

Santos

INFORMATION BOOKLET DARWIN PIPELINE DUPLICATION COMMONWEALTH AND NT COASTAL WATERS ACTIVITIES



INTRODUCTION

The activities described in this booklet relate to the Darwin Pipeline Duplication Project involving the extension of the Barossa Gas Export Pipeline to the Darwin LNG facility. To support this activity, Santos is currently preparing:

- an Environment Plan (EP) relating to the installation and pre-commissioning of the approximately 23 km long section of the Darwin Pipeline Duplication (DPD) and supporting subsea infrastructure, located in Commonwealth waters where offshore petroleum activities are regulated by the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cth) (OPGGGS Act); and
- an Offshore Construction Environmental Management Plan (EMP) which includes the installation of approximately 8.26 km of the DPD pipeline in an area covered by the *Petroleum (Submerged Lands Act) 1981* (NT) (PSL Act).

The activities described above are more simply referred to in this document as the 'DPD activity'.

ACTIVITY LOCATION

DPD Project activities described in this booklet include those undertaken in Commonwealth waters, approximately 95 km north-west of Darwin and approximately 27 km south-west of the Tiwi Islands (Figure 1) and those undertaken in an area of NT coastal waters between the Commonwealth/NT coastal waters boundary and the Territorial Sea Baseline (TSB) with a width of approximately 5.5 km.

Activities will occur within an operational area defined as approximately a 3000 m radius around the pipeline end termination (PLET) and a 2000 m buffer either side of the DPD route. The operational area encompasses the installation of the DPD, as well as the movements of support vessels in the immediate vicinity of the pipelay vessel. Vessels and helicopters within the operational area are considered part of the activity under the DPD EP.

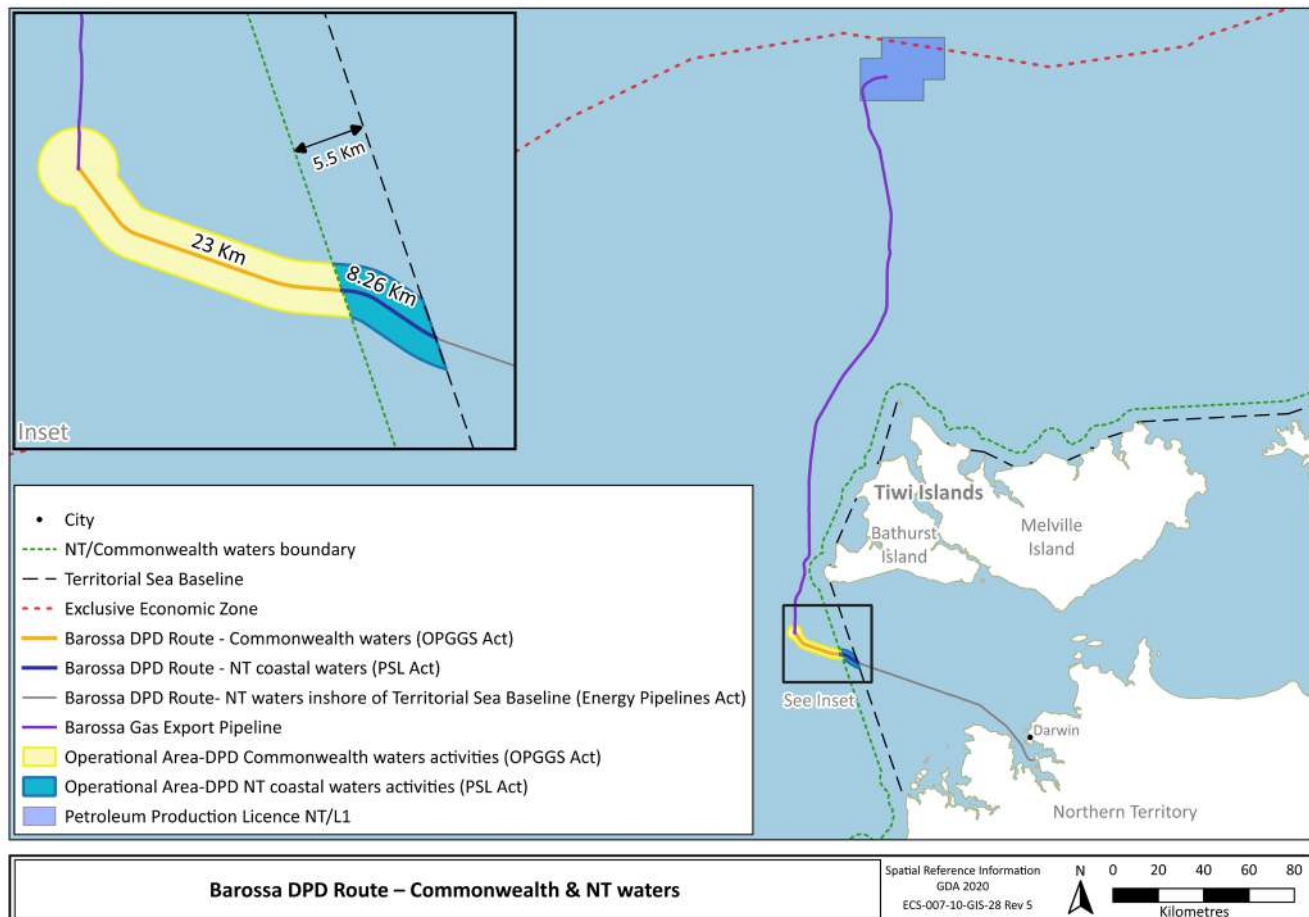


Figure 1: Location of the proposed DPD Route in Commonwealth waters and NT coastal waters

SUMMARY OF ACTIVITIES

The 26 inch stainless steel pipeline with concrete coating will transport natural gas from the Barossa field to the Darwin Liquid Natural Gas (DLNG) plant. A deepwater pipelay vessel will lay the DPD pipeline on the seabed at a rate of approximately 2 to 3 km per day, pending operational performance. A PLET will be installed at the end of the DPD pipeline in Commonwealth waters and a spool will be installed to connect the DPD pipeline PLET to the Barossa Gas Export Pipeline (GEP). Following installation, the DPD pipeline will be pre-commissioned for operations. This will include discharges of pre-commissioning fluids to the marine environment at the PLET in Commonwealth waters.

Helicopter flights to the deepwater pipelay vessel will occur approximately 10 times a week at the peak utilisation, with approximately 70 helicopter movements in total.

This activity is currently planned to commence between Q3 2024 and Q2 2025, subject to obtaining the required approvals but may occur earlier or later due to availability of installation vessels and equipment.

Further to the activity summary above, the list below provides an indicative breakdown of the DPD activity:

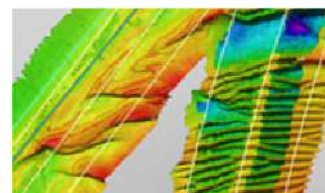
- **Underwater acoustic positioning** - to position equipment and infrastructure underwater
- **Surveys** - to confirm positioning of the DPD, subsea infrastructure and supporting structures
- **Supporting structures installation** - to support or protect the pipeline and associated infrastructure
- **Scour protection and span rectification** - to prevent the movement of sediment around infrastructure and support any pipeline spans
- **DPD pipeline and pipeline end termination (PLET) installation** - in Commonwealth waters (23 km) and 8.26 km of pipeline between the Commonwealth/NT boundary and the TSB
- **Spool installation** - the connection from the DPD pipeline to the GEP
- **Bunkering** - refuelling of pipe-lay and construction vessels
- **Pre-commissioning** - activities to verify the integrity and connections of the infrastructure. Pre-commissioning activities include Flood, Clean, Gauge and Test (FCGT), dewatering and nitrogen filling, and result in fluids (treated seawater and monoethylene glycol (MEG)) that will be discharged to the sea
- **Unplanned and non-routine inspection, maintenance and repairs** - in the unlikely event that damage could have occurred to the DPD infrastructure (e.g. unstable seabed conditions, significant earthquake, cyclone events, anchor strike, dropped objects, and trawl gear interference) inspection, maintenance and repair activities may be required

EQUIPMENT AND VESSELS

The below vessels and equipment will be used to support the DPD installation activities:

- **Pipelay vessel** - the DPD and PLET will be installed using a specialised deepwater pipelay vessel
- **Pipe support vessels (PSVs) and general cargo vessels (GCVs)** - responsible for supply of pipeline to the pipelay vessel
- **Construction and survey vessels** - construction vessels install supporting infrastructure, undertake surveys and support testing and commissioning activities
- **Support vessels** - transport materials, fuel supplies and waste and supplies to and from other vessels
- **Remotely operated vehicles (ROVs)** - to support subsea infrastructure installation and survey
- **Helicopters** - transport to and from the area of operation

Pre-lay survey



Pre-lay span correction

Concrete mattresses are installed at span locations.



Pipe transport

Pipe is loaded onto general cargo vessels at the coating yard in SE Asia and transhipped onto DP pipe supply vessels in sheltered water.



Deep water pipelay and survey

Approximately 23 km of pipeline is installed by a dynamically positioned pipelay vessel. Survey and span correction, if required, is performed as pipelay progresses.



Flood, clean, gauge, testing

The DPD will be flooded and tested with treated seawater before being dewatered and preconditioned.



Spool installation and testing

A spool shall be installed connecting the offshore GEP to the DPD. Once installed the spool will be leak tested.

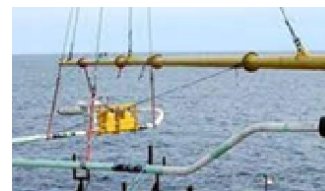


Figure 2: DPD installation process

REGIONAL EXISTING ENVIRONMENT SUMMARY

Environment that may be affected (EMBA)

Santos recognises the region’s various environmental values and sensitivities. In an EP, it is common to present a geographically defined area of the environment that may be affected (EMBA) by an offshore activity.

Figure 3 depicts the proposed operational area for the activities to be carried out in Commonwealth and NT coastal waters (small highlighted yellow and blue areas) and the EMBA by the proposed activities (orange line). The EMBA represents the greatest geographical extent that could be affected by the unplanned, ‘worst case’ spill scenario. It should be noted that an actual spill event is more accurately represented by only one of the 300 simulations from the modelling, meaning a much smaller geographical area would be affected in the event of an actual spill. Modelling all these scenarios assists with spill response planning. The EMBA also provides the basis for assessing the range of potential socio-economic risks and establishes a planning area for scientific monitoring.

The Moderate Exposure Value (MEVA) (pink line) is used to inform environmental ecological assessment and identify potential environmental consequences. Beyond the MEVA, environmental impacts and risks are unlikely to result in measurable effects to ecological receptors.

To learn more about spill modelling, exposure values and spill responses, see [NOPSEMA Spill Modelling Video](#).

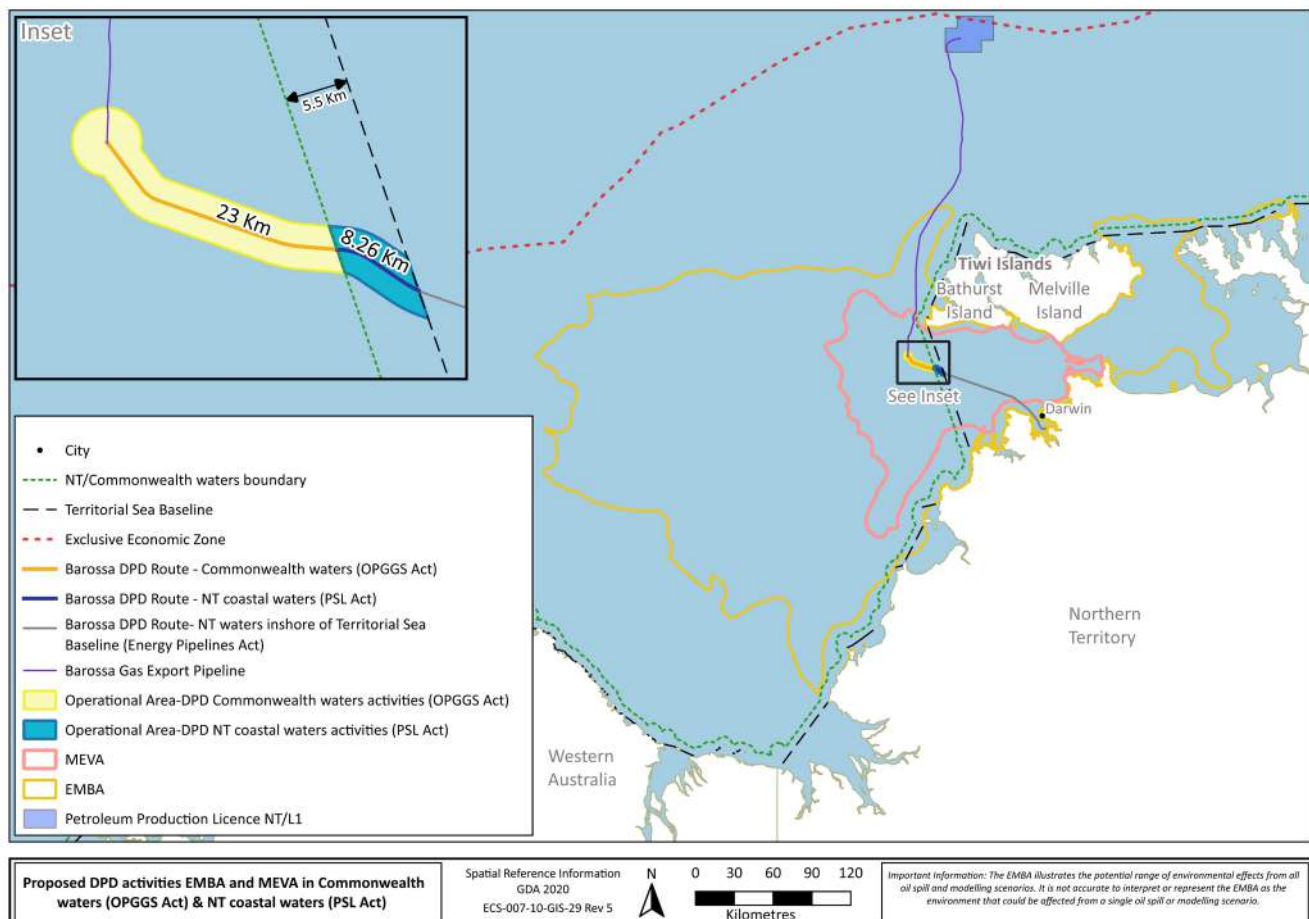


Figure 3: Proposed DPD Activities modelled EMBA and MEVA, in Commonwealth waters covered by the OPGGS Act and NT coastal waters covered by the PSL Act

Below is a summary of known values and significant areas within the EMBA recognised under relevant environmental legislation, including approximate distance from the operational area.

- Oceanic Shoals Marine Park (44km)
- Joseph Bonaparte Gulf Marine Park (185km)
- Garig Gunak Barlu – Marine National Park (230km)
- Cobourg Peninsula – Wetland of international importance (230km)
- Kakadu – World Heritage Areas and wetland of international importance (220km)
- Adelaide River Floodplain System – Nationally important wetland (118km)
- Cobourg Peninsula System – Nationally important wetland (230km)
- Port of Darwin – Nationally important wetland (80km)
- Carbonate bank and terrace system of the Van Diemen Rise – Key ecological feature (5km)
- Pinnacles of the Bonaparte Basin – Key ecological feature (155km)
- Carbonate bank and terrace system of the Sahul Shelf – Key ecological feature (202km)

Regional protected and significant areas

Figure 4, Figure 5 and Figure 6 illustrate the boundaries and zonings of regional marine parks and reserves, key ecological features and wetlands respectively.

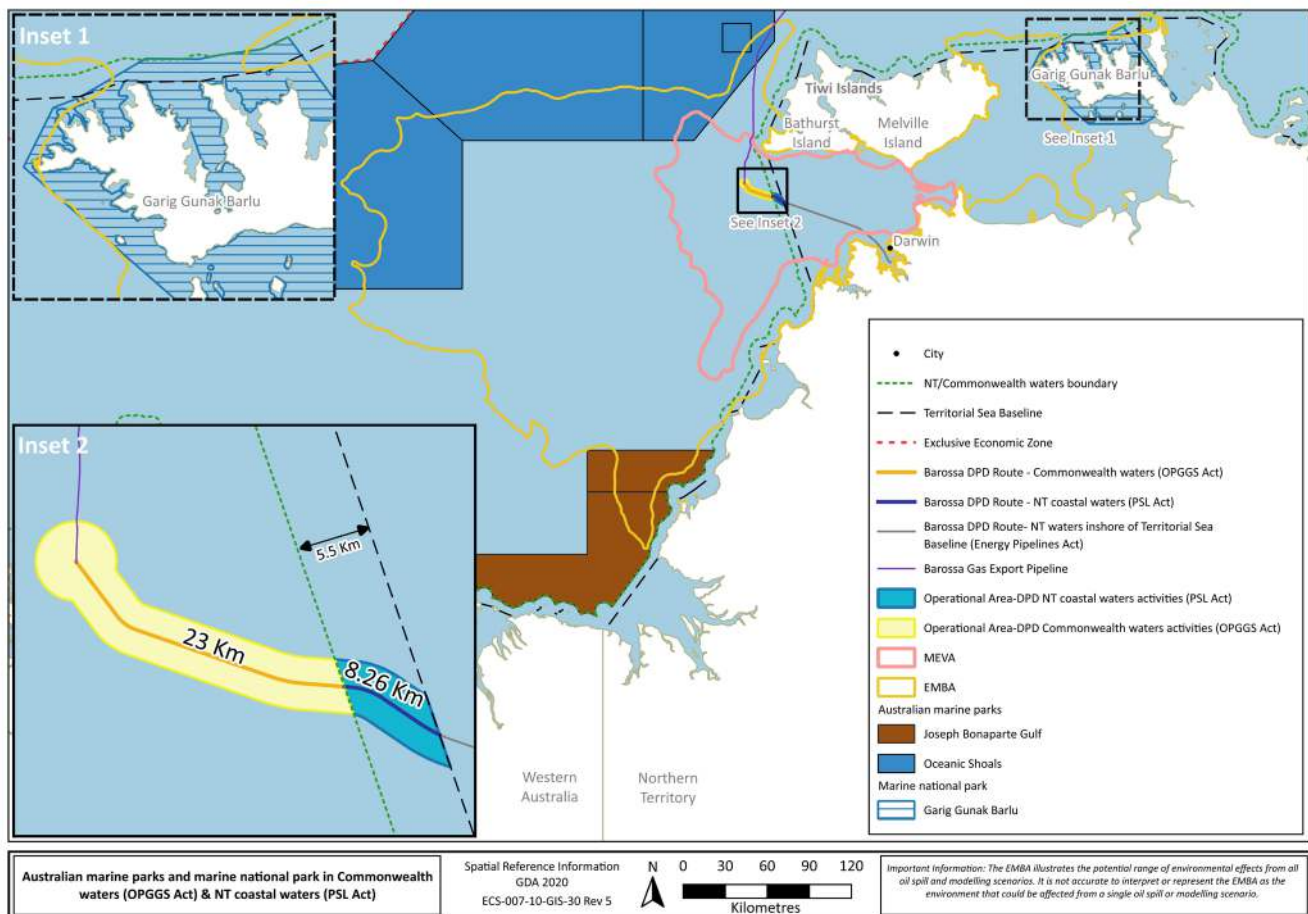


Figure 4: Australian marine parks and marine national park situated within Commonwealth waters covered by the OPGGS Act and NT coastal waters PSL Act

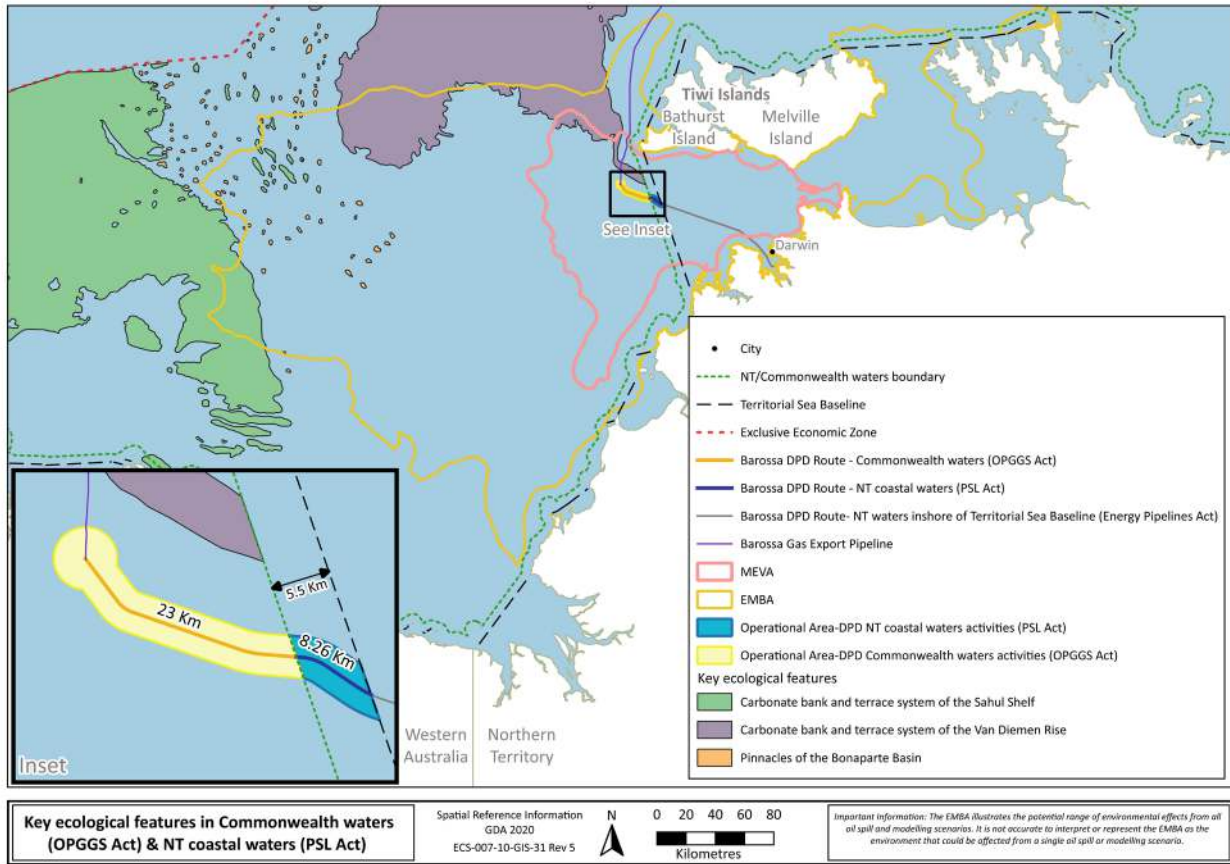


Figure 5: Closest key ecological features to the operational area and EMBA

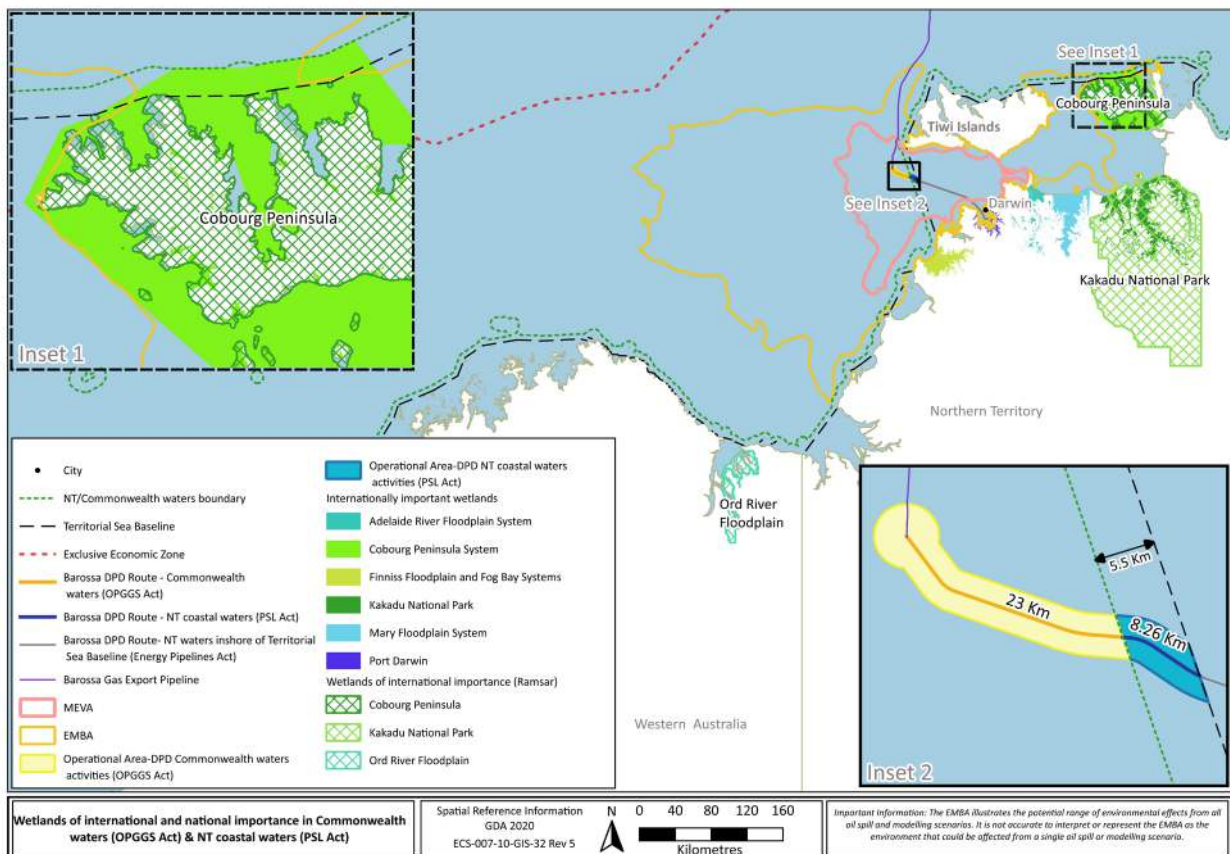


Figure 6: Wetlands of international and national importance

Marine fauna and biologically important areas

Some biologically important areas and habitat critical to the survival of species, occur within the operational area and EMBA. Intersecting the operational area is a flatback turtle internesting biologically important areas, and nesting habitat critical to survival of flatback turtles. Within the EMBA there are biologically important areas for turtles, dolphins, and birds (Figure 7).

DPD activities will be conducted in water depths ranging from approximately 50-60 m where there is a variety of highly mobile marine fauna with a wide distribution that may transit the area in low numbers, such as:

- Bryde’s, blue, fin, humpback, killer and sei whales
- Australian humpback, Australian snubfin and spotted bottlenose dolphins
- Alive ridley, green, loggerhead, hawksbill, leatherback and flatback turtles
- Saltwater crocodile
- Sea snakes
- Whale sharks
- Seabirds and migratory shorebirds
- Rays, fish and sharks.

Santos has considered government guidance, including wildlife management plans, recovery plans, conservation advice and threat abatement plans in the development of the EP and is developing control measures to reduce impacts and risks to marine fauna and biologically important areas to as low as reasonably practicable and acceptable.

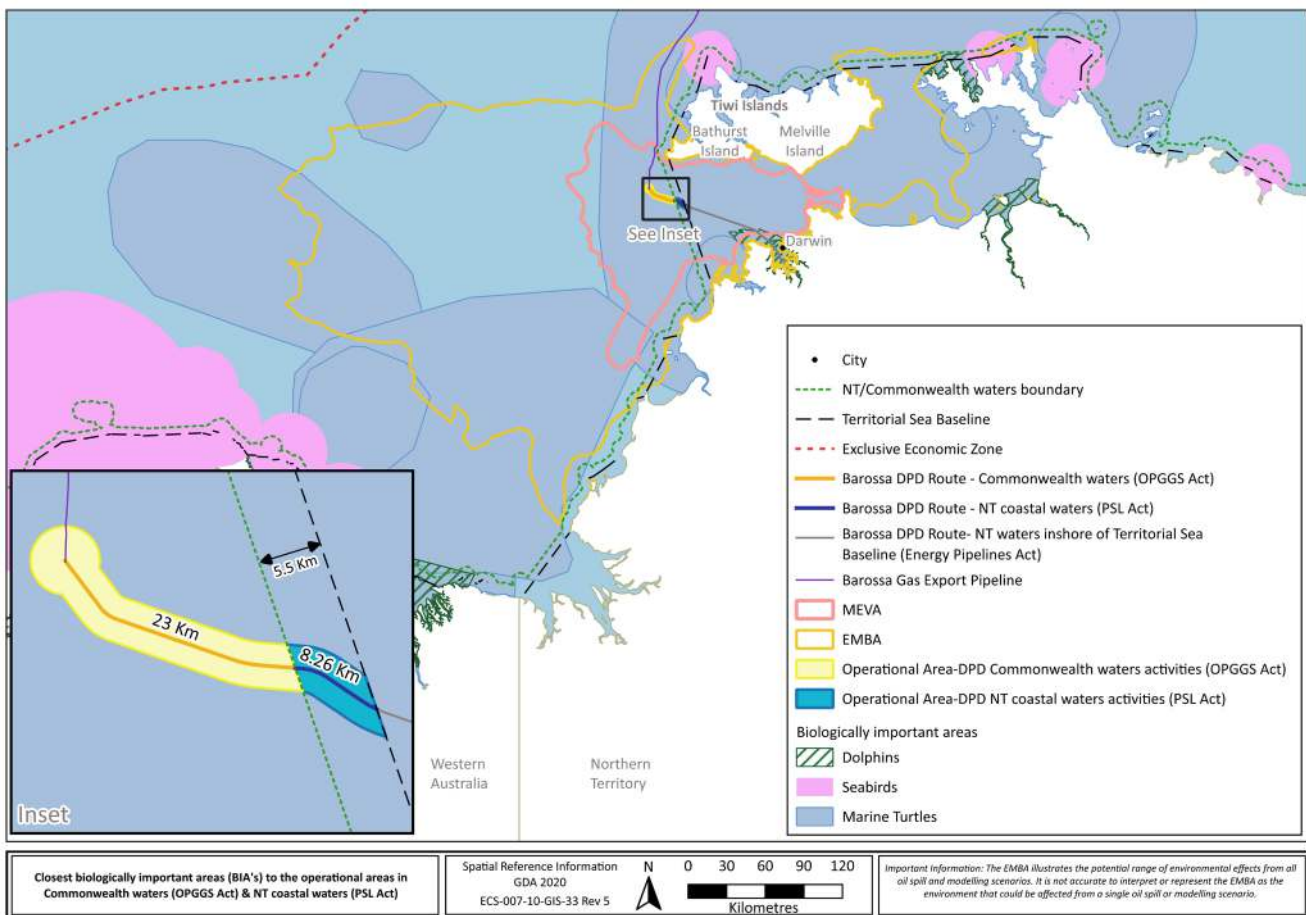


Figure 7: Closest biologically important areas to the operational area and EMBA

REGIONAL SOCIO-ECONOMIC SUMMARY

Socioeconomic activities that may occur in the operational area and EMBA include commercial, recreational and traditional (subsistence) fishing, aquaculture, petroleum industry activities, defence activities, shipping and tourism.

Nearest population centres

The operational area, at its closest point, is located approximately 27 km from Bathurst Island, which is part of the Tiwi Islands. Darwin, is the closest city.

Summary of other uses within the EMBA

Santos' understanding of the uses and values of the area and its strategies to reduce impacts or risks to these uses and values will be informed by consultation. Santos has set out in the list below a summary of the uses and values of the area of which it has knowledge based on existing information or previous consultation. Santos welcomes further information and encourages relevant persons to raise any further uses with Santos.



Commercial fishing

Within the operational area interaction with some commercial fishing is possible. These fisheries include Northern Prawn, Spanish Mackerel, Pearl Oyster, Offshore Net and Line and Demersal. Due to the distance from coastlines and a lack of seabed features that support fish assemblages (including targeted species), the operational area avoids areas of medium and high fishing effort.

Santos has been consulting on various Barossa activities with the relevant fisheries' representative associations, licence-holders and the industry's regulatory bodies over many years.



Tourism, recreational fishing and traditional fishing

The operational area is located in offshore waters that are not likely to be accessed for tourism activities (e.g. charter boat operations) or recreational fishing, as these tend to be centred around nearshore waters, islands and coastal areas. Traditional fishers, as well as recreational fishers, are expected to transit and fish in the EMBA. Some fishers may transit the operational area when travelling between sites.



Shipping

The Darwin Port is Australia's nearest port to Asia and the nation's 'northern gateway' for Australasian trade. There is also a port, Port Melville, located at Garden Point, Tiwi Islands.



Defence Activities

The operational area intersects a defence force practice area, and the EMBA intersects the practice and training areas of the North Australian exercise area and Darwin air weapons range. Australian Border Force vessels may transit through the operational area and EMBA.



Petroleum industry

No established oil and gas operations are located within or in the immediate surrounds of the operational area. There are two existing pipelines within the vicinity of the operational area — the Bayu-Undan to Darwin Pipeline and the INPEX Ichthys pipeline.



Heritage

The EMBA intersects the outer boundary of Kakadu National Park World Heritage Property (Figure 8).

There are no other national heritage places or Commonwealth heritage places within the operational area or EMBA. There are no recorded Aboriginal heritage sites or underwater cultural heritage sites within the operational area. Multiple known shipwrecks, sunken aircraft, and historic (more than 75 years old) aircraft and shipwrecks and other sites occur within the EMBA. There are several sites that have a declared protected zone or are protected under the NT *Heritage Act 2011* within the EMBA.



Cultural Values

Santos has identified that the Croker Island native title determination (DCD1998/001) partially intersects with the EMBA. The native title holders within the Croker Island native title determination are the Yuwurrumu members of the Mandilarri-Ildugij, the Mangalara, the Murran, the Gadura-Minaga and the Ngaynjaharr clans. The Larrakia native title determination (DCD2006/001) also partially overlaps the EMBA. This determination found that native title does not exist within the claim area.

Santos is aware of Indigenous peoples' connections with Sea Country and is seeking to further identify cultural features and values within the EMBA, including through consultation with Indigenous people and their relevant representative bodies.

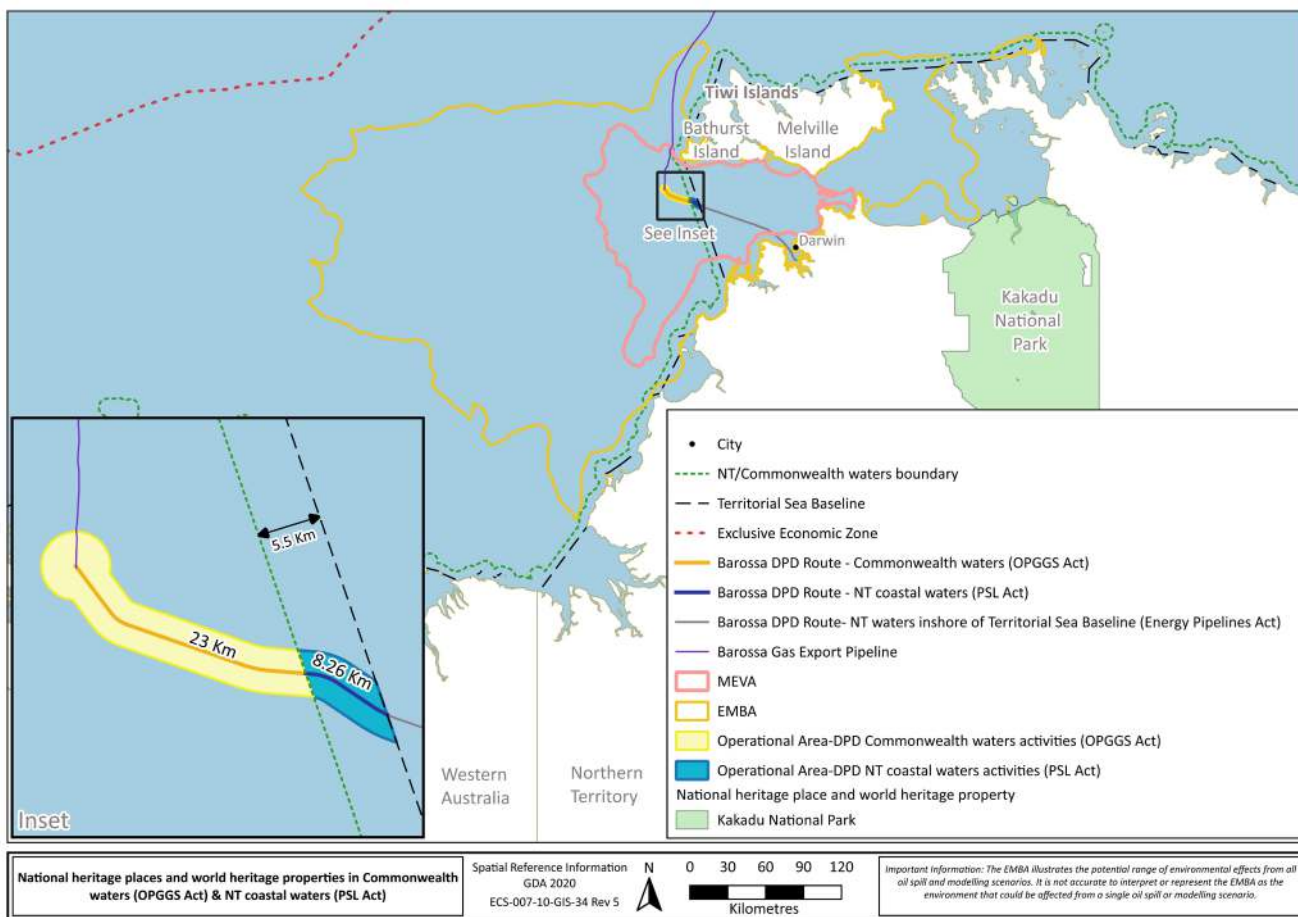


Figure 8: Proximity of the Kakadu National Park World Heritage Property to the operational area and EMBA

SUMMARY OF ENVIRONMENTAL IMPACTS AND RISKS

Environmental impact and risk assessment is the process by which events that will or may occur during an activity are assessed for their potential impacts on or risk to the environment (physical, biological, socio-economic and cultural). They are divided into planned activities and unplanned events.

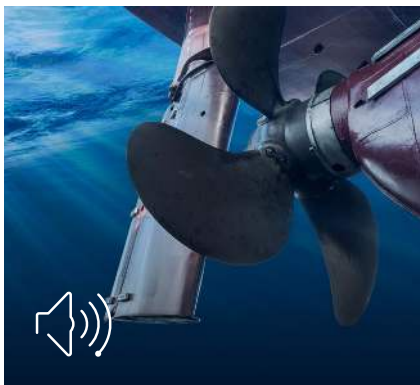
Planned events are unavoidable impacts, such as light, noise, atmospheric emissions, seabed disturbance, discharges, and interactions with other marine users. Unplanned events are not expected to occur but are planned for to manage risks as contingency measures. They are also assessed based on their likelihood of occurrence. Unplanned events include dropped objects, introduction of invasive marine species, interactions with marine fauna, accidental discharges or spills.

PLANNED ACTIVITIES

The Santos environmental assessment identified the following main potential impacts or risks associated with the planned activities.

Santos proposes to adopt a suite of Santos and contractor systems, procedures and standard control measures to reduce impacts and risks associated with these planned activities to a level that results in a minor or negligible environmental consequence. These consequence levels are considered by Santos to be acceptable and as low as reasonably practicable.

Santos continues to consult on the proposed DPD activities in Commonwealth waters and NT coastal waters to inform its understanding of environmental and cultural values and sensitivities and the assessment of associated impacts, risks and control measures.



NOISE SOURCES

Noise will be generated by activity vessels, helicopters, ROVs, acoustic positioning systems and survey methods. The types of noise generated by DPD activities can be categorised as either impulsive (brief, high intensity), such as acoustic positioning and survey methods or non-impulsive noises (ongoing or continuous) such as vessels.

What impacts are expected?

Studies supporting the assessment indicated that potential temporary impacts to marine fauna are expected to be confined to 9.8 km from the activity vessels, whereas the survey methods and acoustic positioning system are confined within a few hundred meters from the source with no significant impacts at the species population level.

As the total DPD activity has a short timeframe of approximately three (3) months in Commonwealth waters and in NT coastal waters, and the pipelay vessel will only be travelling at 2 to 3 km per day, there is a relatively low probability of encountering significant numbers of noise-sensitive fauna. Transiting marine fauna are expected to demonstrate short-term avoidance behaviour within the operational area. Noise effects to fish of potential commercial value would be restricted to within hundreds of metres of the noise source. No effects to benthic invertebrates are expected, including those of commercial value. Therefore, noise impacts are predicted to be minor, localised and temporary.

How will Santos manage impacts?

Activity vessels are required to comply with Santos's Protected Marine Fauna Interaction and Sighting Procedure to comply with regulatory requirements for managing fauna noise impacts. Marine assurance standards and planned vessel maintenance will minimise noise generated from vessels by ensuring contracted vessels are operated, maintained and crewed in accordance with industry standards and regulatory requirements.



LIGHT SOURCES

Artificial lighting is required for operational and navigational safety during the activity. Light sources include safety and navigational lighting on vessels, spot lighting when needed, such as deploying or retrieving equipment or when ROVs are working underwater.

What impacts are expected?

Light may impact threatened, migratory or local fauna (e.g. marine mammals, marine turtles, sharks, rays, other fish and seabirds) and socio-economic receptors (cultural features).

The vessels are expected to produce similar light levels to other marine vessels in the region. Light modelling indicates that the combined light from the pipelay and construction vessels working together is predicted to reduce to below ambient levels at approximately 21.6 km away.

Combined light may have the potential for behavioural impacts to turtles within 4.5 km. The nearest turtle nesting beaches are approximately 27 km from the operational area. Therefore, nesting habitat or flatback hatchling behaviours are not predicted to be impacted.

Fish may be attracted to artificial light, leading to a short-term localised increase in fauna activity. The activity is assessed as unlikely to impact species abundance or distribution.

Marine mammals are not known to be attracted to light sources at sea. Whales predominantly use acoustic senses rather than visual cues.

How will Santos manage impacts?

Lighting is to be limited to that required for safe operations and navigation and will comply with maritime regulations (similar to other commercial vessels operating in the region). In addition, the pipelay vessel will have an enclosed pipe welding deck which reduces light spill for this activity.



AIR EMISSIONS

Air emissions will occur from:

- fuel combustion to operate vessels and helicopters
- operation of vessel incinerators.

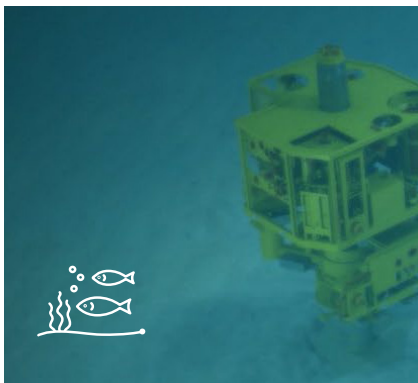
In the offshore environment, air emissions rapidly dissipate into the surrounding atmosphere. Impacts are very localised and not significant. Seabirds and migratory shorebirds are unlikely to be impacted by the localised and temporary reduction in air quality.

How will Santos manage impacts?

Santos proposes to adopt numerous control measures to manage vessel emissions, including requiring contractor vessels' compliance with MARPOL requirements for low-sulphur fuel and air pollution prevention certifications. ('MARPOL' is a reference to the International Convention for the Prevention of Pollution from Ships).

The control measures to be adopted are designed to be consistent with maritime regulations and petroleum industry standards.

Santos has a climate transition strategy and action plan to become a net-zero emissions energy and fuels business by 2040.



SEABED DISTURBANCE

Seabed disturbance will occur because of:

- permanent placement of subsea infrastructure on the seabed (e.g. DPD pipeline and supporting structures)
- temporary placement and set down of equipment and subsea infrastructure on the seabed (e.g. ROV, acoustic positioning transponders, wet-parking equipment)
- temporary disturbance and sediment disturbance during installation.

The total estimated seabed disturbance footprint is approximately 2.36 hectares, approximately half the area of a football field (the MCG playing surface is about 4 hectares). This seabed disturbance area represents a very small portion of the operational area.

The DPD pipeline route intentionally avoids banks and shoals, including Shepparton Shoal. The operational area is predominantly silty, shelly sand with very sparse (<1%) epibiota (mainly soft corals and crinoids).

The activity may cause a temporary increase in water turbidity and will involve equipment directly contacting the sea floor resulting in localised impact to benthic habitat (and associated fauna). As the impacted marine habitats are widespread, the overall ecological impact by this disturbance is not considered to be significant.

Interesting BIA and habitat critical for the flatback turtle overlap the operational area. However, due to the operational area water depths (greater than 50 m), the BIA extending over more than 800 km of coastline, and a lack of foraging habitat, the numbers of interesting turtles will be limited hence seabed disturbance is unlikely to affect interesting or foraging turtles..

How will Santos manage impacts?

Santos has attempted to minimise environmental and socio-economic impacts by installing the pipeline parallel and close to the existing Bayu-Undan to Darwin pipeline for most of the pipeline route.

Santos' vessels will undertake activities to enable safe and accurate placement of infrastructure whilst vessels are on dynamic positioning. Santos also intends to maintain an inventory of all installed equipment to enable collection of all equipment during decommissioning (and thus removal of structures to limit ongoing impacts to the seabed).



INTERACTIONS WITH OTHER MARINE USERS

Other marine users that may be in the vicinity of the DPD operational area include commercial fishing, shipping and other incidental marine traffic.

A 500 m cautionary zone will be established around the pipeline and construction vessels to safeguard them during operations.

Helicopter operations will be infrequent (e.g. maximum helicopter movements will be approximately 10 times a week during the peak utilisation period) and at high altitude for most of the route except for landings and take-off, therefore unlikely to interfere with other marine users.

How will Santos manage impacts?

Santos will notify and communicate with other marine users using standard maritime notifications (e.g., Notice to Mariners) and through broadscale and targeted Project updates, before, during and at the end of the activity. Vessels have speed restrictions imposed and automatic identification systems to aid in their detection at sea. Infrastructure locations will be marked on nautical charts. These proposed control measures are designed to be consistent with maritime regulations and industry practices.

The vessels will have speed restrictions imposed of ≤ 8 knots and will use automatic identification systems to aid in their detection at sea. Support vessels are to actively communicate with third-party vessels to inform them of the activities being undertaken. Protection structures will be installed to provide ongoing protection for fishers operating in the vicinity of PLET. Infrastructure locations are to be marked on nautical charts. These proposed control measures are designed to be consistent with maritime regulations and industry practices.



DISCHARGES

Discharges will occur from the proposed DPD pipelay, construction and support vessels during activities.

Vessel discharges

The types of discharges are typical of most offshore commercial vessels and include deck runoff, treated sewage, grey water, machinery cooling water, bilge water (treated via the oily water system), ballast water, macerated food scraps and brine (from water making). These discharges will be small in volume and released into surface waters.

Activity discharges

Potential impacts may occur in the operational area from discharges of treated seawater and monoethylene glycol (MEG - A hydrate inhibitor used to reduce the risk of hydrate formation in infrastructure that could cause a blockage), grout from grout downline flushing and treatment chemicals (biocides, oxygen scavengers, corrosion inhibitors, MEG and dyes).

What impacts are expected?

Vessel discharges

The small volumes of vessel discharges may cause localised nutrient enrichment, organic and particulate loading, ecotoxicological effects, and increased water temperature and salinity around discharge points and in the direction of the current flows. The environment that may be affected by discharges will likely be within approximately 50 m of the activity vessel and likely to be contained within the operational area. Discharges may cause short-term changes to behaviour in marine fauna (avoidance or attraction). For example, fish and seabirds may be attracted to macerated food scraps discharged by vessels.

Activity discharges

Activity discharges are expected to disperse rapidly and be diluted within the operational area. Treated sea water is conditioned with a pipeline testing mixture comprising some additives with specific functions such as biocides (to prevent biological activity on the internal surfaces), an oxygen scavenger and corrosion inhibitor (to control internal corrosion of the DPD) and a dye (allows for leaks to be detected through visual inspections).

The hydrotest mixture and MEG additives have been selected and optimised for biodegradability as well as low aquatic toxicity and bioaccumulation potential. Given the low toxicity, and short duration of the activity discharges, there are no significant impacts expected to the transient fauna that may be in the vicinity of the discharge location. Water quality changes are expected to recover within hours to days following cessation of discharges.

How will Santos manage impacts?

Vessel discharges

Vessel discharges are to be managed to acceptable levels as regulated by maritime laws and conventions, such as MARPOL and relevant Australian regulatory Marine Orders.

Activity discharges

Activity discharges are to be managed through the application of Santos's Chemical Selection Process, designed so that environmentally acceptable chemicals (which are likely to be discharged) are selected and used.

Summary of activity discharge types, volumes and duration

Activity	Discharge type	Approximate discharge volume (m3)	Duration of discharge
Flooding	Treated sea water	5,650	Approximately 6 to 12 hours
Hydrotest depressurising	Treated sea water	2,000	
Dewatering	Treated sea water	50,000	Approximately 6 hours
Pre-conditioning	MEG	1,000	Up to 1 day
Spool leak testing	MEG	225	Approximately 1 hour
Grout downline flushing (contingency)	Grout	4	

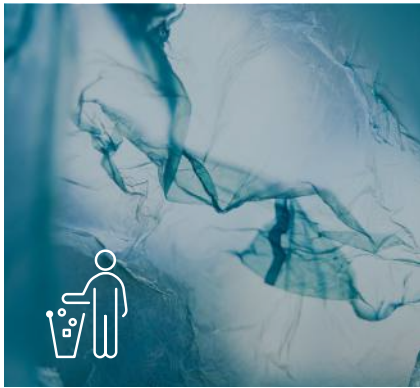
UNPLANNED EVENTS

Santos uses an environmental assessment guideline to identify, analyse and evaluate incident scenarios (unplanned events). Potential unplanned events have been identified and considered and the associated potential environmental consequences and the event likelihoods (i.e., the risks) have been assessed. Based on the assessment undertaken to support the DPD activity in Commonwealth and NT coastal waters, the following unplanned environmental risks have been identified for this activity:

- dropped objects
- introduction of invasive marine species
- interaction with marine fauna
- treated seawater release
- non-hydrocarbon liquid release
- dry natural gas or nitrogen release
- marine diesel oil release

Santos proposes to adopt a suite of Santos and contractor systems, procedures and standard control measures to seek to reduce the impacts and risks associated with these unplanned events to a level that results in a minor or negligible environmental consequence. These consequence levels are considered by Santos to be acceptable and as low as reasonably practicable.

Santos continues to consult on its DPD activities in Commonwealth and NT coastal waters to inform its understanding of environmental and cultural values and sensitivities, and the assessment of associated impacts, risks and control measures.



DROPPED OBJECTS

There is the potential for objects to be accidentally released to the marine environment from vessels or during installation activities. Objects might include plastics & packaging, PPE, tools & equipment, and installation aids.

What environmental impacts could occur?

Objects that float (Buoyant) could potentially move beyond the operational area. All non-buoyant objects are expected to sink to the seabed and remain within the operational area. This could cause localised and short-term damage to the seabed.

Buoyant objects could potentially move beyond the operational area. In relevant recovery plans and conservation advice, marine debris (including plastics and microplastics) is listed as a potential threat to several marine fauna species. Depending on debris size of the dropped object, there is potential for entanglement or ingestion by marine fauna, including turtles and vertebrate wildlife, which could result in injury or death. However, given the limited quantities that might be dropped, impacts to fauna would be limited.

How will Santos manage the risk?

Santos has numerous control measures to reduce the risk of dropped objects, lost equipment or releasing waste to the environment. These control measures are designed to comply with maritime legislation and include:

- safety standards and procedures to reduce the risk of tools and other equipment being dropped during lifting operations
- waste management procedures to reduce the risk of windblown waste entering the marine environment
- implementation of chemical selection processes and the International Maritime Dangerous Goods Code
- dropped objects, regardless of size, must be reported and attempts made to recover the object according to safety and environment criteria.



INTRODUCTION OF INVASIVE MARINE SPECIES

Invasive marine species are marine flora and fauna that have been introduced into a region that is beyond their natural range but have the ability to survive, and possibly thrive. Many compatible invasive marine species to northern Australia are found in south-east Asian countries. They can be introduced from biofouling on vessels and discharge of ballast water.

If successfully established, invasive marine species can out-compete native species for food or space, prey on native species, impact fisheries or aquaculture, impact on human health through released toxins and cause damage to marine and industrial equipment and infrastructure. There may also be flow-on detrimental effects to marine parks, tourism and recreation.

How will Santos manage the risk?

Vessels contracted to Santos, and vessel ballast, are to be managed according to control measures that comply with maritime regulations, industry practices, and the Biosecurity Act 2015. Vessels will also have ballast water management, vessel biofouling management and anti-fouling systems and measures in place.



INTERACTION WITH MARINE FAUNA

How could interactions with marine fauna occur?

There is the potential for activity vessels, equipment (e.g. ROVs) or helicopters to unintentionally interact with marine fauna, including potential strike or collision, potentially resulting in severe injury or mortality.

What environmental impacts could occur?

Marine fauna in surface waters that are most at risk from vessel collision include marine mammals, marine turtles and whale sharks. Some of these species are threatened, and some marine fauna may have cultural significance.

The DPD activity will be conducted over a short time period (approximately 3 months). The pipelay vessel travelling slowly (≤ 1 knot) for up to approximately 2-3 weeks and all other activity vessels will typically be limited to slow speeds. Therefore, the risk of coming into contact with turtles is possible, however, turtles are expected to dive or move away from the vessels.

Marine mammals (such as whales and dolphins) and whale sharks may pass through the operational area in low numbers but there are no known critical habitats or biologically important areas for these species that overlap the operational area. Considering the relatively slow vessel speeds, short duration of activities, and the mobility of these species, it is unlikely that activity vessels will adversely interact with any individuals.

How will Santos manage the risk?

Santos' procedure for interacting with marine fauna, is aligned with the Environment Protection and Biodiversity Conservation Regulations 2000. This procedure limits marine fauna approach distances and speed, allowing marine fauna to be avoided or to move away. It also includes reporting requirements. Vessel speed restrictions, standard operating procedure and crew inductions also supports the management of fauna interactions.



TREATED SEAWATER RELEASE

How could treated seawater be released?

A release of treated sea water (contingency dewatering) may occur as a result of an unplanned wet-buckle (rupture to pipeline wall) or during a stuck pig during FCGT activities or during dewatering operations.

A release of treated seawater may result in impacts to water quality. Actions to address a stuck pug during dewatering operations may also result in the discharge of MEG with the potential to impact environmental receptors.

What environmental impacts could occur?

Any unplanned treated seawater discharges and MEG are expected to disperse rapidly and be diluted within the operational area, with water quality changes expected to recover within hours to days following the cessation of discharges.

How will Santos manage the risk?

Santos has a suite of control measures to manage the risk and impact of treated seawater release. Only environmentally acceptable chemical products are to be used, procedures will be in place to limit the concentration of hydrotest mixture within the treated sea water and differential GPS for pipelay vessels maintains accurate vessel position during installation.



NON-HYDROCARBON LIQUID RELEASE

How could non-hydrocarbon liquids be released?

Non-hydrocarbon liquids including miscellaneous chemicals and waste are used or stored on vessels during the activity. Examples of non-hydrocarbon liquids include brine, cleaning and cooling agents, stored or spent chemicals and leftover paint materials.

An accidental release of chemicals and other non-hydrocarbon liquids into the marine environment has the potential to occur from:

- mechanical failure of equipment, such as tank or pipework failure
- handling and storage spills and leaks due to insufficient fastening or inadequate bunding
- firefighting foam during an unplanned incident

A release of non-hydrocarbon liquids or chemicals may result in impacts to water quality and hence sensitive environmental receptors.

What environmental impacts could occur?

A non-hydrocarbon release could occur from activities such as transferring, storing or using chemical products, mechanical failure of equipment, handling and storage spills, hose or coupling failure or rupture, or tank overfilling.

An accidental release could result in impacts to water quality that are expected to be short term and localised. Potential receptors include the physical environment (e.g. water and sediment quality, benthic habitats), threatened, migratory or local

fauna (e.g. marine mammals, marine reptiles, sharks and rays, other fish, and birds) and socioeconomic features of the environment (including cultural features).

How will Santos manage the risk?

A suite of procedures will be in place to manage the selection, storage, handling and clean-up of chemicals and other non-hydrocarbon liquids. Vessels also have spill response plans. The chemical selection procedure is designed so that only environmentally acceptable chemicals should be used for leak testing and pre-commissioning fluids.



DRY NATURAL GAS OR NITROGEN RELEASE

How could a dry natural gas or nitrogen release occur?

Although highly unlikely, lifting the PLET (foundation, PLET or protection structures) and other DPD activities pose a risk of causing damage to the Bayu-Undan or other Barossa pipelines (NT DPD or GEP if already laid) should an unplanned event occur. Damage could result in a potential rupture that may release dry natural gas or nitrogen into the environment.

What environmental impacts could occur?

Potential receptors include the physical environment (water and air quality); threatened, migratory or local fauna (marine mammals, marine reptiles, sharks and rays, other fish, and birds); socioeconomic (other marine users and cultural features). Potentially the gas cloud may impact air-breathing fauna, such as marine mammals, marine reptiles and birds. Marine mammals, turtles and birds are very unlikely to be affected given the dry natural gas or nitrogen dispersion into the atmosphere, this potential effect would be highly localised (within 500 m of the surface release point) with a short duration and rapidly dispersed within the environment.

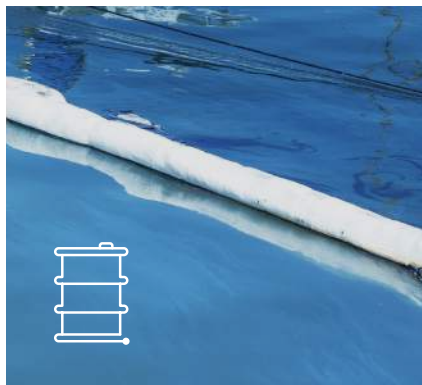
Socio-economic receptors

For the Bayu-Undan pipeline release, a gas cloud could form an explosive mix that, if ignited, results in injury/death and property damage. A nitrogen gas cloud could cause asphyxiation at high concentrations. Either gas cloud could risk the health and safety of other users, such as fishers (traditional and commercial), tourism and recreational users. However, all other marine users will be excluded from the construction vessel exclusion zone and, therefore, will not be within 500 m of an event if it occurs.

How will Santos manage the risk?

A thorough set of controls has been proposed to minimise the risk of damage to the Bayu-Undan and Barossa pipelines and related environmental consequences should they occur.

These control measures include implementing standards and procedures for lifting equipment, implementing procedures for lifting over live infrastructure and emergency response procedures implemented to minimise potential for impacts in the event of a loss of containment from the Bayu-Undan Pipeline.



MARINE DIESEL SPILL

How could a marine diesel spill occur?

Although highly unlikely, a spill could result from a collision between two activity vessels or an activity vessel and a third party. Such a collision could rupture a fuel tank at the sea surface resulting in the release of vessel fuel to the sea. A vessel collision could occur due to factors such as human error, poor navigation, vessel equipment failure or poor weather.

A spill could also occur from a refuelling incident (fuel hose failure or rupture, coupling failure or tank overfilling) where vessel or helicopter refuelling would need to be stopped manually. Fuel released before pumping stops and fuel remaining in the transfer line may be released to the environment.

What environmental impacts could occur?

Spill modelling, based on a worst-case credible scenario (700 m³ release of vessel fuel over 6 hours) indicated (using the moderate exposure value):

- probability of shoreline accumulation was highest during summer conditions, at a maximum of 10%, and lowest during transitional and winter seasons, at 1%. The chance of shoreline accumulation during the summer season only was 3% at Vernon Islands, 1% at Melville Island and 1% at Cox Finnis.
- surface oil was predicted to be limited to within approximately 40 km of the release location
- entrained oil within the water column was predicted to occur within approximately 135 km of the release location
- dissolved hydrocarbons within the water column were predicted within 23 km of the release location.

Potential receptors include the physical environment (water quality, shoals and banks, benthic habitats, shorelines), threatened or migratory fauna (marine mammals, marine reptiles, fish and birds), protected and significant areas, socio-economic receptors (fisheries, tourism, recreation and other third-party operators) and cultural values and sensitivities.

A hydrocarbon release will cause a decline in water quality and may cause chemical (e.g. toxicity) and physical (e.g. coating of emergent habitats, oiling of wildlife at sea surface) impacts to marine species. The severity of the impact of a hydrocarbon release depends on the magnitude of the release (i.e. extent, duration) and sensitivity of the receptor. Given vessel fuel is expected to weather quickly through evaporation and dispersion and is unlikely to persist in the environment, impacts to sensitive receptors are likely to be temporary and localised in nature.

How will Santos manage the risk?

The risk of collision is reduced through controls that manage interactions with other marine users before and during the activity. This includes standard maritime notifications, automatic identification systems and navigational lighting. Cautionary zones will also be in place to manage vessel movements close to activities. Operational procedures are designed to minimise refuelling incidents.

Spill response plans will be in place and regular exercises are planned to be conducted. These control measures are designed to comply with maritime regulations and standard industry practices.



CONTINGENCY SPILL RESPONSE OPERATIONS

In the unlikely event of a hydrocarbon spill, response strategies will be implemented to reduce environmental impacts to as low as reasonably practicable. Response strategies will be undertaken using the Net Environmental Benefits Assessment process. Santos will undertake a 'first-strike' spill response and will act as the control agency until the designated control agency assumes control. The response strategies considered to be appropriate for the worst-case spill scenarios identified for the activity are detailed in the Oil Pollution Emergence Plan (OPEP) specific for the DPD installation activities, and comprise the following potential strategies:

- source control
- monitor and evaluate
- mechanical dispersion
- oiled wildlife response
- scientific monitoring
- waste management.

What impacts are expected?

Spill response operations may be required at any location within the EMBA. Potential environmental impacts include:

- Noise and light emissions – generated by response vessels and equipment which may impact marine fauna, such as fish (including commercial species), marine reptiles and marine mammals
- Atmospheric emissions – generated from response equipment and vessels are expected to be localised and are not considered to create emissions on a scale where noticeable impacts would be predicted.
- Operational discharges and waste - generated from response equipment and vessels are expected to be consistent with those of normal commercial vessel operations and may create a localised and temporary reduction in marine water quality. Cleaning of oil-contaminated equipment, vehicles and vessels has the potential to spread oil from contaminated areas to areas not impacted by a spill. Sewage and other waste will be generated from offshore activities at temporary staging/mooring areas, which may include toilet and washing facilities. These wastes have the potential to impact water quality, impact habitats, and reduce the aesthetic value of the environment, which may be within protected areas.
- Physical presence and disturbance - operating vessels during spill response operations has the potential to disturb the physical environment and marine habitats and fauna (e.g. vessel strike, behavioural changes) or cause disruption to other marine users, coastal areas, townships and commercial fishing.

How will Santos manage impacts?

Santos will rely primarily on the implementation of the OPEP to manage the potential impacts associated with a spill response event. Other control measures that would be implemented include:

- procedure for interacting with marine fauna
- chemical selection process
- minimum lighting to meet maritime safety and navigation requirements
- air pollution prevention certification
- sewage and oily water treatment systems on vessels
- additional and ongoing consultation with relevant persons
- chemical dispersant application.

SUMMARY OF THE RISK MANAGEMENT STRATEGY

Santos has a management system that includes specific measures, to be used for the duration of the activities under the DPD EP, which seek to confirm that:

- environmental impacts and risks continue to be identified for the duration of the activity are reduced to as low as reasonably practicable and acceptable levels
- control measures are effective in reducing environmental impacts and risks to as low as reasonably practicable and acceptable levels
- environmental performance outcomes and standards set out in the EP are being met
- there will be ongoing appropriate consultation with relevant authorities and other relevant interested persons or organisations
- the roles, accountabilities and responsibilities are defined and understood
- workforce training is completed and competencies assured
- emergency preparedness and response arrangements are in place
- incident reporting, investigation and follow-up is monitored
- audits, inspections, reporting and notifications and document management are appropriately undertaken.

APPROVALS PROCESS

The Commonwealth Government's independent expert regulator for offshore oil and gas development, National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), accepted the Barossa Offshore Project Proposal (OPP) in March 2018.

The DPD Project, specifically the proposed activities in Commonwealth waters, was not included in the Barossa OPP, as the initial intent was to tie the Barossa gas export pipeline directly into the existing Bayu-Undan gas export pipeline. The current intention is to preserve the existing Bayu-Undan pipeline for potential future use to facilitate regional carbon capture and storage. Santos has referred the DPD Project (including the portion of the Project in Commonwealth waters) to the Minister under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The DPD Project was determined to be a 'controlled action' on 6 December 2022. Approval of the DPD Project under the EPBC Act will constitute the government's 'project-level' environmental approval for the Project, with installation and operation of the DPD Project in Commonwealth waters to be subject to acceptance of activity-level EPs by NOPSEMA.

To be accepted by NOPSEMA, an EP must meet the requirements set out in the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (OPGGS Environment Regulations).

The DPD Project within NT jurisdiction requires primary approval under the *Environmental Protection Act 2019* (NT) (NT EP Act). Following a public comment period, the DPD Project referral under the NT EP Act was determined by the NT Environment Protection Authority (NT EPA) to require assessment by way of Supplementary Environmental Report (SER). The DPD Project SER has been submitted to the NT EPA and has undergone a public comment period. The SER is currently under assessment.

For the DPD activity in NT coastal waters, a DPD Construction Environmental Management Plan (CEMP) will be submitted to the NT Department of Industry Tourism and Trade (DITT) for acceptance under the PSL Act.

In order to meet its proposed schedule for the Barossa Gas Project, Santos is aiming to submit the DPD EP to NOPSEMA and the CEMP to DITT and, subject to regulatory acceptance, to commence activities in 2024. This timeline has been developed by Santos to meet this objective, while still providing a reasonable period for meaningful consultation, having regard to Santos's regulatory obligations and to feedback from relevant persons.

An overview of the various approvals required for the Darwin Pipeline Duplication Project can be found in the Commonwealth and Northern Territory Approvals Summary document.

SEEKING INFORMATION AND WHAT'S NEXT

In preparing an EP for submission to NOPSEMA, a titleholder must consult with each 'relevant person', including relevant Commonwealth, State and Northern Territory Departments or agencies and persons (or organisations) whose **functions, interests or activities** may be affected by the activity proposed to be carried out under an EP.

For more information about 'relevant persons' please scan this QR Code:



Relevant persons being consulted on EPs under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth) (OPGGS Environmental Regulations) should note that they:

- are entitled to be given sufficient information to allow them to make an informed assessment of the possible consequences of the activity on their functions, interests or activities;
- are entitled to be allowed a reasonable period for the consultation; and
- may request particular information provided in consultation not be published.

If you do ask this, Santos will respect that, and the information will not be published under the OPGGS Environment Regulations. Information we need to give to NOPSEMA to assess our plan will be provided in a separate report (rather than in the published EP).

Your input is important to Santos:

- so that we can understand the environmental values in the operational area and the environment that may be affected, and the environmental impacts and risks associated with the activity;
- to inform how consultation processes may need to be adapted for different relevant persons;
- to ensure that we provide information to people in an appropriate and accessible manner; and
- to assist with Santos' preparation of the EP.

If you think you may be a relevant person for the purposes of one of Santos' proposed activities in Commonwealth waters (OPGGS Act) or Northern Territory coastal waters (PSL Act), please contact Santos on **1800 267 600** or email offshore.consultation@santos.com to seek to be included in consultations and to provide feedback on how you would like to be consulted (if a relevant person). This can also be done using the form available by scanning the QR Code below:



www.santos.com/barossa/darwin-pipeline-duplication for more information on the Barossa Gas Project.



Further information and links

- DPD Project EPBC Act Referral - <https://epbcpublicportal.awe.gov.au/all-referrals/project-referral-summary/?id=08c67f84-cb47-ed11-bba2-00224818a87f>
- Barossa Offshore Project Proposal <https://www.nopsema.gov.au/sites/default/files/documents/2021-03/A598152.pdf>
- Barossa Offshore Project proposal appendices <https://www.nopsema.gov.au/sites/default/files/documents/2021-04/A598152.2.pdf>
- NOPSEMA Environment plan content requirements <https://www.nopsema.gov.au/sites/default/files/documents/2021-03/A339814.pdf>
- NOPSEMA Environment plan consultation requirements <https://www.nopsema.gov.au/sites/default/files/documents/Consultation%20in%20the%20course%20of%20preparing%20an%20Environment%20Plan%20guideline.pdf>
- NOPSEMA Consultation on offshore petroleum environment plans - Information for the community <https://www.nopsema.gov.au/sites/default/files/documents/Consultation%20on%20offshore%20petroleum%20environment%20plans%20brochure.pdf>
- Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 <https://www.legislation.gov.au/Details/F2023C00107>