

Otway Offshore Project

Seabed Assessment and Drilling Program 2019 - 2021

Information Sheet | June 2019



Project overview

Overview of activities

Beach Energy is planning further development of the Otway offshore natural gas reserves within existing Commonwealth offshore exploration permits and production licenses.

Activities will include:

- Seabed assessments to determine the suitability of the seabed for the drilling operations and installation of infrastructure to connect new production wells to the existing platform or pipeline
- Drilling of offshore exploration and production wells, up to 9 in total
- Inspections and modifications to existing seabed infrastructure to prepare for the new activities
- Tie-ins to connect new production wells to the existing platform and pipeline
- Plugging and discontinuing of one or more wells in the Geographe and Thylacine field

Where an exploration well is proven successful it may be converted to a gas producing well either as part of this drilling campaign or later. Commercially unviable wells will be plugged and discontinued.

Locations

All activities will take place in Commonwealth waters approximately 32 to 80 km from Port Campbell.

The map over the page shows the current known locations of seabed assessments and drilling activities, with some locations to be confirmed as planning progresses. Coordinates of all locations will be made available to relevant stakeholders after completion of planning.

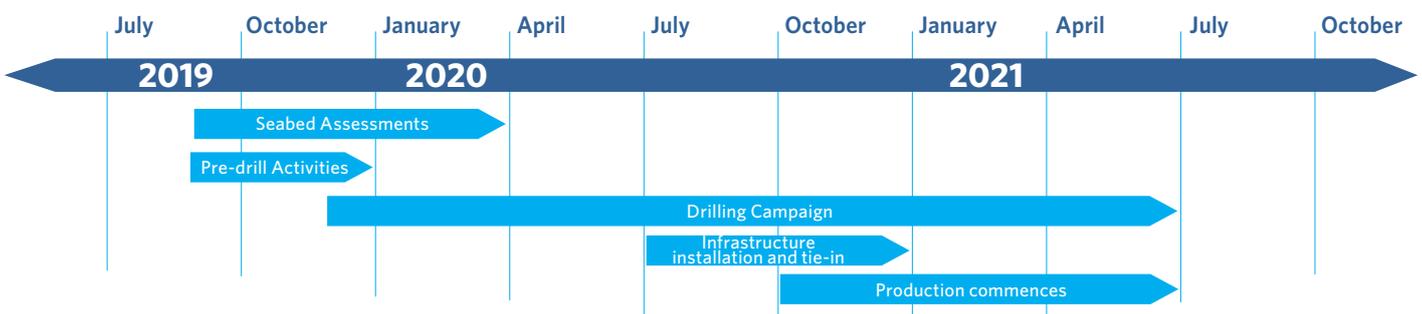
Project timeline

The below diagram outlines the activities starting from September 2019 and running over several phases through to late-2021. Approximate duration of key activities are:

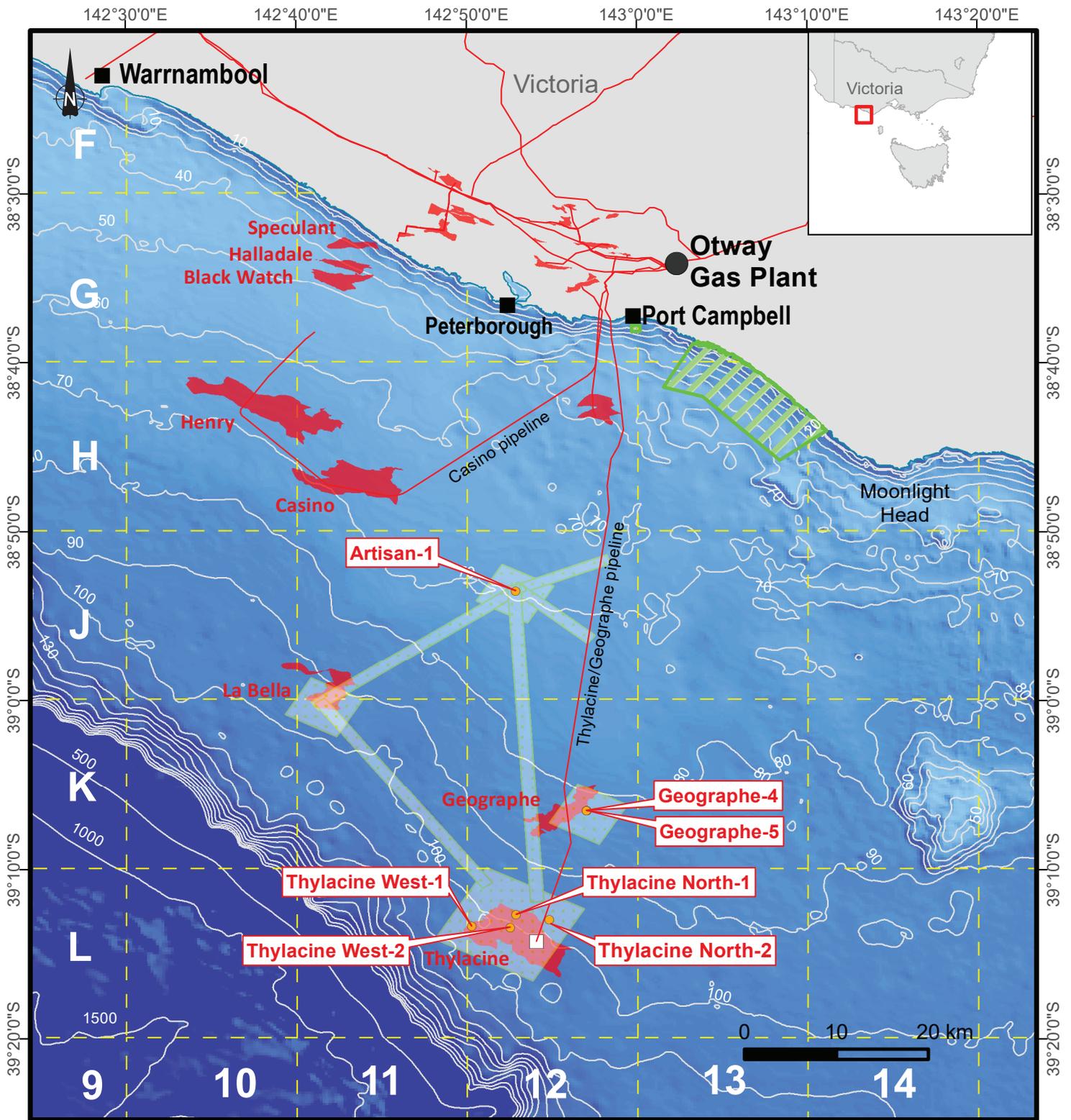
- Seabed assessments:
 - 4.5 x 5 km areas: 3 to 5 days
 - 9 x 9 km area: 8 to 12 days
 - 1 km wide tie-in paths: 3-5 to 5-7 days
- Exploration wells: 35 to 55 days
- Production wells: 70 to 90 days

Seabed assessments will be carried out over two phases, the first starting around September 2019 and the second starting around March 2020. Start dates and durations will be provided to relevant stakeholders after completion of planning and regulatory approvals. Exact timings will also depend on fair sea state conditions. Stakeholders will be provided with specific locations and timings prior to the commencement of the activity.

Project timing



Seabed Assessment and Drilling Locations



OT19-0032

Legend

- Proposed well
- Thylacine platform
- Proposed seabed survey area
- Gas pipelines
- Gas field
- Marine Reserve
- Fishing grid

(Final seabed site assessment and well locations to be confirmed)

Gas Development in Victoria's Otway Basin

The unique geological characteristics of the Otway Basin mean it is an abundant source of natural gas which has been produced in the region for many years. Further activities, including offshore drilling, are being planned for the Otway Offshore Project and this information sheet provides an overview of the proposed activities, the regulatory framework for safety and environment protection, potential impacts and risks in carrying out these activities, and measures to reduce and manage them, in accordance with Commonwealth regulations.

The Otway Offshore Project includes existing:

- offshore gas fields
- an offshore platform, wells and subsea infrastructure
- seabed and onshore raw gas buried pipeline
- and a gas processing plant near Port Campbell

The development commenced in 2004 by Woodside Petroleum Ltd under a joint venture arrangement with first gas produced in mid-2007. In March 2010, Origin Energy Resources Ltd commenced operatorship of the joint venture (later changing its name to Lattice Energy). In January 2018, Beach Energy acquired Lattice, which included the Otway Offshore Project.

Beach Energy is planning to carry out further activities in the Otway Basin to ensure continued production at the Otway Gas Plant, which will help ensure natural gas supply for Victorian households and businesses.

To date, three development phases have been completed to enable production at the Otway Gas Plant: construction of the gas plant; construction of the Thylacine offshore platform; and the development of the currently producing gas wells. To maintain natural gas production, further phases to develop additional offshore wells are being planned.

Otway Offshore Project Information

Environment protection

Beach Energy recognises the environmental, heritage, social and economic values in the areas in which we operate.

The environment in which the activities will be conducted is characterised by:

- Water depths ranging from 60 to 200 metres



The Thylacine platform in the offshore Otway Basin (showing drilling rig and tug boats in the background).

A variety of marine fauna including the potential presence of:

- Blue, humpback and fin whales, particularly during the summer months
- Southern right and minke whales, particularly during the winter months
- Common dolphins and sharks species throughout the year
- New Zealand and Australian fur seals throughout the year
- Loggerhead, green turtle and leatherback turtles throughout the year
- Commonwealth managed fisheries, including: southern and eastern scalefish and shark; and southern squid jig fishery
- Victorian managed fisheries, including: rock lobster and giant crab
- Commercial shipping activity

The Australian Marine Parks, Apollo and Zeehan, and State Marine Protected Areas, Twelve Apostles Marine National Park and The Arches Marine Sanctuary, are outside the proposed activity areas at a minimum distance of 20km.

Beach is in the process of developing Environment Plans for the proposed activities which must be accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) before any activity can commence.

Activities will be carried out in accordance with relevant Commonwealth and State safety and environmental legislation.

Environment protection - continued

The Environment Plans will be comprehensive and detail the environment that may be affected by the activities and how Beach will conduct the activities to ensure that potential impacts and any residual risks are reduced to "As Low As Reasonably Practicable" (ALARP) and of an acceptable level.

In developing the Environment Plans, relevant up-to date technical and scientific studies will be taken into consideration, along with stakeholder feedback.

When conducting offshore activities, there is an unlikely risk of release of hydrocarbons (which are primarily gas) or a spill from vessels in the event of an accident. Beach Energy will review its existing Oil Pollution Emergency Plan (OPEP) to ensure it includes potential spill risks associated with the proposed activities. The OPEP forms part of the Environment Plans required to be accepted by NOPSEMA for each activity.

Preparing an OPEP involves using hydrocarbons spill modelling information for the local area using the most conservative credible case scenario. The modelling calculates the transport, spreading, entrainment and evaporation of spilled hydrocarbons over time, based on the prevailing wind and current conditions and the volume and physical and chemical properties of possible spills event. The plans also assess the likelihood and consequences of any oil spill which must be reduced to ALARP through a range of control measures and include detailed response plans.

Further information on the environmental requirements for offshore petroleum activities may be found on NOPSEMA's website: www.nopsema.gov.au.

Beach Energy values stakeholder consultation and feedback and it is an important part of the process of preparing Environment Plans. This information sheet has been prepared to inform stakeholders, invite feedback and seek consultation with those who may be affected by or who have an interest in the proposed activities for maintaining gas production for Beach Energy's Otway Offshore Project.

Maritime safety

Safety is paramount. The marine vessels and drill rig contracted by Beach Energy will operate in accordance with Australian Maritime Standards, regulated by the Australian Maritime Safety Authority (AMSA) and will have their specific safety cases reviewed and accepted by NOPSEMA. This includes adherence to the following protocols at sea:

- Notifications to AMSA will be issued by the vessel contractor and drilling rig operator before they mobilise to the permit areas, and before demobilisation
- Communication with other vessels and marine users will occur using standard maritime protocols
- Safe operating distances will be maintained around all vessels and drilling rig at all times

Exclusion zones

The activities will occur among commercial shipping routes and designated Commonwealth and State fisheries which cover vast areas, whereas the seabed assessments only require access to relatively small areas for short periods of time.

During drilling, all vessels are required to be aware of a 2 km radius cautionary zone around the drilling rig, overlaid by a temporary 500 m safety exclusion zone around the drilling rig. This formal safety exclusion zone will be communicated via a 'Notice to Mariners' placed with Australian Hydrographic Office (AHO) outlining the exclusion zone and timeframe for the activities. The safety exclusion zone will be monitored by supporting vessels once the drilling rig is anchored into position.

The cautionary zone is to allow for anchors, mooring chains and wire to be placed within the operational area during the drilling program. Exact locations of mooring chains and anchors will be made available at commencement of drilling each well. To avoid entanglement and safety risks, fishing nets, lines or pots should not be placed near seabed assessment areas or drilling exclusion zones.

We are committed to minimising the impact of our activities and will consult with commercial fishers on arrangements to ensure each other's operational plans are understood, helping to minimise any impacts to fishing activities and to Beach's offshore development program.

Seabed site assessment phase

Objective

The objective of the seabed site assessments is to determine suitable locations for anchoring and rig placement for drilling operations and the installation of infrastructure to connect new production wells to the existing platform or pipeline. Various techniques such as seabed grab samples, the use of echo sounders and sonars will be used to study the seabed and identify possible hazards from man-made, natural and geological features.

Approach and equipment

Seabed site assessments use a variety of methods to:

- Map the seabed and features on and immediately below it
- Accurately measure water depth, water temperature and topography across the seabed
- Identify any objects on the seabed or immediately below it which may compromise the positioning of a drilling rig

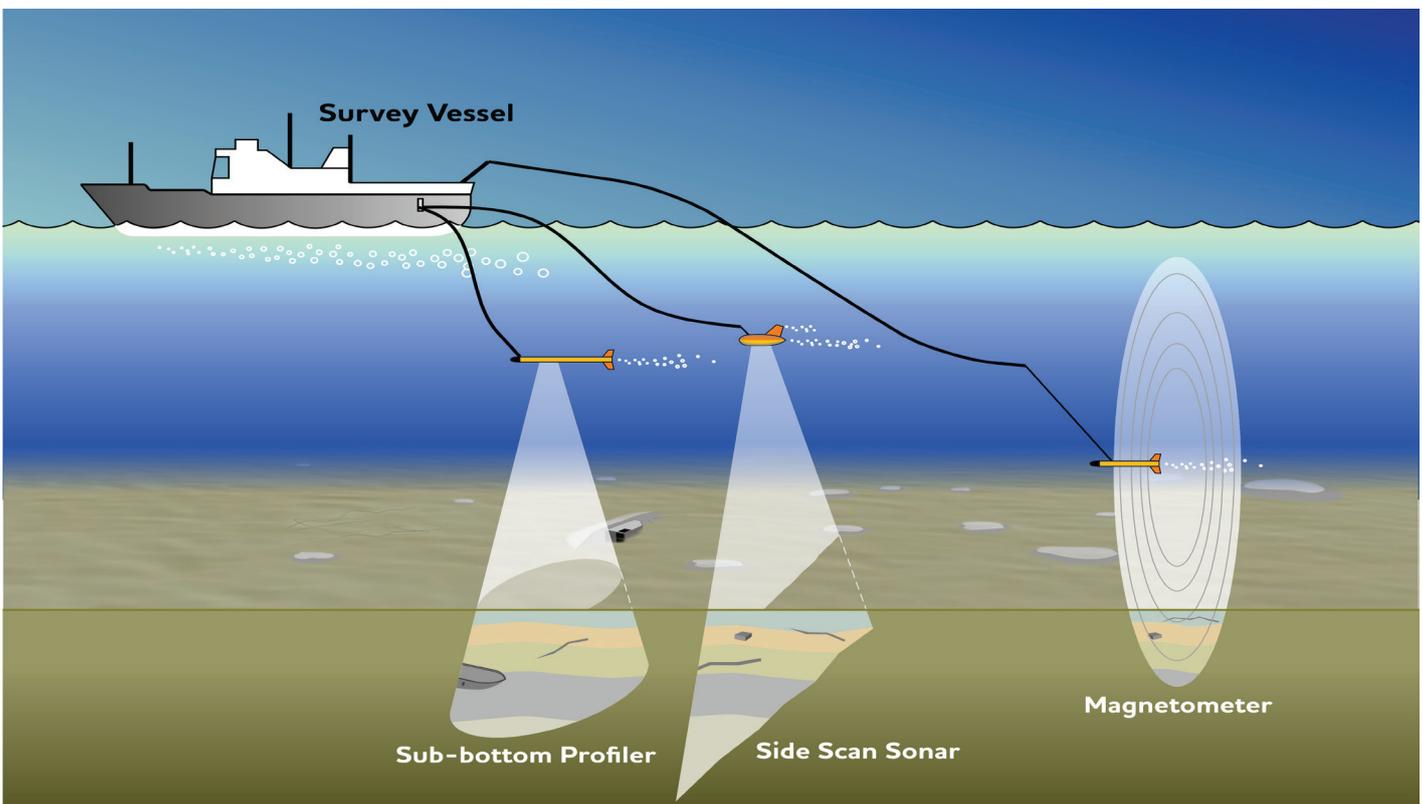
During the seabed site assessment, the survey vessel may use a range of equipment, such as:

- Single-beam dual-frequency echo sounders, to measure water depths

- Motion-corrected multi-beam echo sounders, to conduct bathymetry mapping of water depths
- High-resolution side scan sonars for delineating seabed features
- Sub-bottom acoustic profilers used to acquire and assess features immediately below the seabed
- Marine magnetometer, to detect and map ferrous objects such as sunken ships, anchors and pipelines
- Seabed grab samples may be taken at the seabed, and core samples may be taken as far as 6m below the seabed to confirm if the seabed will be suitable for the drilling rig to anchor and the subsea infrastructure to be installed

There is a range of commonly used techniques and equipment suitable for different marine environments. The diagram below shows a common setup for seabed site assessments.

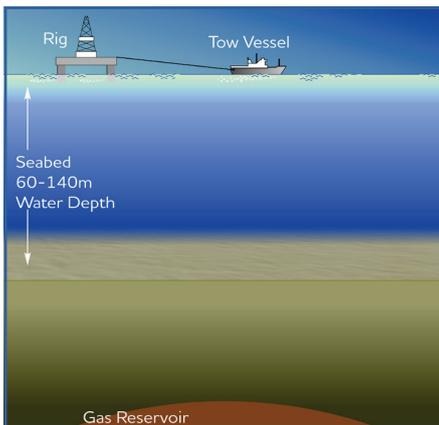
Sound from the seabed site assessment equipment is significantly lower intensity than that produced from seismic surveys. An assessment of sound impacts on marine fauna is currently being undertaken and information will be provided to stakeholders when available.



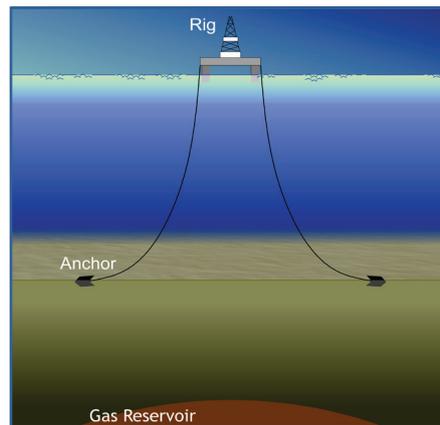
Common site assessment equipment. Source: Innerspace Exploration Team (Illustrative only, not to scale)

Drilling phase

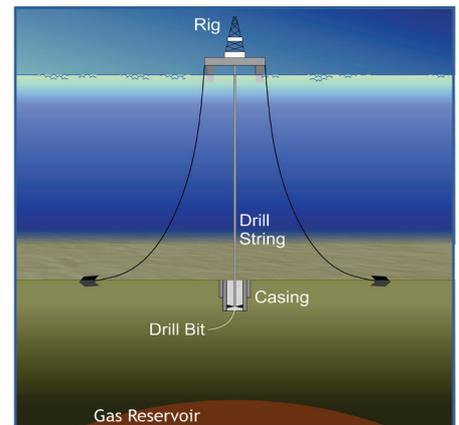
How it all works



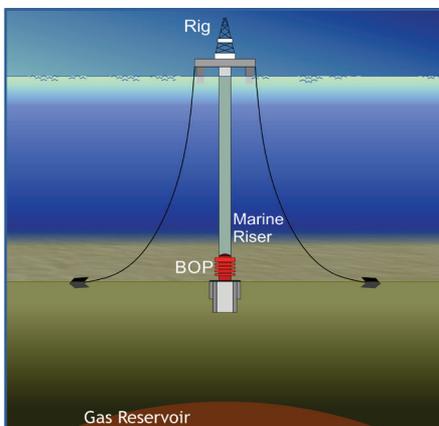
1 Rig towed to site



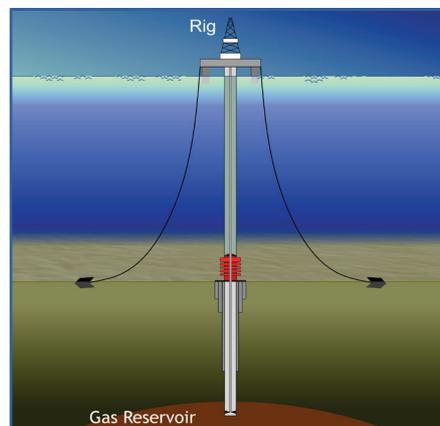
2 Anchors laid on seabed



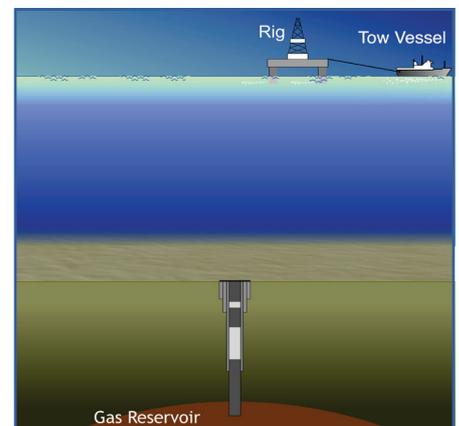
3 Surface hole constructed (drilled and cased)



4 Marine Riser and Blow Out Preventers (BOP) run to seabed



5 Drill and construct well to gas reservoir



6 Well suspended or discontinued and rig towed away

An outline of the drilling process that will be used in the offshore Otway Basin drilling program

The offshore Otway Basin gas exploration and development program may drill up to 9 wells using a contracted semi-submersible drill rig, over a twelve to eighteen month period.

Additional seabed infrastructure will also be installed to tie-in new wells after the drilling phase.

Two different types of wells are proposed as part of the drilling program:

- **Exploration well**

The first well drilled into a prospective gas reservoir to prove if hydrocarbons exist.

- **Production well**

A well that has successfully reached a proven reserve and will supply raw gas for processing. A tie-in would be constructed from the well to the existing seabed pipeline, which crosses the shore at the rifle range near Port Campbell and connects to the onshore gas pipeline (PL250) through to the Otway Gas Plant.

Approach and equipment

A semi-submersible drilling rig will be used to drill each well. Broadly, the steps involved in mobilising the drilling rig and drilling a well include:

- Using up to two tugs to tow the rig into place using designated shipping channels where possible
- Anchoring the rig to the seabed at sites that are environmentally and physically suitable, determined from the seabed site assessment
- Anchors may be pre-laid at locations prior to drill rig mobilisation
- Drilling the well to access the gas reservoir beneath the seabed
- Moving the rig from one well to the next at the completion of drilling and repeating the anchoring and drilling process
- Towing the rig to an agreed demobilisation point once all wells have been drilled safely and successfully

Vertical Seismic Profiling (VSP) is an evaluation method that may be used to validate one of the exploration wells after it is drilled.

As the name suggests, this technology produces a high resolution seismic profile along the well, and enables well data to be correlated with the surrounding conventional seismic surveys. The technology works by using a small seismic energy source at surface near the well and receivers in the wellbore that record the signal. If a VSP is required, sound levels will be assessed to enable an impact assessment and any mitigation plans that may be required.

Drilling operations

Offshore drilling operations typically use both water based and synthetic based fluids to lubricate and stabilise the wellbores in each section, as well as to remove material produced through drilling called cuttings via circulation.

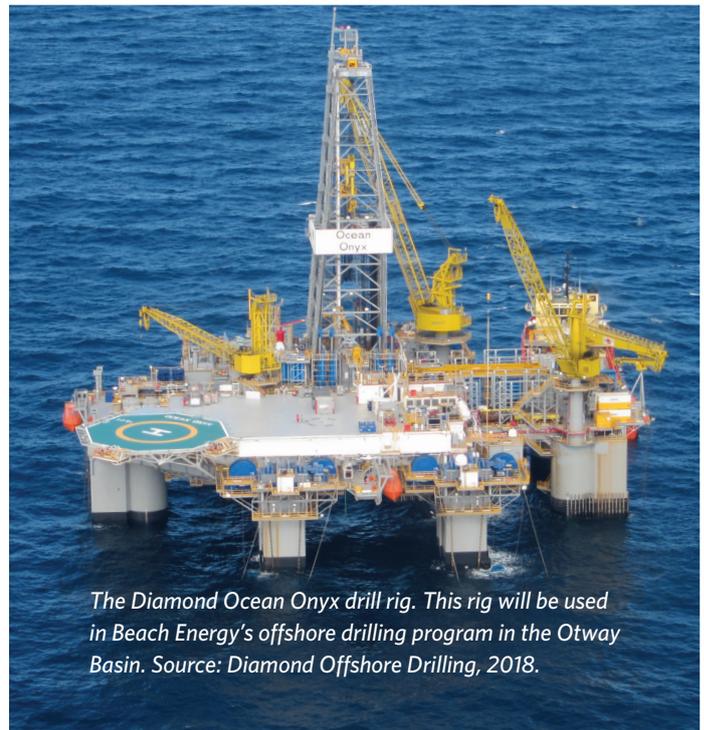
Water based mud will be used in the upper drilling sections to remove extracts of sedimentary layers called cuttings. These cuttings will not require any treatment and will be deposited onto the seabed.

Synthetic based fluid will be used in the lower drilling section and produces cuttings that will require treatment to recover the fluid from the cuttings. The cuttings will be processed on the drilling rig before they are discharged overboard where they will settle rapidly on the seafloor around the well site. The cuttings will contain small levels of base fluid, which will quickly biodegrade. This is standard industry practice in Australia.

Offshore drilling also requires the installation of some specialised equipment to ensure integrity of the well and safety of the personnel post drilling of the surface hole.

Equipment such as a marine riser and blow out preventers (BOP) will be installed in order to prepare for drilling the reservoir.

Once the drilling of a well is complete, if successful, the well will be commissioned and brought online to produce gas (a production well), or suspended for future access (exploration well). Commercially unviable wells will be plugged and discontinued.



Questions and Answers

Why was this area chosen for gas exploration and development?

Beach Energy holds offshore exploration permits and is required to complete exploration activities within timeframes set by the Commonwealth National Offshore Permit Titles Administrator (NOPTA). Beach Energy also has existing production permits and offshore gas facilities in the area already extracting hydrocarbons and operates a gas processing plant near Port Campbell producing natural gas from these reservoirs. The proposed activities will enable ongoing gas supply for the Victorian market.

Are seabed assessments or VSP the same as a seismic survey? What is the difference?

No, these activities are not the same as a seismic survey which uses different technology to map the geology several kilometres below the seabed. The seabed site assessments only map the surface and immediately below the surface, using echo sounders, sonars and a sub-bottom profiler which operate at a much lower energy (intensity) and medium to higher frequency compared to those used in seismic surveys.

What is an Environment Plan and who will assess it?

An Environment Plan is required under the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (the Regulations) to conduct petroleum activities in Commonwealth waters.

The contents of an Environment Plan are set out in the Regulations and must include a description of the existing environment and the proposed activity, an evaluation of the impacts and risks associated with the activities, environmental performance outcomes and standards, implementation strategy, and reporting requirements.

An Environment Plan must also include an Oil Pollution Emergency Plan (OPEP) for managing any hydrocarbon release. Environment Plans are assessed by the Commonwealth National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

What is ALARP?

ALARP stands for "As Low As Reasonably Practicable". It is an assessment principle commonly used in the oil and gas industry to assess and reduce potential risks and impacts that cannot be completely eliminated. For information on how NOPSEMA assesses ALARP see: <https://www.nopsema.gov.au/about/our-regulatory-activities/>

What does an Oil Pollution Emergency Plan cover?

An Oil Pollution Emergency Plan describes the arrangements for responding to and monitoring any release of hydrocarbon and includes:

- The control measures necessary for rapid response
- Response arrangements and capability in place to ensure rapid implementation and provide for the ongoing maintenance of capability
- Response arrangements and capability in place for monitoring oil pollution to inform response activities as well as monitoring the effectiveness of these activities

These arrangements are based on the worse case spill event associated with the proposed activities to ensure that Beach Energy has the appropriate level of response arrangement and capability.

Will an exclusion zone exist?

The work will occur among commercial shipping routes and designated Commonwealth and State fisheries. Each fishery covers a vast area, whereas the seabed assessments will only require access to relatively small areas as follows:

- 4.5 x 5 km areas: 3 to 5 days at a time
- 9 x 9 km area: 8 to 12 days
- 1 km wide tie-in paths: 3 -5 to 5-7 days at a time, depending on the length of the path

To avoid entanglement and safety risks, fishing nets, lines or pots should not be placed near a seabed site assessment.

During drilling, all vessels are required to be aware of a 2 km radius cautionary zone around the drilling rig, overlaid by a temporary 500 m safety exclusion zone around the drilling rig. This formal safety exclusion zone will be communicated via a 'Notice to Mariners' placed with Australian Hydrographic Office (AHO) outlining the exclusion zone and timeframe for the activities. The safety exclusion zone will be monitored by supporting vessels once the drilling rig is anchored into position.

Beach Energy is committed to minimising the impact of its activities and will consult with commercial fishers on arrangements to ensure each other's operational plans are understood, helping to minimise any impacts to fishing activities and to Beach's offshore development program.

How will you reduce the risk of collision with other vessels?

The marine vessels involved in the activities will operate in accordance with Australian Maritime Standards and ensure safe operations by:

- Having operational and navigation lighting on all vessels
- Maintaining a 24-hour shipping radar watch
- Ensuring vessels have a crew to maintain 24-hour visual, radio and radar watch for other vessels
- Equipping vessels with navigation lighting and movements that comply with maritime standards
- Monitoring and managing safety and exclusion zones

1: Day, R.D., McCauley, R.M., Fitzgibbon, Q.P., Hartmann, K., Semmens, J.M., Institute for Marine and Antarctic Studies, 2016, *Assessing the impact of marine seismic surveys on southeast Australian scallop and lobster fisheries*, University of Tasmania, Hobart, October. CC BY 3.0.

Will the activities affect whales and dolphins?

Any impact is expected to be low and only in the area around each well site. Due to the slow movements of the vessels within each well site area and the noise generated from the vessels, marine fauna are likely to hear the equipment and vessels and avoid it. The seabed assessment equipment operates at high frequencies generally outside the hearing range of whales. Dolphins may hear the higher frequency sounds. However, given the low intensity downward direction of the equipment's beam, any impact to dolphins is expected to be low during the assessment activity.

Avoidance of whales and dolphins will be undertaken in accordance with the Environment Protection and Biodiversity Conservation (EPBC) Regulations (2000), including adherence to speed and distance requirements.

What about rock lobsters?

Sound from the seabed site assessment equipment will be a significantly lower intensity than seismic surveys and sound modelling identified that sound levels will not reach the impact level referred to in the Day et al Report¹ at the seafloor and therefore impacts on rock lobster are not predicted.

There will be minimal impact from drilling activities given the wells are usually on flat seabed and avoid typical rock lobster habitat.

Will the site assessments or drilling impact upon commercial fishing?

The seabed site assessments will be located within existing designated Commonwealth and State fisheries that may be used by commercial fishers. Each fishery covers a vast area, whereas the seabed assessments will only require access to relatively small areas as follows:

- 4.5 x 5 km areas: 3 to 5 days at a time
- 9 x 9 km area: 8 to 12 days
- 1 km wide tie-in paths: 3 -5 to 5-7 days at a time, depending on the length of the path

The well sites are located within existing designated Commonwealth and State fisheries that may currently be used by commercial fishers.

During drilling, a 2 km radius cautionary zone will be in place, overlaid by a temporary 500 m safety exclusion zone which will be communicated to all fishing stakeholders. To avoid entanglement and safety risks, nets, lines or pots should not be placed near seabed assessment areas or drilling exclusion zones.

We are committed to minimising the impact of our activities and will consult with commercial fishers on arrangements to ensure each other's operational plans are understood, helping to minimise any impacts to fishing activities and to Beach Energy's activities.

Will the drilling impact shipwrecks?

The drilling program will not impact any known shipwrecks. Prior to any drilling commencing, Beach Energy will have conducted a seabed site assessment process to ensure a detailed understanding of the marine environment of each well site. Any new information confirmed will be provided to relevant authorities.

How does the drilling rig work?

Beach Energy will use a typical semisubmersible drilling rig that is used in Australian waters. It can operate in waters up to 3,000m deep, drill for gas at up to 10,000m deep and can accommodate around 150 crew.

Once the drilling rig is in position and anchored at the well site, the drilling process is expected to use four or five stages of drilling, starting with a 36- inch drill head. Drilling will then reduce in diameter to consecutively smaller sizes until it reaches the end target depth.

For each section, a casing will be placed in the hole and cemented, then a smaller drill will be run through the casing to drill a smaller hole to the next target depth and the process repeated until the wellbore is completed.

How is the drilling rig secured?

Once the drilling rig has been towed to the well site, supported by an 'anchor handling vessel', the tug boats will run out eight anchoring lines which may extend to a kilometre. Specifically designed marine anchors, around 15 - 20 tonnes each, will be used to moor the drill rig. Positioning of the anchors will be determined by a rigorous mooring analysis, based on the results of the seabed site assessment and year-round weather data for the area.

How long will drilling take and when will you start?

It is expected that each exploration well will take between 35 to 55 days. Each production well will take between 70 to 90 days. Drilling is expected to start around late-2019 to early-2020, depending on final project planning decisions, regulatory approvals, and fair sea state conditions. The entire drilling program will take around 12 to 18 months.

What happens after the wells are drilled?

After the proposed production well is drilled and commissioned, the hydrocarbons within the reserves will flow through the pipeline via a small tie-in to be constructed from the well to an existing seabed pipeline, to the Otway Gas Plant for processing. These reserves are expected to produce for several years. Other wells in this drilling program will be suspended for future use, by placing a standard wellhead of around one to two metres high from the seabed. Positions of wellheads will be notified to Australian Hydrographic Service and recorded on sea charts. If a well is to be plugged and discontinued due to limited gas prospectivity, multiple cement plugs will be installed within the well to isolate both water and gas zones and permanently seal the well. A cement plug will be installed at the seabed and all casings will be cut at least 2m below mudline, to ensure that the seabed is returned to the same condition prior to drilling.

Will the drilling rig be visible from land?

The drilling rig and support vessels, will have low visibility from the land and may appear similar to other shipping activity. Gas flaring will be required for the proposed production wells. Given the significant distance from shore, the flaring is not likely to be visible. Flaring is a common and necessary part of the gas production process, carried out to safely combust excess gases.

How many people will work on the drilling rig?

There will be up to 150 crew on the drilling rig at any one time. The crew will be transported to and from the rig

via helicopter. The helicopter will take a direct path to the drilling rig and will fly at an altitude unlikely to cause disturbance to activities on the ground or sea surface.

What are drill cuttings? How are they dealt with?

Drill cuttings are the extracts of sedimentary layers that emerge from the drilling process and will range from very fine to coarse sizes. Cuttings will not require any treatment during the top hole section drilling and can be deposited onto the seabed.

Cuttings that will contain synthetic based drilling fluids will be processed on the drilling rig before the cuttings are discharged to settle rapidly on the seafloor. Marine mammals and fish may transit through these areas but will usually avoid the disturbance. Any exposure to suspended sediment before it settles on the seabed would be highly localised and temporary due to high dilution and fast dispersal in the water column.

What will Beach Energy do to ensure safety is maintained on the drilling rig?

Beach Energy is committed to best practice safety standards. All drilling rig operations will be managed in accordance with the dedicated Safety Case for the drilling rig, to be accepted by the regulator NOPSEMA, as per the requirements of the Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009 (OPGGs).

For more information on Safety Cases see: <https://www.nopsema.gov.au/safety/safety-case/>

Consultation

Beach Energy values stakeholder consultation and feedback, and it is an important part of preparing our Environment Plans for acceptance. The purpose of consultation is to understand how different stakeholders' functions, interests and activities may be affected by the seabed site assessments, drilling program and associated activities.

Beach Energy will consider all feedback, including any concerns and objections. Measures will be explored to reduce any impacts and risks, and responses will be provided to stakeholders. All feedback will be considered alongside technical and environmental assessments as the Environment Plans are prepared for submission to NOPSEMA.

From 25 April 2019, all Environment Plans will be publicly available on the NOPSEMA website: <https://www.nopsema.gov.au/> with exploratory drilling Environment Plans relevant to the activities described in this information sheet available for public comment for a period of 30 days after they are submitted to NOPSEMA for assessment.

Please be advised that all stakeholder feedback, records of consultation, copies of correspondence, including emails, will be communicated to NOPSEMA in the preparation of the Environment Plans as required by legislation.

If you are seeking further information about this project specific to your functions, interests or activities, or wish to provide feedback, please contact us. Beach Energy invites consultation with stakeholders potentially affected by the survey or the drilling, including those stakeholders with specific local knowledge or an interest in the environmental performance of this project. Feedback and consultation will inform the development of the Environment Plans.



Contact us

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beachenergy.com.au/vic-otway-basin/