Our EP in brief

Exploring safely for oil and gas in the Great Australian Bight

A guide to Equinor’s draft Environment Plan for Stromlo-1 Exploration Drilling Program

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Our EP in brief

This booklet is a guide to our draft EP for the Stromlo-1 Exploration Program in the Great Australian Bight. The full draft EP is 1,500 pages and has taken two years to prepare, with extensive dialogue and engagement with stakeholders shaping its development. We are committed to transparency and have published this guide as a tool to facilitate the public comment period. For more information, please visit our website.


What are we planning to do?

We are planning to drill one exploration well in the Great Australian Bight in accordance with our work program for exploration permit EPP39. See page 7.

Who are we?

We are Equinor, a global energy company producing oil, gas and renewable energy and are among the world’s largest offshore operators. See page 15.

Can it be done safely?

Over decades, we have drilled and produced safely from similar conditions around the world. In the EP, we demonstrate how this well can also be drilled safely. See page 14.

How will it be approved?

We abide by the rules set by the regulator, NOPSEMA. We are required to submit draft environmental management plans for assessment and acceptance before we can begin any activities offshore. See page 20.
What’s in it for Australia?
If oil or gas is found in the Great Australian Bight, it could be highly significant for South Australia. A report has found that it could create thousands of jobs, spur economic growth and generate billions of dollars in State and Federal tax income.

How we’re shaping the future of energy
How can an oil and gas producer be part of a sustainable energy future? And how can a company that claims to support the Paris Agreement, continue to explore for oil and gas?

How it works: exploring for oil
Where and when are we planning to drill? What equipment do we use? Learn all about our giant floating exploration rig and all the safety measures we put in place to minimise the chances of an oil spill.

What is the risk of an oil spill?
The chance of a major oil spill from our well is extremely low. We drill 30-40 exploration wells like this every year, and we have prepared for any scenario.
This document, ‘Our EP in brief’, is a shortened and simplified version of our full draft Environment Plan – Stromlo-1 Exploration Drilling Program (EP). It’s not part of our legal submission to the regulator, NOPSEMA, but is provided as a guide. In the case of any discrepancy, the full draft EP applies.

The EP has taken two years to develop, including co-funding extensive baseline surveying of the deep-water environments and the met-ocean conditions of the Great Australian Bight. Furthermore, this is the first time a draft EP for an offshore exploration well has been published before submission to NOPSEMA.

We have travelled across South Australia and beyond, holding more than 130 meetings with organisations with an interest in our offshore exploration project in the Bight. We wanted to engage broadly, listen and learn about local issues. We recognise that people have questions about our planned activity and want assurances it can be done safely. We also heard from many people who were excited about the opportunities it could bring to the region. We will continue to travel in the region and meeting with people in the community.

We consider that transparency is essential in building trust with communities. To that end, we decided to publish our draft EP in full, with a 30-day open public comment period prior to submission to NOPSEMA. Two years of consultation and engagement have shaped our approach and the content of this plan. We would like to express our gratitude to all the people and communities who have contributed through this process.

We hope you find the guide informative and useful, and welcome your feedback in the comment period.
Equinor has safely drilled more than 65 deepwater wells and operated for decades in stronger winds, higher waves and colder waters than the Great Australian Bight.
In June 2017, Equinor became the operator and 100 per cent equity owner of offshore exploration permits EPP39 and EPP40 located in the Great Australian Bight. The Stromlo-1 well location is situated in EPP39, about 372 km off the coast of South Australia and 476 km west of Port Lincoln. The water depth at the drilling location is 2,239 metres.

Since 2011, the Australian Government has awarded 11 exploration permits in the Great Australian Bight. Each permit has minimum work requirements (e.g. seismic surveys and drilling) that operators must complete to comply with the permit conditions. We are planning to drill one exploration well, Stromlo-1, as required by the conditions of our permit.

We will draw on our extensive offshore experience to drill the well safely using established techniques and technology. At the end of the exploration drilling program, we will plug the well and not conduct any further testing.

The drilling location has been selected after comprehensive analysis of geological and geophysical data from the area, from seismic surveys and from the 13 other exploration wells already drilled in the Great Australian Bight. We believe there could be a petroleum-based resource about 2,700 m below the seabed.

When will we drill?

We plan to start drilling in Q4 2020 once all the necessary safety and environmental regulatory approvals are in place. The exploration drilling will take place over approximately 60 days. The summer period is the best time of year for drilling in the Great Australian Bight as the meteorological and ocean conditions are most favourable.

The location for our proposed well is over 370 km from the nearest shore and 550 km from Kangaroo Island.
What’s in it for Australia?

We’re early in the exploration phase and we don’t yet know if we will find oil or gas. But if we do find oil or gas, it could offer significant benefits to Australia, regionally and nationally.

Energy is at the heart of modern society: heating, cooling, transportation, housing, lighting, food, health, education and resources for industry. The world needs more energy, and oil has been the world’s most used source of energy since the mid-1950s. However, the world—and Equinor—is in an energy transition. Read more about this on page 12.

Local economic benefits

South Australia has the potential to have a safe, sustainable and valuable offshore oil and gas industry if oil or gas is discovered in the Great Australian Bight.

South Australians can expect new jobs to be created as well as rich opportunities for local suppliers and contributions to tax revenue for the Federal and State governments.

Why do we want to explore the Great Australian Bight?

We have a good understanding of the geology in our licence area, based on high-quality 3D seismic data analysis. We believe there could be a working petroleum system within our permit area and we are well positioned to test this potential.

The best way to understand the potential benefits is to look at places where large discoveries have been developed. The Bass Strait oilfields near Melbourne and the North-West Shelf in Western Australia are two good Australian examples, where well-regulated and safe operations have provided economic development for decades.

Benefits and co-existence

Norway is another good example where oil and gas projects have yielded great benefits for the wider community. Other industries including fishing and tourism continue to flourish in Norway alongside oil and gas activities. We believe this could also be the case for South Australia.
Equinor has a long history of co-existence with other maritime industries and in environmental protection.
For over 40 years, we’ve operated successfully alongside fishing and tourism in Norway, creating thousands of jobs and boosting our nation’s economy. If oil or gas is discovered in the Great Australian Bight, it could bring significant economic benefits to Australia, regionally and nationally.
Potential benefits from petroleum development in the Great Australian Bight

In 2018, the Australian Petroleum Production and Exploration Association – APPEA – published a study by ACIL Allan, looking at the potential economic impacts from oil and gas in the Great Australian Bight.

Based on the base case assumptions:

**A$5.9 billion**

increase in GDP per year

Australia’s Gross Domestic Product (GDP) could increase on average by A$5.9 billion per annum.

**1,361 jobs**

In the construction phase, 1,361 FTE workers could be employed, more than were employed at Holden’s Elizabeth plant prior to its closure.

**6%**

increase in the size of the SA economy

A $5.8 billion increase in real output equates to a 6 per cent increase in the size of the South Australian economy, measured in 2016-17 figures.

**SA’s largest export**

At peak production, oil from the development would be easily South Australia’s largest export and be larger in value terms than the State’s top five exports combined in 2016-17.

**$1.7 billion tax income**

$1.7 billion in Commonwealth and State taxation payments per annum from the development is equivalent to the cost of three Adelaide Oval redevelopments every year.

The study has examined two possible production scenarios from the exploration permit areas in the Great Australian Bight: a ‘base’ case production scenario of 1.9 billion barrels of oil equivalent liquids, and a ‘high’ case production scenario of 6 billion barrels, a resource potentially equivalent to Bass Strait. Most of the economic dividends from these developments are expected to be realised in South Australia.

**Potentially South Australia’s largest industry**

Average annual output of A$5.8 billion per annum (base case) would transform the mining and resources industry into South Australia’s second largest industry. An average annual output of A$18.4 billion (high case) would increase the size of the mining and resources industry five-fold, making it South Australia’s largest industry.

**South Australia’s most valuable export**

At peak production, oil from the developments would be South Australia’s largest export, larger in value terms than the State’s top five exports combined in 2016-17.

**Up to three new Royal Adelaide Hospitals per year**

A$1.7 billion in Commonwealth and State taxation payments per year from the developments is equivalent to the cost of three Adelaide Oval redevelopments every year. A$7.7 billion in Commonwealth and State taxation per year is equivalent to the cost of three new Royal Adelaide Hospital developments every year.

Offshore exploration would create jobs in these and other areas:

- Transport and logistics
- Fuel supply
- Food services
- Construction.
How we’re shaping the future of energy

How can Equinor be part of a sustainable energy future?

Equinor embraces the need for change and the new opportunities that lie in the transition of the global energy market to a low-carbon future.

We use our experience and technology to provide energy to a growing population. We are committed to a future where energy is affordable and sustainable, and where we can offer products and services across a range of energy sources.

At Equinor, we actively support the UN Sustainable Development Goals and the Intergovernmental Panel on Climate Change’s (IPCC’s) scientific consensus on climate change, and we’re committed to a low-carbon future. We want to be part of the solution and we are changing from an oil and gas company to a broad energy company, using our offshore expertise for advances such as floating wind turbines which capture energy from rough windy sea environments. Our Climate Roadmap describes how we plan to achieve this and how we will develop our business, supporting the ambitions of the Paris Climate Agreement.

So why are we still exploring for oil and gas?

The world is in an energy transition and we need all the new renewable energy sources that can be developed. Still, every realistic energy scenario for the future requires new investments in oil and gas to meet current and predicted energy needs. We are working on two priorities in parallel: growing and innovating in renewables and reducing the carbon footprint from our oil and gas production. We believe the Bight could hold light, high-quality oil that aligns with our approach. Equinor is already producing oil and gas with low CO₂ emissions compared to the world average, with clear targets to improve further.

The International Energy Agency predicts that global oil demand will grow by around one million barrels per day on average each year to 2025, with demand peaking in 2040. Even after that, oil and gas will remain a key component of energy supplies, a fact that is acknowledged within the Paris Agreement. This will require new exploration and extending the production life of existing fields.

Equinor is investing in renewables and CO₂-reductions

We’re making substantial investments in offshore wind and solar power. We operate three wind farms off the coast of the United Kingdom, and we’re developing further large-scale offshore wind projects in the United Kingdom, Germany, Poland and the United States.

The IEA publishes the World Energy Outlook report each year. The New Policies Scenario is based on policies and targets announced by governments, while the Sustainable Development Scenario assumes that the world delivers on the Paris Agreement and Sustainable Development Goals 2015. Both scenarios show a continuing need for oil and gas resources in 2040. (WEO 2018).
We energise the lives of 170 million people. Every day.
The Sleipner Vest platform in the North Sea in heavy waves. Sleipner is a gas field 250 kilometres west of Stavanger, Norway, and the home of the world’s first commercial CO2 storage project.

One of the free-fall lifeboats installed on the Troll C platform. The Troll field contains large quantities of gas resources and is also the largest oil producing field on the Norwegian continental shelf.

We're also investing in solar power and carbon capture and storage (CCS). Our ambition is to direct 15-20 per cent of our investments into renewables by 2030. By 2020, up to 25 per cent of our research funding will focus on new energy solutions and energy efficiencies.

Our approach to safety

The Barents Sea, the Norwegian Sea, and offshore Canada have very similar conditions to the Great Australian Bight. After operating in these settings for decades, we have adapted our technology and developed our expertise to operate safely in these conditions. Safety is always our first priority.

We believe that all accidents related to people, environment and assets can be prevented, and our vision is zero harm to people and the environments we are operating in. We focus on preventing personal injuries and accidents, and the goal of zero injuries has become part of how we think and work, with a strong focus on continuous improvement.

Wherever we work, we have emergency preparedness on standby, we carry out stringent risk assessments of our operations, we integrate environmental and social risk management into our planning, and we adhere to high standards for emissions to air and ecosystems.

Although we are confident in our ability to prevent incidents, we always develop emergency response plans to be able to minimise the harm to people and the environment in the unlikely event of an accident occurring.

Our continual focus on safety has yielded results

![Graph showing serious incident frequency (SIF): serious incidents per million work-hours]

1.9
1.4
1.1
1.0
0.8
0.6
0.6
0.6
0.6
0.5


www.equinor.com

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Equinor is an international energy company present in more than 30 countries worldwide.

Founded in 1972 under the name Den Norske Stats Oljeselskap AS—Statoil (the Norwegian State Oil company), we changed our name to Equinor in 2018. Our headquarters are in Stavanger, Norway.

Our purpose
Turning natural resources into energy for people and progress for society.

Our vision
Shaping the future of energy.

Our strategy
Always safe, high value, low carbon.

Equinor facts
› 20,245 employees (2017)
› Norwegian State ownership: 67%
› Adjusted earnings: USD 18 billion (2018)
› Equity oil and gas production/day: 2.1 million boe (2017)
› Offshore wind: 290 MW in production, 190 MW in development
› Head office: Stavanger, Norway.

By 2020 we expect up to 25% of research funds to be devoted to renewable solutions & energy efficiency.

Aiming to achieve annual CO₂-emission reductions of 3 million tonnes by 2030 compared to 2017.

By 2030 renewable energy has the potential to constitute around 15-20% of investments/annual capex.

We are proud to have received the following recognitions and awards for our sustainability performance:
› MSCI Global Sustainability Index 2017: AAA-
› Rystad Energy Gullkronen: Green Initiator of the Year 2018
› STOXX Global ESG Leaders indices 2016: Component
› Investor Climate Compass: 1st place 2017, climate risk preparedness
› CDP: Performance band A-
› FTSE4Good Index 2017: Constituent
› Ethibel Sustainability Index 2018: Excellence Europe
› Ethibel Sustainability Index 2018: Excellence Global
› The Global Gas Flaring Reduction Partnership (GGFR) Excellence Award 2015
› Petroleum Economist Award 2015: Cleaner Energy Initiative

We have received a number of awards for our sustainability and safety performance:

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- Ethibel Sustainability Index 2018: Excellence Europe
- Ethibel Sustainability Index 2018: Excellence Global
- The Global Gas Flaring Reduction Partnership (GGFR) Excellence Award 2015
- Petroleum Economist Award 2015: Cleaner Energy Initiative
How it works: exploring for oil

Like all our exploration wells, this activity begins with years of geological surveys and analysis, technical planning and risk assessment. The drilling operation in the Great Australian Bight will be carried out using a drilling rig. Here’s how it works.

For drilling Stromlo-1 we will probably use a rig that floats on semi-submersible pontoons. It uses dynamic thrusters to maintain its position during the drilling program without any need for anchoring in deep water.

How do we drill?

Once the rig is on site, we will set up seabed transponders which send acoustic signals from fixed points on the seabed and allow the rig’s sophisticated dynamic positioning system, which controls eight thruster propellers, to keep the rig in place in any sea conditions.

The rig will lower the drill string and start drilling. The drill string has a number of sophisticated sensors to help us carefully control the drilling process. The top-hole of the well will be drilled to about 96 m, with drill cuttings (natural fragments of rock from the hole) and lubricating water-based drilling muds deposited to the seafloor around the well.

Once this top-hole is drilled, a sturdy steel casing is inserted into the hole and firmly cemented in place. A subsea wellhead will then be fitted to provide further control and stability. We will then drill through the cement plug, fit a smaller diameter casing and cement that in place. This process continues with progressively smaller diameter casings.

To understand how we would deal with an oil spill, see page 42.

Refer to Chapter 2: Activity Description in the EP.
A typical drilling rig

- Floats on pontoons that can be partially filled with water to provide ballast and stability
- Self-propelled using dynamic thrusters that keep it in position
- Uses a combination of satellite GPS, gyroscopes and seabed transponders to stay on location
- No need for anchors to keep it in place during the operation, but has anchors in reserve
- Can weigh over 50,000 tonnes
- Draft up to 25 metres
- Main deck is approximately 100 x 100 metres
- Speed during transit is up to 7 knots
- Can disconnect and move away quickly if necessary.
Installing the blowout preventer

A blowout preventer (BOP) will be installed on top of the subsea wellhead and a marine riser will be run down from the rig to the BOP. This riser will provide a closed-circuit for bringing drilling fluids and cuttings back to the surface for re-use and cleaning while drilling the lower sections of the well with synthetic-based mud.

Into the reservoir

The section of the well where we could find oil is called the reservoir, and this is the destination for our well. The reservoir is a thick porous sandstone layer, where hydrocarbons may be trapped in the pores. To determine the result of the well, we have chosen a simple data collection program which maintains the safety of the well.

What do we do at the end?

After the operation is finished, the well will be permanently sealed, irrespective of whether we have found oil or gas. We will leave the wellhead permanently in place after setting the final cement plugs. At this water depth, leaving the wellhead in place will not affect other marine users, like trawl fishers who are restricted to shallower waters.

What would we do if we found oil or gas?

If a commercial oil discovery is made, the type of development would depend on the nature of the find.

For more information about the blowout preventer and the measures we would use to prevent an oil spill, see page 42.
Equinor drills 30-40 exploration wells each year on average, and many more production wells.
How will we get approval for the drilling activity?

Drilling of the Stromlo-1 well can only proceed on acceptance of an EP by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

NOPSEMA administers the Commonwealth Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) and associated regulations which apply to exploration drilling. They ensure a consistently high standard of performance across the oil and gas industry.
What is an EP?

An Environment Plan (EP) is a comprehensive document that describes all the measures we will put in place to avoid and mitigate environmental impacts and risks. We need to demonstrate how the measures we choose reduce these risks and impacts to a level that is ‘as low as reasonably practicable’ (ALARP) and acceptable. The EP also considers and incorporates outcomes from our stakeholder engagement and consultation.

What is ALARP?

The ALARP methodology involves applying standard control measures to reduce risks and impacts to the environment, and then assessing if there are additional measures which may further reduce impacts or risks without a disproportionately high cost. Equinor is required to apply this methodology throughout its EP.

Refer to chapter 1.7, Legislative Framework, in the full EP.
New regulations

At the time of writing, we are aware that there are new regulations pending for environment plans in the petroleum industry, which among other things, will require a public comment period of 30 days. Based on feedback from the community, we aim to comply with the intentions of the new regulations and are therefore voluntarily including a public comment period in our process before submission to NOPSEMA.

What is an acceptable level of risk or impact?

The regulations also require us to assess whether the remaining risks and predicted impacts after all control measures have been put in place are acceptable, based on guidance provided by NOPSEMA. The concept of acceptability incorporates consideration of the sensitivities and resilience of the affected environment, the duration, severity and uncertainty of effects. Our assessment of acceptability was based on the following key points:

› Internal context – Equinor’s own policies, standards, procedures and systems
› External context – the environment, relevant stakeholders, protected areas and species, principles of ecologically sustainable development
› Legislation and conventions – e.g. international marine pollution requirements, management plans and guidelines
› Industry standards and best practices – widely adopted standards and published

NOPSEMA’s assessment

NOPSEMA’s dedicated assessment team of highly qualified and experienced industry experts will assess our plan against strict criteria as set out in the Offshore Petroleum Greenhouse Gas Storage Act 2006 (OPGGS Act) and associated regulations, and their own guidelines.

If NOPSEMA responds with requests for further information or modifications to the EP, we will address those individually, to clarify and improve our plan and to provide better environmental outcomes.

Publishing the final EP

If our EP meets the criteria set out in the OPGGS Act (Environment) Regulations and is accepted, NOPSEMA will publish the final EP on its website.

What is NOPSEMA?

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) is Australia’s independent expert regulator for health and safety, environmental management, structural and well integrity for offshore petroleum facilities and activities in Commonwealth waters.


www.nopsema.gov.au
Listening to the community: engagement and consultation

We are committed to transparency and have engaged broadly with communities and relevant persons, holding more than 130 meetings during the process.

We wanted to understand local sensitivities first-hand. Our senior management team went to sea with eco-tour operators to see local dolphin populations and other offshore wildlife for ourselves. We saw the magnificent southern right whales at Head of Bight and visited Seal Bay to see the declining population of Australian Sea Lions. We also visited businesses, going out to oyster beds and abalone farms in the Eyre Peninsula. Gaining a direct understanding of the environment we plan to operate in was important for us.

These meetings have given us an opportunity to listen to people on the ground and to learn about local issues and concerns. We also spoke to many people who are excited about the opportunities and jobs a discovery could bring to the region.

How the public comment process works

Our draft EP has been published for a period of 30 days. Anyone can submit their comments about our plans to NOPSEMA, and they will be forwarded to us for consideration. Based on the comments, we will update our EP and submit it to NOPSEMA for assessment.

Ongoing consultation

We are required to continue consulting with relevant persons after our EP is accepted and throughout our operations. This ensures any changes or new information can be considered and reflected in our plans.

What is the difference between engagement and consultation?

**Engagement with communities**

We have engaged broadly with the community to provide information about our company and our plans for the Stromlo-1 exploration well, and are committed to ongoing engagement throughout the duration of the project through:

- Meetings: we have held over 130 meetings with organisations and individuals to understand perspectives about the proposed drilling project
- Letters and emails: updates on key events and milestones
- Senior management visits: executives from our head office have met with a broad range of stakeholders
- Our website: Equinor’s Australian page is updated as our project progresses
- Our EP has been published for a 30-day public comment period
- Media: we will advertise the public comment period and continue to be available to media to talk about our project and plans

**Consultation with relevant persons**

Consultation with relevant persons is a legal requirement under Regulation 11A of the OPGGS(E) Regulations 2009. Equinor must provide all relevant persons with sufficient information to allow them to make an informed assessment of how our planned operations might impact their functions, interests or activities. A reasonable amount of time must be allowed for them to respond and for consultation to occur. We have consulted with relevant persons prior to publishing this draft EP.

**Who are the relevant persons?**

- State and Commonwealth departments, agencies and authorities
- People and organisations who have an interest that is close to the drilling activity and might be impacted.
Understanding the EP: what it contains

This section describes how we have assessed impacts and risks associated with the drilling activity, what the difference is between planned and unplanned events, and our overall approach to the impact and risk assessment in the EP. It also provides an overview of the EP to help you locate the information you are looking for.

What is an Environment Plan?

An Environment Plan or EP is a comprehensive document that describes all the measures we will put in place to avoid and mitigate impacts on the environment. The plan will only be accepted by NOPSEMA if it can demonstrate that the environmental risks and impacts have been reduced to a level that is ‘as low as reasonably practicable’ (ALARP) and acceptable.

The EP is a legal document and its development and implementation is a transparent and interactive process which must follow regulatory processes to ensure an acceptable level of environmental protection. The process described here, and in the EP, follows internationally accepted practices and standards.

Equinor has high standards of environmental safety and these are applied wherever we explore around the world. We have worked with our own subject matter experts to develop this EP.

A key aspect to the assessment is the separation and definition of environmental impacts and risks.


Section 5 of the EP describes the robust process we followed in assessing environmental impacts and to assessing risks, including those from a major oil spill.

Sections 6, 7 and 8 describe the impact and risk assessments in detail.
Environmental impacts are the changes to the receiving environment which result from the planned drilling activity. They are minimised through careful planning, engineering, practices and procedures, but some level of effect is unavoidable. Impacts from planned activities are expected to occur, so they are assessed solely in terms of their likely environmental consequences.

Environmental risks are possible changes to the environment which may occur if there is an unplanned event, or incident. While mitigation strategies, technologies and process control measures are used to avoid even the smallest unplanned incident, they remain a possibility. These risks are not expected to happen, but they must be assessed for the potential effects (consequences), and how likely they are to occur.

Key terms used in the EP

**Impact EMBA**

This is the geographical area that may be affected by our planned activity, drilling the exploration well. The maximum extent of underwater noise effects is the main factor setting the size of this EMBA. The noise comes mainly from vertical seismic profiling (VSP) of the well and the drilling rig’s propellers. The extent of low-level predicted effects on sensitive marine fauna was approximately 25 km; however, the size of the Impact EMBA for the activity has conservatively been set at a radius of 40 km around the well site to allow for any uncertainty in predicting the exposure and sensitivity of marine life that might be present.

**Risk EMBA**

To make sure we have planned for anything that could possibly happen, regardless of how unlikely it is, we form a single map by superimposing 100 different variations of a worst-case spill to generate a large planning area which we have called the Risk Environment that May Be Affected (Risk EMBA).

**Control measures**

The people, equipment, procedures or plans that are specifically used to reduce risks or impacts are collectively referred to as control measures. The EP sets out standards of performance for each control measure and establishes how it will be measured during the drilling program or in the event of an incident.

For more definitions and abbreviations, see the Glossary on page 50.
Our full EP contains a lot of information over more than 1,500 pages. To help readers navigate its sections, we have provided a summary of each chapter below.

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<td>Describes how we will implement the EP once it is accepted by NOPSEMA and ensure compliance with the accepted control measures, standards, practices, procedures, requirements. Includes description of preparations for oil spill response readiness.</td>
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<td>A ready reference to explain terms used in various parts of the EP to accommodate a broad range of readers.</td>
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## EP appendices
Greater detail explaining the process and rationale is not required in the EP itself, but is of recognised value of interest to NOPSEMA and other stakeholders.

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<td>4-1</td>
<td>Protected matters search tool (PMST) report for the Impact EMBA</td>
<td>Report from the Department of Environment and Energy’s interactive Protected Matters Search Tool drawing on Commonwealth government environmental data. Based on geographical extent of the Impact EMBA.</td>
</tr>
<tr>
<td>6-1</td>
<td>Underwater sound modelling report</td>
<td>Detailed modelling of the propagation of underwater sound generated by the mobile offshore drilling unit’s thruster propellers and by the down-hole vertical seismic profiling used to analyse the well geology.</td>
</tr>
<tr>
<td>6-2</td>
<td>Drill cuttings and muds dispersion modelling study</td>
<td>Detailed modelling of the dispersion of drill cuttings (rock fragments) and drilling muds after discharge to the ocean during the drilling activity.</td>
</tr>
<tr>
<td>7-1</td>
<td>Oil spill modelling study</td>
<td>Detailed modelling of the fate and trajectory of oil released during a major spill. Includes details of how the modelling was undertaken and the outcomes including maps of various spill scenarios and shows the areas which may be exposed to oil on the sea surface, on the shoreline and in the water column.</td>
</tr>
<tr>
<td>7-2</td>
<td>Protected matters search tool (PMST) report for the Risk EMBA</td>
<td>Report from the Department of Environment and Energy’s interactive Protected Matters Search Tool, drawing from Commonwealth government environmental data. Based on geographical extent of the Risk EMBA.</td>
</tr>
<tr>
<td>7-3</td>
<td>Existing environment of Risk EMBA</td>
<td>Describes the environmental values and resources across the area within the Risk EMBA – the area which may be exposed to oil as a result of a major oil spill lasting for 102 days.</td>
</tr>
<tr>
<td>7-4</td>
<td>ALARP assessment for loss of well control</td>
<td>Assessment of measures for reducing the consequences and risks associated with a loss of well control leading to a major oil spill. Examines alternatives for minimising the time required for spill response, intervention and mitigation measures such as using the capping stack, blowout preventer, dispersants and relief well.</td>
</tr>
<tr>
<td>9-1</td>
<td>Oil Pollution Emergency Plan</td>
<td>Describes the measures that have been selected for responding to a major oil spill and has been developed in consultation with state spill response agencies. It is the response plan that would be implemented in the unlikely event that an oil spill occurred.</td>
</tr>
<tr>
<td>9-2</td>
<td>Operational and scientific monitoring program (OSMP)</td>
<td>The plan for how oil spill effects monitoring would be conducted during and after a major spill, including provisions for rapid adaptation to the actual situation following a spill.</td>
</tr>
</tbody>
</table>
The environmental values of the area that may be affected

Our drilling location is an area of fine sediments, 370 km from shore, in 2,239 m of water. It is situated on the lower part of the continental slope or the abyssal slope in the Great Australian Bight.

What is the area like and what lives there?

Recognising that there were few investigations of seabed values of the deep abyssal slope of the central Great Australian Bight, and that our assessment of impacts therefore would be uncertain, we co-funded the Great Australian Bight Research Program. This research program included studies of benthic habitats and assemblages of deep-sea biota and the movements of iconic high-order predators such as great white sharks, tuna and whales within the Great Australian Bight.

Further research by CSIRO and Chevron Australia as part of the Great Australian Bight Deepwater Marine Program has provided additional information on benthic habitats and communities, including on volcanic seamounts in the region. These research programs have contributed to making this area one of the best-known deep-water regions in Australia.

In addition, we conducted an extensive review of scientific literature and government databases to understand the environment in which will be working.

Actual ROV photo taken on the seabed. Soft sediment habitat with solitary octocoral near Stromlo location.

See the full EP, Section 4 ‘Existing environment of impact EMBA’ and Section 6 ‘Impacts associated with planned activities’.

Section 4 of the EP describes the existing environmental values of the Impact EMBA and Appendix 4-1 presents the results of the search of Commonwealth government databases for the area. The predicted impacts to these values are described in Section 6 of the EP.
We found a deepwater, sedimentary ecosystem with worms, crustaceans and other invertebrates that extends across vast areas of the central Great Australian Bight. Migrating whales, seabirds, and schools of southern bluefin tuna may pass through the area on their way to the shallower parts of the continental shelf and coastal waters.

The area of seabed that will be affected by the drilling (Impact EMBA) lies in the midst of a vast abyssal slope, and the habitats there are very well represented across the surveyed parts of the central Great Australian Bight. The closest volcanic seamounts are about 20 km away and will not be affected by our operations.

The site of our proposed well lies within a Multiple Use Zone where drilling is permitted within the Great Australian Bight Marine Park.

Where do we get our information from?

Our understanding of the environmental values and resources of the Impact EMBA has been drawn from published scientific information on the distribution of species listed under the EPBC Act – which protects biota in Commonwealth marine areas – as threatened, migratory under the EPBC Act or if not threatened, recognised as having ecological importance and which may occur in the Impact EMBA. The values of the Great Australian Bight Marine Park were also considered, particularly the values of marine mammals, the benthic communities in the eastern Bight and Anna’s Pimple, a 200 m high volcanic seamount in the area. We have also listened to stakeholders who have provided robust information on species of concern and appropriately incorporated any new information where publicly available.

EPBC Act

*Environmental Protection and Biodiversity Conservation Act 1999* – administered by NOPSEMA on behalf of the Department of Environment and Energy. The EPBC Act is the Australian Government’s key environmental legislation, providing a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the EPBC Act as ‘matters of national environmental significance’.

www.environment.gov.au/epbc

The Great Australian Bight Research Program (GABRP)

A key source of relevant baseline information has been the Great Australian Bight Research Program (GABRP) which was a four-year, $20 million research program funded by Joint Venture partners Equinor (then Statoil) and BP, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Marine Innovation Southern Australia partners – the South Australian Research and Development Institute (SARDI), University of Adelaide and Flinders University.

The overall aim of the GABRP was to improve understanding of the environmental, economic and social values of the Great Australian Bight. It was undertaken between April 2013 and September 2017 with more than 100 scientists involved. The research program comprised seven themes:

- **Oceanography** – studies of the connections between regions beyond the continental shelf and coastal regions, and the dynamic effect of the ocean on the sea floor and its biodiversity

- **Open water ecosystem** – studies of the biodiversity of microbes, plankton and micronekton. Research included assessing food web structure in relation to currents, turbidity, light levels, stratification, nutrient concentrations and turbulence

- **Sea floor biodiversity** – studies of the abundance and distribution of faunal biodiversity on and in the seabed

- **Ecology of iconic species and apex predators** – studies of the status, distribution and abundance of key iconic species such as whales, sea lions and other apex predators such as southern bluefin tuna (SBT) and sharks

- **Petroleum geology and geochemistry** – identification and characterisation of possible natural petroleum seepage in specific areas of the Bight

- **Socio-economic analysis** – development of a socio-economic profile for communities potentially affected by any petroleum activities

- **Integration and modelling** – development of a quantitative model of the structure and dynamics of the Bights ecosystem as a whole.

Information about the GABRP program can be found at www.misa.net.au/GAB
Seabed habitats

The Stromlo-1 well lies in 2,239 m water depth on the lower part of the continental or abyssal slope, which features slope terraces and deep submarine slope canyons. Approximately 70 per cent of the seabed in the Great Australian Bight comprises soft unconsolidated sediments, so the sedimentary seabed in the Impact EMBA does not represent a rare or unusual habitat. The nearest seabed features with hard substrates which may support more diverse and less well represented biota, are two volcanic mounts in water depths of about 1,800 m which lie about 20 km north of Stromlo-1, with ten other such seamounts known in the greater region. None of these seamounts are within the area and would not be disturbed by the drilling.

Weather and oceanic conditions

The winds at Stromlo-1 have been measured and modelled and are strongest between June and September (when they blow mainly from the west and south-west) and are weaker during the preferred drilling period November to February (when they blow mainly from the east and south-east). Waves around Stromlo-1 reach an annual mean height of 3 m, peaking during May to August and they arrive largely from the south-west. The real met-ocean conditions in the Great Australian Bight have been measured for one year (2013), when several buoys were deployed in the area. This data has been matched with existing models to make a forward predicting model of the area. Investigations and comparisons in Equinor have determined that the closest match is the Norwegian Sea. We have drilled several exploration wells and have many fields in production there, and we will use this experience when drilling Stromlo-1.

Upwelling

In most years between November and March, oceanographic processes push deep, nutrient-rich waters up the continental slope towards the sea surface. This phenomenon is known as ‘upwelling’ and is a key ecological feature of the eastern Great Australian Bight because the nutrient enrichment stimulates
an increase in the growth of plankton which cascades to higher levels of the food chain, supporting increases in the productivity of zooplankton, fishes, seabirds, predatory fish and marine mammals such as blue whales. The main upwelling area is off the Bonney coast to Kangaroo Island in the eastern Great Australian Bight; there is no upwelling in the Impact EMBA and therefore it does not support seasonal peaks in biological activity and abundance.

Biological species and communities

The habitats within the Impact EMBA which support biological assemblages and communities are part of a large expanse of homogeneous habitat types; soft sediment benthic habitats and open ocean pelagic habitats. The GABRP discovered a large number of new species of benthic (seabed) biota and species recorded for the first time in the Bight, because it was the first comprehensive survey of these deep habitats. The seabed habitats that support benthic biota are widespread in the deep waters of the central Bight and none surveyed are restricted to the Impact EMBA.

Generalised observations of the deep-water Stromlo-1 site environment and comparisons with the greater Great Australian Bight include:

- Planktonic community composition and abundance is greater in the eastern Great Australian Bight in the vicinity of the upwelling areas
- Infaunal diversity, composition and abundance is lower in the deep-water habitats (>2,000 m) around Stromlo-1 compared to shallower habitats in the Great Australian Bight
- Species richness, abundance and biomass of fish is lower in deep water
- Threatened sharks and southern bluefin tuna may migrate through the area but there are no critical habitats for them in the Impact EMBA
- The area is not biologically important for marine reptiles and while individual turtles or sea snakes may pass through the area, they are largely tropical species and are uncommon in the Great Australian Bight
- Pygmy blue whales may migrate through the Impact EMBA but the breeding, calving, foraging and migration areas important to other protected whales, dolphins, seals and sea lions are located closer to shore
- Seals and sea lions are largely restricted to shallower coastal waters and over the continental shelf; however, modelling indicates that the New Zealand fur seal may travel across the central Great Australian Bight which means it could be an occasional visitor in the Impact EMBA
- No biologically important areas for foraging albatross, petrels and prions intersect the Impact EMBA but they may transit the area
- Short-tailed shearwaters form large flocks (>10,000 birds) which migrate over large distances and such flocks or individuals may visit the offshore waters of the Great Australian Bight including the Impact EMBA.

Socio-economic

The offshore boundaries of six Commonwealth-managed commercial fisheries intersect the Impact EMBA; however, there is no current or expected fishing effort in or near the Impact EMBA. The fishing effort and all state fishing and aquaculture activity is restricted to shallower shelf and coastal waters.

There are no heritage places, historic shipwrecks, defence, tourism or recreational activities in the Impact EMBA due to it being over 370 km from shore. A low-density shipping lane used by ships travelling between Adelaide and the south-west of Western Australia lies in the south of the Impact EMBA, while the main shipping lane between Albany and Cape Otway is approximately 200 km further south.
## Receptor group

<table>
<thead>
<tr>
<th>Receptor group</th>
<th>Presence</th>
<th>Impact</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Seabirds</strong></td>
<td>Low</td>
<td>Low</td>
<td>This is considered a biologically important area for the short-tailed shearwater. Foraging albatross, shearwater, petrels and prions may transit the area. Seabirds are not sensitive to temporary activity.</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marine reptiles</strong></td>
<td>Low</td>
<td>Low</td>
<td>Individual turtles or sea snakes may transit the area. Marine reptiles are not sensitive to temporary activity.</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Plankton</strong></td>
<td>Low</td>
<td>Low</td>
<td>There may be small communities of plankton. Plankton are sensitive to some activities, but have rapid recovery rates.</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sharks</strong></td>
<td>Low</td>
<td>Low</td>
<td>Various sharks may transit through the area. Sharks are not sensitive to temporary activity.</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cetaceans</strong></td>
<td>Low</td>
<td>Some</td>
<td>Pygmy blue whales may transit through the area. Transiting whales predicted to avoid the area affected by underwater sound. There are no other breeding, calving, foraging and migration zones for other protected whales in the area.</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Seafloor communities</strong></td>
<td>Low</td>
<td>Some</td>
<td>Individual deep-water corals may be present in the Impact EMBA. The seafloor is sensitive to planned offshore activities such as localised cuttings and mud discharges.</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fisheries</strong></td>
<td>Low</td>
<td>Low</td>
<td>Southern bluefin tuna may transit through the area. Southern bluefin tuna have low sensitivity to planned activities.</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Protected areas</strong></td>
<td>Some</td>
<td>Some</td>
<td>Part of the impacted area overlaps with the Great Australian Bight Marine Park, which is zoned as ‘Multiple Use’ which allows oil and gas activities. Small pelagic fish of the SW Marine Region are considered a key ecological feature in the area. Benthic invertebrate communities of the eastern Great Australian Bight are considered a key ecological feature in the area. Fish and invertebrate communities are sensitive to planned offshore activities such as localised cuttings and mud discharges.</td>
</tr>
</tbody>
</table>
Impact and risk assessment

We have assessed all impacts and risks associated with the exploration drilling according to robust and internationally-accepted risk management practices.

Given the deep offshore environment and the nature and scale of the consequences of drilling a single exploration well, all identified predicted impacts and most residual risks were considered to be low.

The impact and risk management process takes account of the nature and scale of the consequences to the environment. The activities with potential for greater levels of environmental consequence are assessed in more detail. For example, underwater sound, muds and cuttings discharges and oil spill (including chemicals to disperse the oil) were all assessed using detailed modelling to better predict the range of effects.

Impact assessment for planned activities

Section 6 of the EP describes impacts from planned activities as well as the control measures that will be implemented to reduce impacts to ALARP. Alternative additional controls are identified and considered to test if predicted impacts are ALARP and to ensure compliance with the pre-set acceptability criteria.

Environmental impacts are the changes to the receiving environment which result from undertaking the planned drilling activity. They are minimised through careful planning, engineering, practices and procedures, but some level of effect is unavoidable. Impacts from planned activities are expected to occur, so they are assessed solely in terms of their likely environmental consequences.

The list below shows the aspects of the activity that would lead to the identified impacts with the largest effect on the receptors in the Impact EMBA:

› Displacement of other marine users
› Seabed disturbance
› Underwater sound
› Light emissions
› Atmospheric emissions
› Drilling fluids and cuttings discharges
› Cement discharges
› Cooling water and brine discharges
› Sewage, greywater and putrescible waste discharges
› Deck and bilge waters discharges
› BOP fluid discharges.

All the resulting impacts are defined as ‘very limited impact on local populations, ecosystems or environmentally sensitive areas of local importance. Restitution times <1 month or local impact may occur at individual organism level’. 

Section 6 of the EP describes environmental impacts from planned activities.

Sections 7 and 8 describe risks from unplanned events, or incidents, including a major oil spill.
Risk assessment of unplanned events

Section 7 of the EP describes the potential outcomes of unplanned events associated with drilling Stromlo-1. The detailed risk assessment addresses the levels of risk with control measures in place to reduce residual risks to ALARP and to a pre-determined acceptable level. For each risk, environmental performance outcomes are determined, and the measurement criteria used to assess achievement of the performance outcome are defined.

Environmental risks are possible changes to the receiving environment which may occur if there is an unplanned event, or incident. While best endeavours, preventative barriers, mitigation measures, technological and process control measures are followed or implemented to avoid even the smallest unplanned incident, they remain a possibility and the risk of them occurring must be assessed. Risks are not expected to happen, so they are assessed in terms of both the potential effects, or consequences, and in terms of the likelihood that they may occur.

The risks associated with unplanned events, which are assessed in the EP Section 7 and 8 are:

- Introduction of marine pests
- Collision with marine fauna
- Loss of solid materials overboard
- Loss of hazardous substances overboard
- Vessel collision leading to fuel spill
- Loss of well control leading to major oil spill
- Response actions to a major oil spill.

Based on Equinor’s risk matrix, most of these risks are assessed as having a low residual risk level when the control measures in place are considered.

The chance of a major oil spill from the planned Stromlo-1 well is extremely low, but could have serious consequences for the environment. In a worse-case scenario, some already-vulnerable animal populations may need more than 10 years to recover.

On page 42 of this document, our robust oil spill response plan is described. All of the oil spill response actions are described as low risk, except dispersant use, which is categorised as medium because it comes with certain trade-offs. Using dispersants, particularly at the well-head, has been proven to be highly effective. It reduces oil volumes at the surface and the potential for oil to reach the shore. It also increases the natural breakdown of hydrocarbons in the water. However, it dissolves the oil into smaller droplets below the surface, which may increase the effect on some fish species and the seafloor environment.
For Equinor, any oil spill is unacceptable, which is why we plan meticulously to ensure we are drilling safely.

Major oil spills are extremely rare. In approximately 59,000 offshore wells drilled around the world since 1980, there have been two major oil spill incidents – the Macondo spill in the Gulf of Mexico in 2010 and the Montara spill in the Timor Sea in 2009. The risk of a major oil spill for Stromlo-1 is extremely low.

Our experience in drilling in deep offshore waters and in very rough seas, coupled with several additional safety barriers including sound well design and the use of technology will enable us to drill the well safely.

Further reading

NOPSEMA – Oil Spill Modelling at a glance
What does the oil spill modelling show?

The map in the top right-hand corner is shown in our EP. However, it does not represent what a single spill would look like, nor the area it would affect. To identify all possible locations which could be affected in the highly unlikely event of an oil spill, we use computer-simulated modelling. The results are used to define the geographical area which we use in our risk assessment and response planning – a planning area, as shown on the larger map.

To make sure we have planned for anything that could possibly happen, regardless of how unlikely it is, we form a single map by superimposing 100 different variations of a worst-case spill to generate a large planning area which we have called the Risk Environment that May Be Affected (Risk EMBA).

The modelling assumes that every piece of safety equipment on the rig fails, and nothing is done to stop the leak, contain or disperse the oil for a hundred days. In case of a real oil spill, we would respond immediately. Also, the oil volumes are equivalent to the flow from an unrestricted open hole. In practice the hole would always have blockages caused by the drill pipe and blow-out preventer.

Appendix 7.1 Oil spill modelling report.
How would we respond to an oil spill?

At Equinor, we are determined to prevent all accidents and regard any oil spill as unacceptable. Nevertheless, we must be fully prepared in the highly unlikely event of an oil spill. We have prepared robust response strategies in close cooperation and consultation with state and federal agencies.

The key priorities in our response plan in the event of an oil spill are: ensuring human safety, stopping the flow of oil to the environment, mitigating the effects of any oil that has been spilled, recovering any oil spilled, and monitoring the effects on the environment.

How would we stop an oil spill?

Hydrocarbon reservoirs (buried porous rocks filled with water, gas and oil) are under pressure due to the weight of the overlying rock and sediment and the processes under which they were formed. Drilling into the reservoir introduces an avenue (the well bore) for the liquids and gases to escape. The outside of the steel drilling string casing is sealed against the surrounding rock using cement.

Sensors on the end of the drilling string monitor temperatures and pressures in the well and heavy muds are pumped through the drill string to push rock fragments out of the hole and control the fluids in the well.

The weight of the drilling mud is carefully monitored and maintained, and any changes due to pressure differences in the geology are responded to accordingly. It is a highly effective process.

Appendix 9.1 Oil Pollution Emergency Plan (OPEP).
Section 7.7 addresses the risks associated with a major oil spill.
Appendix 7-1 presents the modelling of the fate and trajectory of the spilled oil after mitigation with dispersants.
Equinor’s oil spill response plan includes measures to stop any leak, disperse and contain oil in the water and at the surface, while protecting important habitats and the coastline.

One of the most important measures in place to stop a potential loss of well control (LOWC) is the blowout preventer, a 400-tonne device that offers multiple effective ways to control a situation. The drill pipe passes through the BOP, which is equipped with hydraulic rams that can seal the bore if necessary. In the unlikely event of an LOWC, the BOP is activated immediately. If this were not to work properly, the BOP is also equipped with shear rams which can completely cut through the drill string and seal the well in a short space of time.

In the extremely unlikely event that all the shut-in mechanisms on the BOP fail, a capping stack can be used to stop the leak. The capping stack weighs approximately 100 tonnes and is deployed from a construction vessel and designed to be mounted over the leaking wellhead or blowout preventer after any debris or obstructions have been cleared away. The capping stack is a specialised piece of equipment and there are a limited number of capping stacks and teams of people capable of deploying them. In South East Asia, Singapore is the central hub with suitable storage and mobilisation facilities and at least two capping stacks are maintained and tested here for urgent deployment across the region. These capping stacks are compatible with the BOP design to be used for Stromlo-1. It would take up to 15 days to mobilise a capping stack from Singapore, transport it to site and deploy it from a large construction vessel.

If for some unforeseen reason the capping stack was not effective in stopping the flow of oil from the well, it would be re-fitted, and a second capping stack would be brought in to attempt to close the well again. Should the well be impossible to stop with a capping stack after multiple attempts, a relief well would be drilled to stop the leak. This would be drilled from a second rig brought in from the closest location. The closest relief well rigs are likely to be on the North West Shelf; however, for added conservatism in the risk assessment, we have assumed a rig needs to be brought in from Singapore to drill the relief well. This may take up to 102 days, including mobilisation, transit, drilling and successful well kill stopping the leak.
What have we learned from Macondo and Montara?

Lessons learned from major incidents in the last decade have resulted in the advancement of regulations and engineering and process solutions to further reduce risks of a major oil spill, and to facilitate rapid and effective source control and mitigation if a release were to occur.

These include (but are not limited to):

- Improved blowout preventer design and testing programs
- Availability of capping stack options at multiple locations worldwide
- Well design criteria that allow Stromlo-1 to be capped
- Designing of capping stacks for rapid air transport
- Improved designs of subsea dispersant injection (SSDI) systems
- Developing Global Incident Management Assist Teams (GIMATs), which provide a global resource of trained incident response personnel that can be mobilised quickly to support escalation to an incident management team (IMT)
- Improving preparedness of operational and scientific monitoring programs (OSMPs) to facilitate more rapid, efficient and effective mobilisation and monitoring (following the Montara Commission of Inquiry in 2010).

In addition to the above, we have committed to lowering potential risks for Stromlo-1 by including the following measures:

- Study, review and application of the learnings from offset wells
- Well design to have only one potential hydrocarbon reservoir exposed in the same well section
- The last liner and cement plug will be set above the potential hydrocarbon reservoir.
- Not undertaking a well test in the event of a discovery of hydrocarbons
- Not retaining the well for subsequent production
- Not conducting conventional well coring.

Equinor will have three support vessels available to commence a first strike response; two PSVs and one subsea construction vessel (SCV) and the following equipment to support spill response:

- Detection radar, tracking buoys, infra-red camera, remote operated vehicle, surface dispersant capability, capability to transport and install subsea dispersant and capping stack equipment.

What other oil spill response methods would we use?

While efforts to stop the flow of oil would continue, we would perform a number of proven actions to minimise impacts on the environment.

**Subsea dispersants**

We would use a combination of remotely-operated vehicles, boats and aircraft to deliver a product called subsea dispersant injection (SSDI). SSDI would be planned for immediately and ready for operation by day nine at the latest. This has been chosen as a primary spill mitigation strategy because:

- SSDI is highly effective because it is injected subsea close to the well head and directly into the most concentrated part of the oil flow
- The combination of subsea and sea surface application of dispersants has been shown to be effective
- SSDI reduces the amount of oil reaching marine life at the sea surface. It also reduces the potential for oil to reach shore or habitats in shallow waters
- It reduces the release of gas into the atmosphere, reducing the effects on air-breathing marine animals and response workers
- In deep water, like at Stromlo-1, it would allow increased entrainment of the oil in the water column at very small droplet sizes which are more readily degraded.

In addition to SSDI, we will have dispersants available on the supply vessels and aircrafts for application on the sea surface. This activity will be initiated after one-two days after an incident has been identified.
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› in deep water, like at Stromlo-1, it would allow increased entrainment of the oil in the water column at very small droplet sizes which are more readily degraded.

In addition to SSDI, we will have dispersants available on the supply vessels and aircrafts for application on the sea surface. This activity will be initiated after one-two days after an incident has been identified.
Containment and recovery (CAR) – offshore and nearshore

CAR uses floating booms to retain and concentrate floating oil and skimmers to recover the oil to nearby response vessels. The oil/water mix is stored temporarily, and filtered seawater is returned to the sea (following AMSA approval). This system frees up storage capacity in our response vessels and allows a greater volume of oil to be recovered before returning to port.

Vessels of opportunity

Large vessels of opportunity will generally be sourced from within Australia, but also internationally (Singapore) depending on the purpose of the vessel and the availability at the time. Equinor will ensure they are available for containment and recovery operations and for general surveillance and support operations as they are needed.

Vessels from Western Australia, South Australia, Victoria, Tasmania and New South Wales capable of supporting nearshore containment, recovery and shoreline protection and monitoring and surveillance will be contracted and scaled up depending on the nature and scale of the spill.

Shoreline protection

Shoreline protection and clean-up includes initial shoreline clean-up and assessment (SCAT), providing key intelligence on the shoreline, sensitivities and level of oiling at each site. Any remaining oil on the shoreline will be cleaned up via personnel manually removing oil and oiled debris from beaches (using water flushing, spade work etc.), mechanical removal and installing nearshore booms to contain or deflect floating weathered oil.

Oiled wildlife

An oiled wildlife response (OWR) involves reconnaissance from vessels, aircraft and shoreline surveys, as well as the capture, transport, stabilisation, cleaning, rehabilitation and release of oiled wildlife. Wildlife protection and response operations will be directed by the relevant state control agency subject to the requirements of the response (as determined by the state control agency (agencies) and the type and location of the pollution incident. Equinor will provide the response resources required by relevant state control agencies and support state control agencies for the duration of the response by providing equipment, trained personnel, technical specialists and training for unskilled personnel.

We have prepared an Oil Pollution Emergency Plan (OPEP) which would be the primary response document referred to when preparing for and responding to a spill. The OPEP comprises two parts:

Part One: Operational response – describes the actions that will be undertaken if there was a spill from a vessel within the petroleum safety zone, or for crude oil spills from a well.

Part Two: Planning and preparation – provides information related to our spill response planning requirements and preparedness.

Refer to Appendix 8.1.

We have developed preparedness procedures so that they will ‘scale up’, as required.
Preparedness and external support: how we will implement the EP

We have developed a strategy to effectively implement all the control measures and environmental standards described in the EP and to demonstrate that they have been achieved.

Preparedness and readiness to respond to oil spill and other incidents stems from a solid basis of competency standards and training for personnel, robust systems and processes, continuous improvement mechanisms and adaptive management to ensure impacts and risks continue to be kept at ALARP and acceptable levels prior to and throughout the drilling program.

The organisational structure for the Stromlo-1 exploration drilling EP includes Equinor personnel based in Norway, Western Australia and South Australia, supported by contractors. These have clearly defined roles and responsibilities relevant to the implementation of the requirements of this EP.

Any contractors for the drilling rig and support vessels will also be required to comply with this EP.

Ongoing consultation and engagement

Our partners in the relevant state emergency response agencies will continue to work with us in our emergency response plans: identifying response resources, organising and exercises, with a focus on testing, learning and improvement throughout our operations.

We spoke with a range of stakeholders when developing the OPEP to ensure we met Commonwealth and state agencies’ expectations and to be we understand our response partners’ capabilities. This included:

Consultations with state agencies

<table>
<thead>
<tr>
<th>Agency</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPA Tasmania</td>
<td>WA DoT</td>
</tr>
<tr>
<td>SA DPTI</td>
<td>Victoria DEDJTR</td>
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<tr>
<td>AMSA</td>
<td>Tasmania DPIPWE</td>
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<tr>
<td>SA DEW</td>
<td>Victoria DELWP</td>
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<tr>
<td>NSW Maritime</td>
<td>SA Police</td>
</tr>
<tr>
<td>Victoria Maritime Safety</td>
<td>Federal Department of Industry, Innovation and Science</td>
</tr>
</tbody>
</table>
We will maintain a dedicated email address for stakeholders to communicate with us after acceptance of the EP. We will also notify when appropriate and as required.

Monitoring

Throughout the drilling program Equinor will monitor environmental performance standards to ensure the objectives and commitments laid out in the EP are being met. The records gathered during monitoring will enable Equinor to demonstrate compliance with the requirements of this EP and to ensure any non-compliance or incident is recorded, investigated, corrected, reported and closed out, in a timely manner.

Oil spill monitoring

In the extremely unlikely event of a major oil spill, the monitoring plans are extensive. These are documented in the OPEP and the Operational and Scientific Monitoring Program Implementation Plan (OSMP). The plans for monitoring particular receptors would be finalised once the trajectory and volume of oil is known.

Where potential risks and impacts may change, or new ones arise, we have a comprehensive Management of Change process to ensure reviews and actions are handled appropriately.

Operational and scientific monitoring program (OSMP)

The Equinor OSMP comprises the following:

› OSMP Implementation Plan: provides detailed information on roles and responsibilities, communication protocols, resources, the independent Scientific Advisory Group (SAG), HSE requirements, activation and termination criteria, logistics and reporting

› Operational Monitoring Plans (OMPs): to obtain situational awareness of a spill and providing information on potential impacts of oil to environmental and socio-economic receptors. Also, to assess the efficacy and potential impacts (both positive and negative) of spill response strategies

› Scientific Monitoring Plans (SMPs): outline the process for scientifically assessing spill impacts and the recovery of environmental and socio-economic receptors. The SMPs also cover post-release/pre-exposure baseline data collection.
Glossary of terms

From ALARP to WOMP, here is a list of technical terms used in this guide. A more comprehensive list is provided in the EP.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Abyssal slope</td>
<td>The deep seabed sloping down from the continental slope to the abyssal ocean depths over 3000 metres down.</td>
</tr>
<tr>
<td>ALARP: As low as reasonably practicable</td>
<td>Reducing predicted impacts and risks to as low as reasonably practicable. This is done by assessing the environmental benefits of control measures and demonstrating that there are no other practical measures that could reduce impacts and risks further.</td>
</tr>
<tr>
<td>AMSA</td>
<td>Australian Maritime Safety Authority (Commonwealth).</td>
</tr>
<tr>
<td>EEZ: Australian Exclusive Economic Zone</td>
<td>An internationally recognised zone extending from 12 nautical miles to 200 nautical miles from Australia’s coastline, over which Australia has full sovereignty. Many Commonwealth fishery boundaries extend to the boundary of the EEZ even though there is no fishing activity this far from shore.</td>
</tr>
<tr>
<td>Bathymetry</td>
<td>Water depths relative to the sea surface, includes seabed features.</td>
</tr>
<tr>
<td>Benthic</td>
<td>The benthic zone is the seabed and animals and plants which live in this zone are known as benthic biota.</td>
</tr>
<tr>
<td>BIA: Biologically Important Area</td>
<td>Spatially defined areas where certain species are known to display behaviours such as breeding, foraging, resting or migration. Defined by the Department of Environment and Energy.</td>
</tr>
<tr>
<td>Biota</td>
<td>The plant and animal life of a region or habitat.</td>
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<tr>
<td>Blowout</td>
<td>A blowout is the uncontrolled release of oil from a well after pressure control systems have failed.</td>
</tr>
<tr>
<td>BOP: Blowout preventer</td>
<td>A system of valves and rams set on the wellhead which can be operated from the surface or from the seabed. If activated, the blowout preventer will automatically seal the well. It has six independent shut-in mechanisms for closing the well and regaining well control either automatically or manually. It is proven to be highly effective in ensuring well safety.</td>
</tr>
<tr>
<td>BOP fluid</td>
<td>Fluids used to test or operate the blowout preventer.</td>
</tr>
<tr>
<td>CCS: Carbon Capture and Storage</td>
<td>Process of capturing waste CO₂ from large point sources, transporting it to a storage site and depositing it where it will not enter the atmosphere, normally into an underground geological formation.</td>
</tr>
<tr>
<td>Cetacean</td>
<td>Whales, dolphins and porpoises.</td>
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<tr>
<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organization.</td>
</tr>
<tr>
<td>Drill cuttings</td>
<td>Natural bits of solid material removed from a borehole drilled by rotary, percussion or auger methods.</td>
</tr>
<tr>
<td>Drilling mud (drilling fluid)</td>
<td>Drilling mud, also called drilling fluid, is a heavy, viscous fluid mixture that is used in drilling operations to carry rock cuttings to the surface. It also lubricates and cools the drill bit and helps to control the temperature and pressure in the well.</td>
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<tr>
<td>Dynamic positioning</td>
<td>A method of keeping an offshore drilling rig or vessel in location without anchors, using computer-controlled propellers (thrusters).</td>
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<tr>
<td>Economically sustainable development</td>
<td>Developing resources in ways that protect biological diversity and maintain essential ecological processes and life-support systems.</td>
</tr>
<tr>
<td>EMBA</td>
<td>Environment that may be affected.</td>
</tr>
<tr>
<td>Emulsification</td>
<td>A mixture of oil and water, often referred to as ‘mousse’ due to its appearance.</td>
</tr>
<tr>
<td>EPP39</td>
<td>The block in which the well is located.</td>
</tr>
<tr>
<td>Environmental impact</td>
<td>Any adverse or beneficial change to the environment that results from a planned activity.</td>
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<tr>
<td>Term</td>
<td>Description</td>
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<tr>
<td>FPSO</td>
<td>Floating Production, Storage and Offloading unit is a floating vessel used by the offshore industry for the production and processing of hydrocarbons, and for storage of oil.</td>
</tr>
<tr>
<td>GAB</td>
<td>Great Australian Bight.</td>
</tr>
<tr>
<td>Gyroscopes</td>
<td>Device used for measuring or maintaining orientation and angular velocity.</td>
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<tr>
<td>HSE</td>
<td>Health, Safety and Environment.</td>
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<tr>
<td>Hydrocarbons</td>
<td>Organic compounds consisting entirely of hydrogen and carbon. Hydrocarbons are the principal constituents of oil and natural gas.</td>
</tr>
<tr>
<td>Impact EMBA</td>
<td>A 40 km area around the rig that may be affected by the planned activities in the Petroleum Safety Zone.</td>
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<tr>
<td>Key ecological features</td>
<td>Aspects of the marine ecosystem which are important for the functioning and integrity of biodiversity in a Commonwealth Marine Area. Defined by the Department of Environment and Energy.</td>
</tr>
<tr>
<td>LOWC: Loss of well control</td>
<td>An uncontrolled flow of well fluids, such as gas, oil or water.</td>
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<tr>
<td>Marine (drilling) risers</td>
<td>Conduit that provides a temporary extension of a subsea oil well to a surface drilling facility.</td>
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<tr>
<td>MODU: Mobile offshore drilling unit</td>
<td>Dynamically-positioned deepwater drilling rig, suitable for operating in rough seas.</td>
</tr>
<tr>
<td>NOPSEMA</td>
<td>National Offshore Petroleum Safety and Environmental Management Authority; the independent government body responsible for regulating offshore petroleum activities.</td>
</tr>
<tr>
<td>Oil weathering</td>
<td>Oil rapidly loses more volatile components largely through evaporation as it weathers. Weathering refers to the ageing and degradation of oil over time caused by chemical, physical and biological processes.</td>
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<tr>
<td>Paris Agreement</td>
<td>An agreement within the UN Framework Convention of Climate Change dealing with greenhouse-gas emissions mitigations, adaption and finance, starting in the year 2020.</td>
</tr>
<tr>
<td>Pinnipeds</td>
<td>Seals and sea lions.</td>
</tr>
<tr>
<td>Risk EMBA</td>
<td>The geographical area that may be affected by any unplanned events within the Petroleum Safety Zone.</td>
</tr>
<tr>
<td>SINTEF: Stiftelsen for industriell og teknisk forskning</td>
<td>One of Europe’s largest independent research organisations, based in Norway.</td>
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<tr>
<td>Socio-economic environment</td>
<td>Relevant commonwealth and state managed fisheries, tourism industry, recreational activities, shipping industry, defence activity and other infrastructure.</td>
</tr>
<tr>
<td>Volcanic seamount</td>
<td>Conical seabed feature in deep water which provides hard substrates otherwise rare in the central Great Australian Bight.</td>
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<tr>
<td>Wellhead</td>
<td>Component at the seafloor or surface of an oil or gas well that provides the structural and pressure-containing interface for the drilling and production equipment.</td>
</tr>
<tr>
<td>WOMP</td>
<td>Well operations management plan.</td>
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