# Haselgrove-4DW1
## Appraisal Well


Update | February 2020

## Well overview

### Haselgrove-4DW1 is located within the Penola Trough in the onshore Otway Basin (PPL 62), South Australia. The well is located approximately 7km south of Penola, in close proximity to the existing Haselgrove wells.

The Haselgrove-4DW1 well will target natural gas in the conventional reservoirs of the Sawpit Sandstone. The well is designed as a deviated well, with the deviation to kick-off from within the Haselgrove-4 well which was drilled in mid-2019. The well is designed to target a different section of the Sawpit Sandstone.

After drilling to an approximate depth of 4000m, it is anticipated that the well will undergo evaluation and be suspended. Completion and testing is anticipated to follow in mid-2020, and if commercially successful it will be tied-back to the Katnook Gas Processing Facility.

The well is an 'appraisal well' because it will be used used in assessing the size of the Haselgrove Field following the Haselgrove-3ST1 discovery well drilled in 2017.

The well will not be fracture stimulated and will use safe and proven techniques.

## Key Timings

The Haselgrove-4DW1 well project is expected to commence in early 2020. A number of factors could affect the timing of operations including regulatory approvals, weather conditions and availability of contractors.

Operations will run over several phases with different levels of activity, vehicle movements and people on site. The busiest phase will be during drilling. Approximate timings for the different phases are estimated below:

| | |
|---|---|
| **Establish drill site:** | **2 - 3 weeks** |
| **Mobilise drill rig:** | **1 - 2 weeks** |
| **Drill appraisal well:** | **1 - 2 months** |
| **Demobilise rig:** | **1 - 2 weeks** |

Subsequent operations:

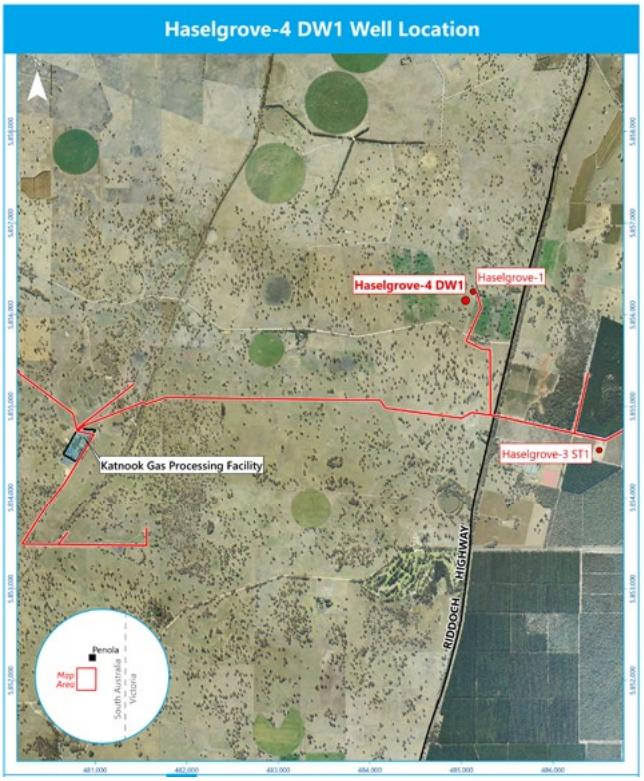
| | |
|---|---|
| **Well completion:** | **2 -3 weeks** |
| **Well testing:** | **2 - 3 weeks** |

# Haselgrove Field History

The Haselgrove Field was first drilled in 1994 by SAGASCO. Production from the Early Cretaceous Pretty Hill Formation first occurred in 1997, with 11 billion cubic feet of cumulative gas produced from the formation up until production ceased in 2011.

All wells prior to 2017 terminated in the Pretty Hill Formation and did not penetrate the Sawpit Sandstone.

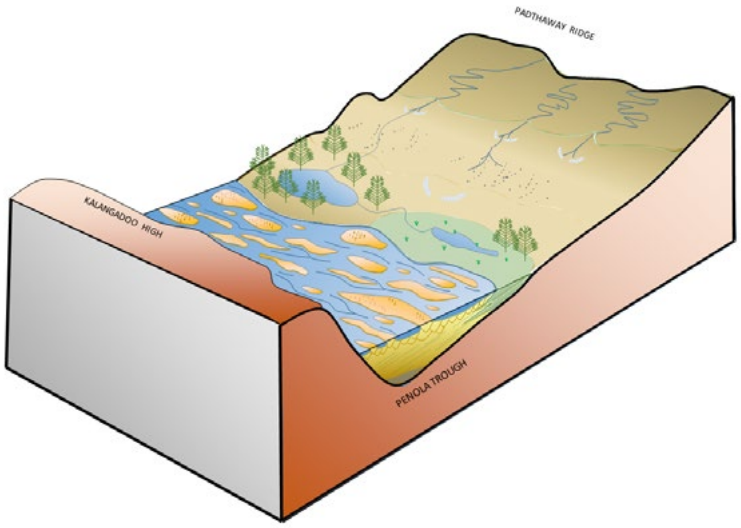
The Haselgrove-3ST1 well, drilled in 2017 by Beach Energy targeted a deeper sandstone reservoir – the Sawpit Sandstone. The Haselgrove-3ST1 well was a discovery well, encountering natural gas in the conventional Sawpit Sandstone, and has been connected to the refurbished Katnook Gas Processing Facility located 5.5km to the west. The natural gas will then be sold into local South East market to support residents and commercial businesses.




# The Sawpit Sandstone

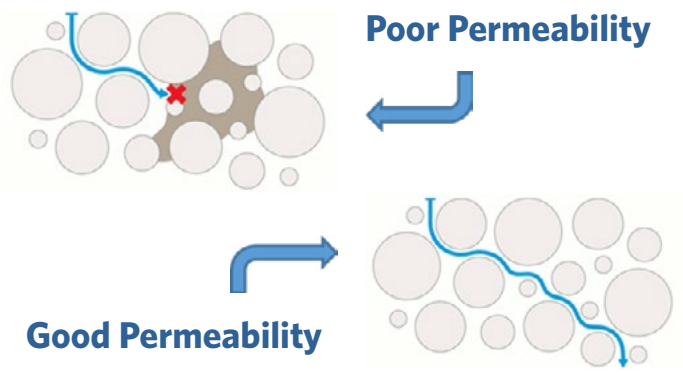
The Sawpit Sandstone forms part of a group of formations in the Otway Basin with similar lithological characteristics called the 'Crayfish Group.' The main exploration target over the last 20-30 years in the Crayfish Group has been the conventional Pretty Hill Formation.

The Sawpit Sandstone was deposited 5-10 million years before the Pretty Hill Formation and is comprised of a thick succession of meandering fluvial and stacked braided stream sandstones, as well as mudstones from ancient floodplains and lakes.




# Reservoir Properties

The property of a rock that describes its productivity is known as permeability. In the Haselgrove wells, the Sawpit Sandstone is dominated by medium to coarse grained sandstones with good porosity and permeability. This means that the high-pressure natural gas trapped in the pores (the microscopic space between sand grains) can flow from the reservoir rock into the well without the requirement for induced stimulation.




Permeability Image Source: Earth Resources – Understanding porosity and permeability. earthresources.vic.gov.au

# Safety and the Environment

For Beach Energy, the safety of our people and the local environment are the highest priorities. Beach operates within a highly regulated industry and must meet stringent environmental and safety standards.

Approvals are required under the *Petroleum and Geothermal Energy Act 2000* and the *Petroleum and Geothermal Energy Regulations 2013*. The Act embraces six key principles of certainty, openness, transparency, flexibility, practicality and efficiency. Compliance involves the preparation of an Environment Impact Report, a Statement of Environmental Objectives, and an Emergency Response Plan among other documentation.

# Our Traditional Custodians

Beach would like to respectfully acknowledge the People from the First Nations of the South East, the traditional custodians of the land on which the Haselgrove well is located. Beach respects their historical and ongoing connection to country through cultural and spiritual sites, language and ceremony, and would like to pay our respect to their Elders past, present and future.

Beach has regularly consulted with representatives of the People of the First Nations of the South East in the assessment of any potential impacts to native title and cultural heritage, and the development of any management plans that may be required.

# Community Consultation

Beach is committed to working with the local community, ensuring people are informed of proposed operations and can ask questions or raise issues about its projects if required. Stakeholder consultation is an important part of preparing the Environment Impact Report as it helps identify local issues and concerns and ensures our planning manages potential impacts.

Beach has ongoing engagement with local land holders and community members and is available to speak with anybody who would like further information or have any questions about this well. The regulator will be provided a report on all consultations with stakeholders in the course of developing the environment plans.

More information about the Haselgrove-4DW1 well, including a FAQ section on the regulatory approval process, our environmental objectives, the drilling operations and our climate change policy can be found online at beachenergy.com.au.

# Partnering with Communities

Beach recognises its intrinsic role in supporting the communities in which we operate and where our people live too. We focus on partnerships and programs that build sustainable and resilient communities with a particular focus on increasing young people's participation in STEM educational opportunities; supporting initiatives that protect and conserve local ecosystems; and promoting the health, safety and wellbeing of communities.

Beach has supported several community initiatives in the South East including:

- The Penola Bowling Club
- The Kalangadoo Community Sport Club
- The Penola Football & Netball Club
- The South Gambier Football & Netball Club
- The Ovation Centre of Performing Arts
- The Penola Men's Shed
- Women in Business & Regional Development
- The Limestone Coast Leadership Program
- The Penola Golf Club
- The 2019 Mount Gambier Science Alive!
- The Boandik Community Wellbeing Centre

Community groups or organisations looking to partner with Beach can find further information in the Community Investment Guidelines on our website, or by sending an email to partnerships@beachenergy.com.au

# Questions and Answers

## What does Beach Energy do?

In FY19 Beach was Australia's largest onshore oil producer and also supplied about 15 per cent of the east coast natural gas demand.

Beach Energy Limited (Beach) was established in the early 1960s by the late Dr Reg Sprigg, a highly regarded geologist, explorer and conservationist. Headquartered in Flinders Street Adelaide, Beach has operated and non-operated onshore and offshore oil and natural gas production across five producing basins in Australia and New Zealand. Beach is currently Australia's second largest oil producer and we supply about 15 per cent of the east coast natural gas demand.

## How much experience does Beach have in drilling wells?

Beach has over 50 years of experience in drilling complex, high integrity wells including directional drilled and horizontal wells. Whilst the Haselgrove-4DW1 natural gas well is a relatively straightforward well, each project has its challenges. Beach has a team of highly skilled natural gas industry professionals with extensive engineering experience to deliver this project. The well designs are highly engineered and factor in various complexities such as down-hole pressures, regional geomechanics, geotechnical obstacles and high temperatures. In-house risk assessments of these types of complexities are undertaken to determine the existing controls and the methodology for treatment.

## What approvals are required before you can drill in the South East?

Onshore petroleum exploration and development in South Australia is administered by the Energy Resources Division under the *Petroleum and Geothermal Energy Act 2000* and associated Regulations. The approval process involves the preparation of a Statement of Environmental Objectives (SEO) which identifies how environmental objectives will be achieved. An Environmental Impact Report (EIR) is also prepared which is used to identify potential risks and how those risks will be managed.

An extensive public consultation on the EIR and draft SEO is undertaken with the Environmental Protection Authority (EPA), the Department of Environment and Water (DEW), the Department of Planning, Transport and Infrastructure (DPTI), SafeWork SA, the Department for Health and Wellbeing (DHW), the Department of Aboriginal Affairs and Reconciliation (AAR), relevant statutory authorities, local councils, landowners, key stakeholders and the general public.

A detailed activity notification is then prepared and submitted, which includes an activity-specific environmental assessment against the approved SEO. A Notice of Entry is provided to affected landowners, and once an agreement is in place, and any land entry issues have been resolved, the Minister for Energy and Mining will issue an approval to commence activities.

## What's in the Statement of Environmental Objectives?

A Statement of Environmental Objectives can relate to either a specific activity carried out at a specific location; or an activity type (e.g. drilling, seismic activities, the construction of facilities and pipelines) carried out within a specific region. The *Petroleum and Geothermal Energy Act 2000* gives a broad definition of the environment to include the natural, social, cultural and economic aspects of the region.

An SEO must include objectives that relate to construction activities, operational activities, emergency response and management, rehabilitation in cases involving a serious or reportable incident, decommissioning, abandonment, rehabilitation, and dealing with the consequences of events associated with the relevant activities on the various aspects of the environment. An SEO must also include conditions and requirements for achieving the stated objectives, such as incident reporting requirements.

These features provide transparency to stakeholders on what is required of the licensee in terms of its environmental performance.

## What is a Notice of Entry?

In addition to the stakeholder consultation requirements in the preparation and approval of the Statement of Environmental Objectives, licensees are obliged under Part 10 of the *Petroleum and Geothermal Energy Act 2000* to give Notices of Entry (NoE) to all landowners 21 days prior to entering and commencing any activity on any land.

The NoE must contain a detailed description of what will be undertaken, sufficient information to enable landowners to reach informed decisions about the impacts and potential impacts the activities may have on the land, and sufficient information on the use and or consequential loss of use of the land by the landowner resulting from the activities.

Beach Energy does not enter land without permission of the landholder.

## What's in an Environmental Impact Report?

In accordance with Section 97 of the Petroleum and Geothermal Energy Act 2000, Licensees are required to prepare an Environmental Impact Report for proposed regulated activities. This document addresses the potential threats and risks on the environment and outlines the extent to which these threats are likely and manageable.

The types of assessments carried out cover potential environmental impacts such as cultural heritage; flora and fauna; landscape; surface and groundwater; geotechnical; air quality; noise; community impacts and consultation.

## Will the drilling impact the aquifers?

No. Proven drilling technologies will be used to protect sensitive zones, such as aquifers. The staged installation of casing and cement in the well bore will ensure that the regional unconfined and confined aquifers are isolated before the remainder of the well is drilled. The cement used to isolate the top-hole section is scientifically tested to ensure rigid specifications are met and reported to the regulatory authorities. The cemented casing also maintains the separation between the two aquifers.

## Can the natural gas get into the aquifers?

No. A natural gas well is typically drilled in 4 sections. Each section – surface-hole, top-hole, intermediate-hole and production-hole is drilled independently, cased, cemented in place, and pressure tested before moving on to the next section. The casing depths are selected in the design process to ensure an adequate safety margin between the formation fracture pressure and anticipated pressures during well control and casing cementation operations.

The casing and tubing within the well are designed to withstand the various compressive, tensile and bending forces that are exerted while running-in the hole. The casing also undergoes integrity analysis to ensure it can withstand the loads, pressures and temperatures that may act on them throughout the entire well life cycle.

When gas is finally flowed into the well during the testing phase of operations, there are 3 secure layers of steel casing and cement isolating the rock formation (and aquifers) from the gas flowing through the well.

## What happens when the natural gas has depleted?

The Sawpit Sandstone is made up of porous sediment which contains natural gas created from organic matter over millions of years. The natural gas is contained in the reservoir by a dense cap rock which essentially holds it in place underground. When a well is created, the natural gas flows freely from within the rock straight into the well because of the pressure differential. When the natural gas is depleted, the porous sandstone remains in place. A useful analogy is seawater draining through the sands on a beach front. The beach stays in place when the water recedes.

## Will the operations run day and night?

Site preparation works will be done during daylight hours only. The drilling, completion and testing phases of the well will be 24/7, as the method requires continuous drilling once it has started. Lighting will be minimised to the extent that is possible, given the safety requirements on site.

## Will the site impact livestock?

The drill site is fenced off to ensure livestock cannot wander onto the site. A livestock impact study was completed for the construction of two of Beach Energy's wells in Victoria. The report found that the cattle quickly habituated to the drilling activities and there were no quantifiable impacts identified. Consultation will continue with the landholders to minimise possible impacts on farm activity.

## Is there a fire or spill risk on the site?

All drilling projects have risks; however, these risks are closely managed. The regulatory approvals process requires all possible risks to be identified, quantified, and for management plans to be in place to ensure risks are reduced to an acceptable level. Beach Energy has maintained ongoing consultation with the local and Region 5 CFA brigades regarding site safety plans and emergency response procedures.

Beach has robust processes in place to minimise the occurrence of spills and to ensure appropriate management of accidental spills and leaks, in the unlikely case they occur. These processes include the appropriate storage of chemicals, containment of hazardous substances in appropriate vessels and bunds, training to ensure appropriate handling of hazardous substances, and testing of spill response and clean-up procedures.

Groundwater monitoring bores are installed at three locations around the well lease with testing of the groundwater occurring before, during and after drilling operations.

### Will there be a visible flare?

Yes. Over a one-to-two-week period, there will be several flaring events of between four to nine hours. Flaring is an ordinary part of the operations and is required to remove final drilling fluids and importantly, to measure production and pressure information to assess the well. Flaring is also an environmentally preferable method to venting. Community consultation will give advanced notice.

### Will the operations be noisy?

Yes, but only in the immediate area, and only during the site preparation, drilling, completion and testing phases. A noise study was undertaken at the previous Haselgrove-4 well site and confirmed that operational noise does not exceed guideline noise levels near the well site nor at nearby dwellings.

### Will there be any road closures?

No, the drill site will be on private land accessed from public loads. A traffic management plan will set out traffic routes and safety conditions as there will be a significant number of escorted haulage loads required to bring the drill rig and equipment to site. During this time, there may be traffic delays. Timings will be planned to minimise impacts and there will be community consultation to give advanced notice.

### How many people will be working at the site?

This will vary over the different operational phases. The busiest time is during the drilling when there will be between 50 to 70 people on the site at different stages. All staff and contractors entering the site have undertaken mandatory training which includes safety, environment, and community considerations.

### Where will those people stay?

A temporary accommodation camp will be established at a site close to the drill rig. This will allow the drilling crew to work in shifts. Other workers and contractors will travel to site on a work needs basis and will arrange local accommodation as required.

### How will you rehabilitate the site?

Once all drilling has been completed, all gas from the reservoir has depleted and the wells decommissioned, the site will be rehabilitated in line with the agreement with the landholder.

### Does Beach have a Climate Change Policy?

Yes. Beach Energy has a climate change policy commitment which includes measuring and reporting carbon emissions; identifying opportunities for carbon emission reductions; and setting targets to encourage innovation into low-emission technologies which can be adopted into our operations. For more information on our climate change policy, download our 2019 sustainability report on our website.

### Local Benefits

Beach has been very focussed on supporting the local economy, and in the last year, we have engaged with 45 local companies and our investment has supported close to 70 jobs across our operations. We continue to work closely with local SME's to develop their business and HSE management systems; building their capacity to capture larger contracts outside of Beach Energy's operations.

## Did you know?

Beach has established a system for monitoring and maintaining the integrity of all operational wells in order to provide assurance that the safety, environmental, regulatory and business risks associated with these assets are effectively managed.

The Beach well-stock is diverse; multiple well types exist (offshore platforms, offshore subsea, onshore gas and onshore oil) operating across multiple assets with multiple regulators. Several of Beach's wells have been constructed by other operators to different standards at time of construction.

In FY19, a project was undertaken to implement a best in-class Well Integrity Management System (WIMS) and associated standards covering Beach Energy wells. Information from all Beach wells are now stored in a database and made available to key technical and management staff via WIMS. Every operational well (including those that are shut-in or suspended) has been subject to a well integrity assessment based on international standards and the latest well monitoring records.

The use of WIMS is now mandatory for all Beach assets, and its use is overseen by an independent Technical Authority function.

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