical storage and handling areas are bunded to prevent overboard discharge. • Onboard storage tanks/containers will be available to store hydrocarbons for appropriate onshore disposal. • Any temporary equipment with potential for spill of chemicals or fuels (e.g., leak testing spread) is located within temporary bunding so that spills are contained for subsequent treatment or disposal of the fluids, without uncontrolled discharge to the sea. • The vessel has a current and valid International Oil Pollution Prevention (IOPP) Certificate. • The vessel has a Shipboard Oil Pollution Emergency Plan (SOPEP). • A high focus is placed on housekeeping.	Very low
Hazardous and non-	Temporary and localised reduction	• As far as practicable, waste is transferred from the vessels in sheltered waters, thus	Very low

hazardous waste	in water quality. Marine pollution.	minimising the likelihood of accidental loss of waste to sea at the project area during transfers. • Up-to-date Material Safety Data Sheet (MSDS) registers are available in key locations throughout the vessel (e.g., bridge, chemical locker). • Chemical drums are securely stored in bunded areas. • All stored waste material to be disposed-of onshore at a licensed waste management facility, or recycled. • Maintenance logistics planning ensures only essential items are brought on board the vessel in line with project requirements. • Vessel induction for crew on waste management. • A Shipboard Waste Management Plan is in place and implemented. • SOPEP response kits are located throughout the vessel in appropriate locations and used to respond to deck spills of hazardous liquids. • Only licensed shore-based waste contractors are used. • Hazardous waste is not discharged overboard.	
Unplanned events – operations and maintenance			
Gas condensate release	Marine pollution, potentially leading to injury of death of marine fauna or seabirds through ingestion or contact.	• Pipeline is designed to withstand 1 in 100 year storm event and expected seismic activity of the region. • A 500-m radius exclusion zone exists around the Patricia and Baleen wellheads (acting to minimise impacts to the wellheads and pipeline infrastructure). • The HIPPS protects the PaB pipeline from overpressure from the Longtom pipeline. • The SCSSV will shut-in the wells in the event of a loss of pressure (e.g., pipeline rupture). • Pipeline and associated subsea infrastructure is regularly inspected and tested in accordance with the Asset Integrity Management Plan (IMP), HIPPS Full Closure Critical Function Testing and HIPPS Partial Closure Critical Function Testing procedures. • Pipeline pressure is constantly monitored by the PaB Gas Plant. • Only trained, certified and experienced personnel are in charge of offshore	Low

		operations and maintenance. • Operator errors are minimised by following the Santos Permit to Work procedure. • The Santos PaB OSCP and ERP will be implemented in the event of a condensate leak or rupture. • Consultation with AMSA has taken place regarding spill response control roles.	
Control fluid spill	Localised and temporary decrease in water quality.	• Umbilical is designed with fail-safe valves, non-return valves, pressure alarms, and best practice with regards to free span. It has also been designed to withstand a one in 100 year storm event. • The pressure and fluid capacity of the umbilical is monitored constantly at the PaB Gas Plant. • The selected control fluid (HW525) is water-soluble, has low toxicity and is not bioaccumulating. • Pipeline inspections are conducted regularly in accordance with the IMP. • Emergency Shutdown System and Emergency Response Plans activated in the event of a spill to minimise spill volumes. • Umbilical Lifting and Cutting Procedure will be developed as part of a campaign-specific procedure.	Very low
Unplanned events – vessel-based activities			
Collision with cetaceans	Injury or death to threatened species.	• The Australian Guidelines for Whale and Dolphin Watching (2005) for sea-faring activities will be implemented for vessels.	Very low
Interference with other marine users	Temporary loss of fishing grounds from drill rig safety exclusion zone, resultant loss of income. Collision risk. Snagging on anchors and anchor lines.	• 500-m radius Petroleum Exclusion Zone is in place around wellheads. • Vessels will be manned by competent, trained and experienced crew. • The PaB asset is currently marked on nautical charts and nautical publications. • Radio communications are maintained with vessels in the vicinity of the safety exclusion zones and pipeline corridors. • All vessels use the Automatic Identification System (AIS) to monitor the movements of nearby vessels. • All stakeholders will be notified at least 1 month prior to the commencement of a planned maintenance activity. • Vessels are lit in accordance with maritime safety requirements to alert other users to presence.	Very low

Introduction of invasive marine species	Establishment of foreign species to open ocean and/or seabed, competing with and displacing native species.	• Vessels will be sourced from Victorian waters where possible.
		• No ballast water exchange will occur within 12 nm of land.
		• Vessels will comply with:
		  ○ The Australian Ballast Water Management Requirements (2011, v5).
		  ○ The National Biofouling Guidance for the Petroleum Production and Exploration Industry (AQIS, 2009).
		  ○ Any requirement for cleaning due to reoccurrence of abalone virus.
		• Any vessels entering from outside Australian waters will have to pass AQIS ballasting requirements (Australian Ballast Water Management Requirements, 2011, v5) prior to entering Australian waters. This includes:
		  ○ Undertaking full ballast water exchange at sea (deep water where sediment is not visible) through one of several tank flooding and flushing techniques.
		  ○ Completing a Quarantine Pre-Arrival Report (QPAR) and submitting this to AQIS between 12 and 96 hours prior to arrival.
		  ○ Obtaining AQIS permission to discharge ballast water in Australian waters.
		  ○ Maintaining a ballast water log.
			Low

Diesel spill	Temporary marine pollution.	• Vessels will maintain 24 hour visual, radio and radar watch. • The location of the vessel will be noted in the Notice to Mariners, issued by the Australian Hydrographic Office. • No offshore refuelling will be conducted. • Consultation with AMSA has taken place regarding spill response control roles. • SOPEP material is available on board and personnel are trained in its use. • The Vessel SOPEP and Santos PaB OSCP will be implemented in the event of an MDO spill to sea.	Very low

8. Environmental Management

Santos manages the environmental and safety impacts of all its activities through the 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 PaB asset operation 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.

9. Hydrocarbon Spill Preparedness and Response

The PaB asset Oil Spill Contingency Plan (OSCP, accepted with the EP) is the primary reference document to be used in the event of a large-scale hydrocarbon spill (e.g., diesel spill resulting from a vessel collision or release of condensate from a pipeline rupture).

Hydrocarbon spill modelling undertaken for the operating phase of the PaB asset indicates small 'Zones of Potential Impact' (ZPI) for diesel and condensate spill scenarios, with limited shoreline contact at thresholds that are likely to have ecological impacts.

In consultation with agencies including the Australian Maritime Safety Authority (AMSA), the Victorian Department of Transport (DoT) and the Australian Marine Oil Spill Centre (AMOSC), Santos 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.

Factors taken into consideration in determining these strategies include:

- The light, highly evaporative nature of gas condensate and diesel.
- 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).
- The non-sensitive nature of the contacted coastlines.
- The weathering of the condensate into non-toxic waxy flakes.
- Dispersant application and other intervention measures may cause greater harm to sensitive environments than the hydrocarbons themselves.

An Operational and Scientific Monitoring Plan (OSMP) has been developed for the PaB Asset that details monitoring to be undertaken in the event of a large scale hydrocarbon spill. The OSMP is designed to assist in refining real-time response options (operations monitoring) and quantify impacts (scientific monitoring).

10. Further Information

For further information about the PaB asset operations, please contact:

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