

Environmental Impact Report

Geophysical Operations in the Otway Basin, South Australia

June 2026

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THE THREE WHATS

What can go wrong?

What could cause it to go wrong?

What can I do to prevent it?

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1 Introduction

Beach Energy Limited and its group of subsidiaries (Beach) hold several petroleum exploration, production and retention licences in the onshore Otway Basin in the South East of South Australia.

Beach have an approved Statement of Environmental Objectives (SEO) to undertake geophysical survey activities within the South Australia Otway Basin, which was supported by an Environmental Impact Report (EIR). The approved SEO and accompanying EIR were produced under the *Petroleum and Geothermal Energy Act 2000* (SA) and Petroleum and Geothermal Energy Regulations 2013 which have since been superseded by the *Energy Resources Act 2000* (SA) (ER Act) and Energy Resources Regulations 2013 (ER Regulations) (SA).

Beach's existing SEO for geophysical operations in the South Australia Otway Basin was approved in 2021. Under Regulation 13 of the ER Regulations, an approved SEO must be reviewed at least once in every five years. This EIR has been prepared to use as a basis for preparation of the revised SEO, which accompanies this EIR.

1.1 Background

The Otway Basin is located along the south-east margin of the Australian mainland and is second only to the Cooper and Eromanga Basins as the most explored oil and gas province in South Australia. The basin extends west-northwest for approximately 500 km along the southern Australian Coast from South Australia to Victoria. Approximately 70% of the basin is located offshore, commencing in South Australian waters south-east of Kangaroo Island and extending south-east to Port Phillip Bay in Victoria (Figure 1-1). The South Australian onshore sector of the Otway Basin is located in the South East region and covers approximately 9,650 km² (Boulton and Hibbert, 2002).

Exploration for hydrocarbons in the South East commenced in the 1890s, with the first deep exploration well, Robe-1, drilled in 1915. The first commercial gas discovery was made at Katnook in 1987, followed by discovery of the Ladbroke Grove Field in 1989. Since then, the Katnook, Haselgrove, Haselgrove South and Redman commercial gas fields have been discovered and the Katnook gas plant was established in 1991. Since this time, Origin Energy, Adelaide Energy and Beach have continued to explore for hydrocarbons, with a number of successful wells discovering new gas fields including Wynn-2 in 2005 and Jacaranda Ridge-2 in 2007. Beach has a long history of exploration in the onshore Otway Basin, with Beach's first well in the basin (Geltwood Beach-1) drilled in 1963. Beach has drilled a total of 33 wells in the onshore Otway Basin across South Australia and Victoria.

Seismic surveys were first undertaken in the South East of South Australia by Beach and other exploration companies in the early 1960's. Beach's most recent seismic survey in the region was at Dombey gas field in 2022 (refer to Section 3.5 and Appendix A). Beach considers the Otway Basin to have substantial exploration potential because of its existing conventional gas, condensate and oil discoveries. Beach plans to continue exploration for hydrocarbons in the Otway Basin and has prepared this EIR to cover ongoing geophysical operations within licensed areas in the South East of South Australia.

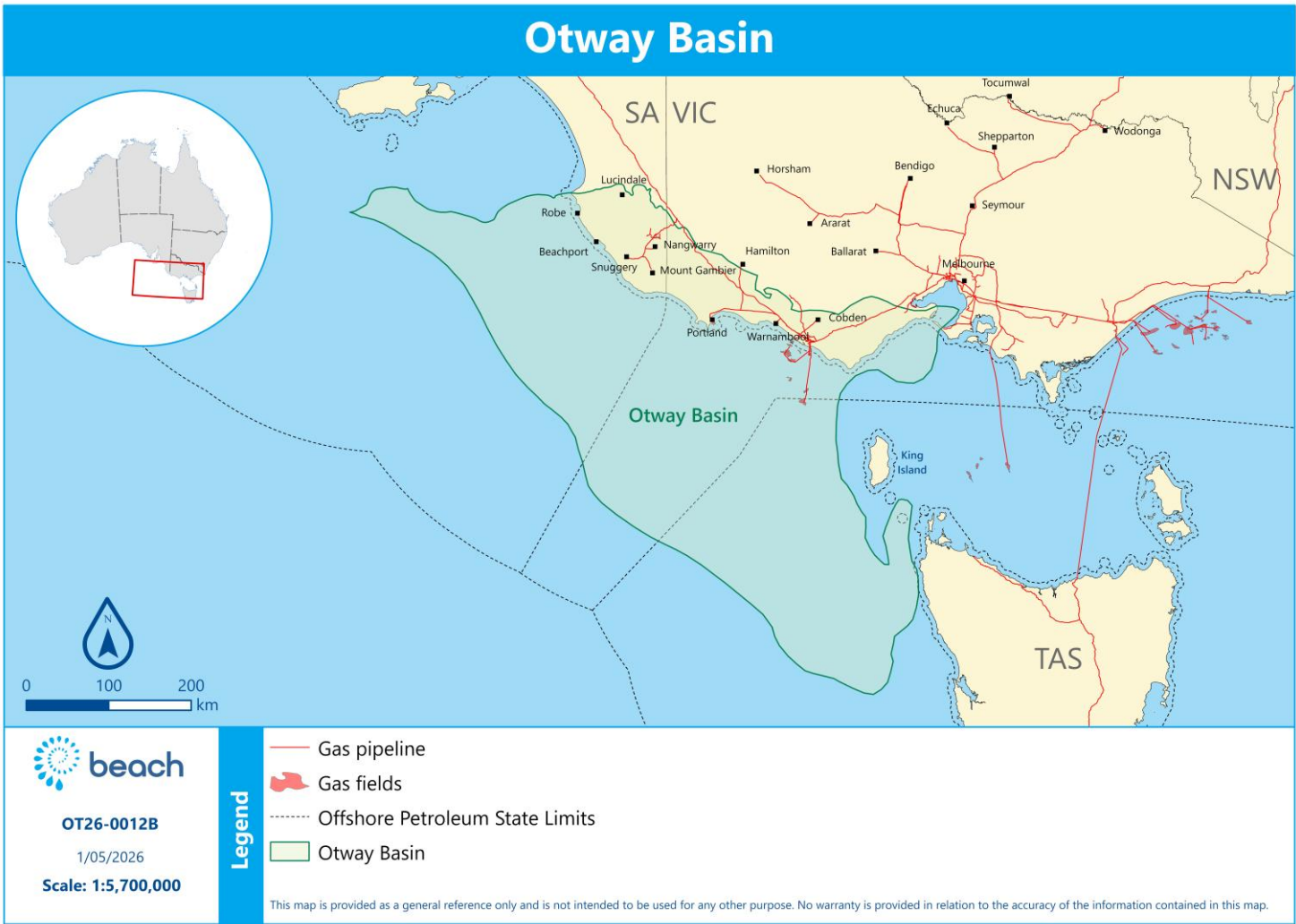


Figure 1-1: Location of the Otway Basin

1.2 Beach Energy Company Profile

Beach is an ASX listed oil and gas exploration and production company headquartered in Adelaide, South Australia. It has operated and non-operated, onshore and offshore, oil and gas production from five producing basins across Australia and New Zealand, and is a key supplier to the Australian east coast gas market.

Beach's asset portfolio includes ownership interests in strategic oil and gas infrastructure, such as the Katnook Gas Plant and Moomba processing facility, as well as a suite of high potential exploration prospects.

Beach currently holds two petroleum exploration licences (PEL), three petroleum production licences (PPL) and four production retention licences (PRL) in the South Australian section of the onshore Otway Basin, both in its own right and with joint venture partners. The locations of Beach's operations are shown in Figure 1-2.

1.3 Scope of this Document

This document has been prepared to satisfy the requirements of an EIR under the ER Act. It has been prepared in accordance with current legislative requirements, in particular Section 97 of the Act and Regulation 10 of the ER Regulations.

This document (and accompanying SEO) covers geophysical operations within Beach licenses¹ that fall within the Impact Assessment Area defined in Figure 1-2. This covers a relatively broad geographical area located in the South East of South Australia within the onshore Otway Basin and subsequently the document is 'generic' in nature, rather than relating to a specific site or sites, or to specific projects. This approach has been applied in many other EIRs and SEOs that have been developed under *the Petroleum and Geothermal Energy Act 2000* (SA) (which was superseded by the ER Act in April 2024) including previous EIRs and SEOs developed by Origin Energy, Adelaide Energy and Beach for exploration in the onshore Otway Basin. The Impact Assessment Area (Figure 1-2) has been defined based on the historical extent of PEL 494 prior to the 2025 acreage relinquishment and the extent PEL680. The impact assessment area encompasses Beach's PEL 680, Petroleum Retention Licence Application (PRLA) 253, PRLA 254 and associated petroleum production licences (PPLs). It also includes RSEL-E which was offered in the Otway Basin Acreage Release OT2025, and awarded to a joint venture that is operated by Beach.

Prior to commencement of geophysical operations, additional site-specific and technical detail for operations at individual survey locations must be provided to DEM under the activity notification / approval requirements of the Act, including a demonstration that the activities are covered by (and are compliant with) an applicable SEO (refer to Section 2.1.3).

This document relates to planning activities, environmental and cultural heritage surveys, access track and seismic survey preparation activities, surveying operations, recording operations, laydown areas, accommodation and associated activities, rehabilitation / restoration and monitoring and auditing in

¹ Geophysical surveys may, from time to time, ingress upon adjacent contiguous land located outside Beach's licence areas (Figure 1-2). These activities are required to ensure adequate geophysical data acquisition of the licence area. In such circumstances, Beach would apply for an Associated Activities Licence (AAL) to conduct associated activities on land located outside the area of the primary licence. An associated activity is anything that is reasonably necessary for, or incidental to, carrying out regulated activities in the area of, or the vicinity of, the primary licence area.

the onshore Otway Basin in South Australia. This EIR and the accompanying SEO do not apply to petroleum activities such as:

- drilling activities
- fracture stimulation
- production and processing operations beyond well production testing
- production and processing operations at the Katnook gas plant site
- well operations (after drilling has finished) including production completions and workovers, well integrity management, artificial lift and well head production equipment, gas well deliquification and downhole decommissioning following production
- field production / processing equipment installation, operation, post operation decommissioning and rehabilitation
- pipeline construction, operation and decommissioning.

These activities are covered by other EIRs and SEOs. The relevant SEOs in place at the time of preparation of this document include:

- *Statement of Environmental Objectives: Onshore Otway Basin Petroleum Drilling, Completion and Well Production Testing (Beach Energy, 2019)*²
- *Statement of Environmental Objectives: Onshore Otway Basin Petroleum Production Operations (Beach Energy, 2025).*

Operation of major transmission pipelines in the region not owned by Beach, such as the SEA Gas or SESA pipelines, are not covered by this EIR and SEO.

1.4 Limitations on Use

This document has been prepared to satisfy the requirements of the *Energy Resources Act 2000* (SA) and Energy Resources Regulations 2013 and is to be submitted to the Department of Energy and Mining (DEM) and the relevant Minister.

Beach does not authorise this document to be used by third parties for any other purpose.

² Beach has submitted an updated SEO for Drilling, Completion and Well Production Testing to DEM which is currently undergoing public consultation. Until the updated SEO is approved by DEM, the current approved SEO remains in effect.

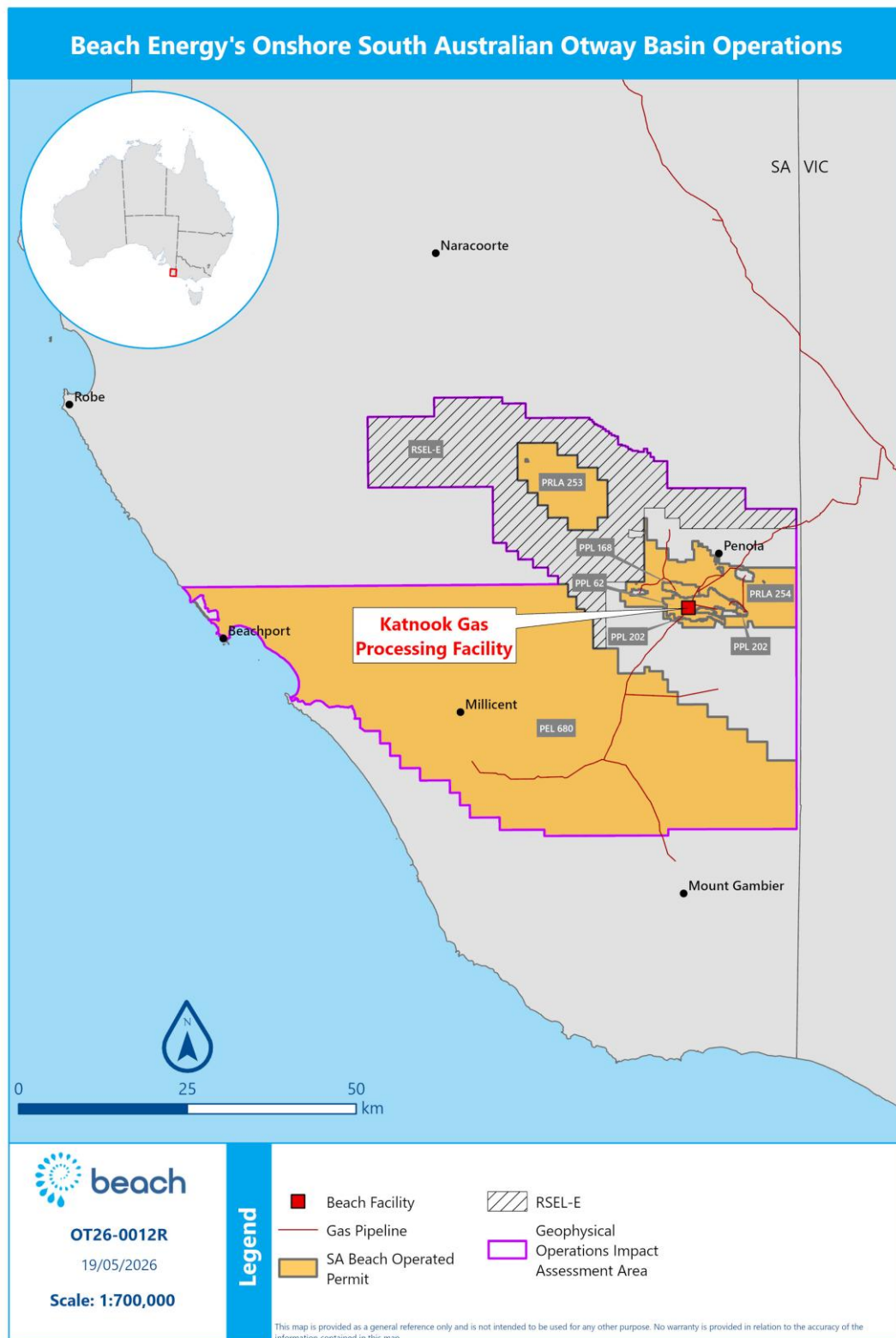


Figure 1-2: Beach's Onshore South Australian Otway Basin Licences and the Impact Assessment Area

2 Legislative Framework

2.1 *Energy Resources Act 2000 (SA)*

The legislation governing onshore petroleum exploration and production in South Australia is the *Energy Resources Act 2000 (SA)* (ER Act) and associated Energy Resources Regulations 2013 (SA) (ER Regulations). This legislation is administered by DEM. This legislation came into effect in April 2024, superseding the *Petroleum and Geothermal Energy Act 2000 (SA)* and Petroleum and Geothermal Energy Regulations 2013 (SA) under which EIR and SEO reports (including the earlier version of this report) were produced.

Key objectives of the legislation include:

- to create an effective, efficient and flexible regulatory system for exploration and recovery or commercial utilisation of petroleum and other regulated resources
- to minimise environmental damage from the activities involved in exploration and recovery or commercial utilisation of petroleum and other regulated resources
- to establish appropriate consultative processes involving people directly affected by regulated activities and the public generally
- to protect the public from risks inherent in regulated activities.

The ER Act and ER Regulations are objective-based rather than prescriptive. An objective-based regulatory approach principally seeks to ensure that industry effectively manages its activities by complying with performance standards that are cooperatively developed by the licensee, the regulatory authority and the community. This contrasts with prescriptive regulation where detailed management strategies for particular risks are stipulated in legislation.

Regulated resources, as defined in Part 1 of the ER Act, are:

- a naturally occurring underground accumulation of a regulated substance
- a source of geothermal energy
- a natural reservoir.

A reference in the ER Act to petroleum or another regulated substance extends to a mixture of substances of which petroleum or other relevant substance is a constituent part. Regulated substances as defined in Part 1 of the ER Act are:

- petroleum
- hydrogen sulphide
- nitrogen
- helium
- carbon dioxide

- any other substance that naturally occurs in association with petroleum
- any substance declared by regulation to be a substance to which the ER Act applies.

Regulated activities, as defined in Section 10 of the Act, are:

- exploration for petroleum or another regulated resource
- operations to establish the nature and extent of a discovery of petroleum or another regulated resource, and to establish the commercial feasibility of production and the appropriate production techniques
- production of petroleum or another regulated substance
- utilisation of a natural reservoir to store petroleum or another regulated substance
- production of geothermal energy
- construction of a transmission pipeline for carrying petroleum or another regulated substance
- operation of a transmission pipeline for carrying petroleum or another regulated substance.

2.1.1 Statement of Environmental Objectives

As a requirement of Part 12 of the ER Act, a regulated activity can only be conducted if an approved SEO has been developed. The SEO outlines the environmental objectives that the regulated activity is required to achieve and the criteria upon which the objectives are to be assessed.

Under Regulation 13 of the ER Regulations, an approved SEO must be reviewed at least once in every five years. Beach's Geophysical Operations SEO was originally approved in 2021, supported by an EIR. This updated EIR has been prepared to use as a basis for preparation of the revised SEO.

2.1.2 Environmental Impact Report

In accordance with Section 97 of the Act, an EIR must:

- take into account cultural, amenity and other values of Aboriginal and other Australians insofar as those values are relevant to the assessment
- take into account risks to the health and safety of the public inherent in the regulated activities
- contain sufficient information to make possible an informed assessment of the likely impact of the activities on the environment.

As per Section 96A of the ER Act, the Minister has determined environmental impact assessment criteria. These criteria form the basis of the assessment completed in Section 5:

- elements of the environment
- potential impact events
- confirmation of impact events

- control and management strategies and uncertainty assessment
- environmental significance assessment.
- statement of environmental objectives (accompanying document to this EIR).

As per Regulation 10 of the ER Regulations, for the purposes of an EIR, a licensee must provide:

- a description of the regulated activities to be carried out under the licence (including their location)
- a description of the specific features of the environment that can reasonably be expected to be affected by the activities, with particular reference to the physical and biological aspects of the environment and existing land uses
- an assessment of the cultural values of Aboriginal and other Australians which could reasonably be foreseen to be affected by the activities in the area of the licence, and the public health and safety risks inherent in those activities (insofar as these matters are relevant in the particular circumstances)
- if required by the Minister – a prudential assessment of the security of natural gas supply
- a description of the reasonably foreseeable events associated with the activity that could pose a threat to the relevant environment, including information on:
 - events during the construction stage (if any), the operational stage and the abandonment stage
 - events due to atypical circumstances (including human error, equipment failure or emissions, or discharges above normal operating levels)
 - information on the estimated frequency of these events
 - an explanation of the basis on which these events and frequencies have been predicted
- an assessment of the potential consequences of these events on the environment, including information on:
 - the extent to which these consequences can be managed or addressed
 - the action proposed to be taken to manage or address these consequences
 - the anticipated duration of these consequences
 - the size and scope of these consequences and
 - the cumulative effects (if any) of these consequences when considered in conjunction with the consequences of other events that may occur on the relevant land (insofar as this is reasonably practicable)

- an explanation of the basis on which these consequences have been predicted.
- a list of all owners of the relevant land
- information on any consultation that has occurred with the owner of the relevant land, any Aboriginal groups or representatives, any agency or instrumentality of the Crown, or any other interested person or parties, including specific details about relevant issues that have been raised and any response to those issues, but not including confidential information.

The EIR has been produced in accordance with relevant guidelines and criteria for the ER Act (refer to Section 5.1 for further information).

2.1.3 Activity Notification / Approval Process

Prior to commencing a regulated activity, Section 74(1) of the ER Act requires that activities to be undertaken in accordance with the ER Act are classified as requiring either high-level or low-level official surveillance. In accordance with Section 72(2), Beach has been classified as a low-level official surveillance operator for geophysical activities.

Section 74(3) of the ER Act and Regulation 18 of the ER Regulations requires that low level official surveillance operators provide an Activity Notification to the Minister at least 21 days in advance to the commencing an activity.

The Activity Notification must provide specific technical and environmental information on the proposed activity and include an assessment to demonstrate that it is covered by an existing SEO as per the requirements of Regulation 20 of the ER Regulations and Energy Regulation Guideline 017: Preparation of an Activity Notification.

Consequently, the Activity Notification process provides an additional opportunity for DEM to ensure that the proposed activities and their impacts can be effectively managed and are consistent with the EIR and SEO approval process. This is particularly relevant for activities that are conducted under an SEO that applies to a broad geographical area, as it provides site-specific detail that is not usually contained in the generic documents.

The detail provided as part of the Activity Notification process would include an assessment of the environment of the proposed location, investigation of specific and any proposed measures to minimise impacts to elements of the environment as defined in Section 5.

2.2 Other Legislation

2.2.1 Commonwealth

- *Aboriginal and Torrens Strait Islander Heritage Protection Act 1984* (Cth)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (*EPBC Act*)
- *Native Title Act 1993* (Cth).

2.2.2 South Australia

- *Aboriginal Heritage Act 1988* (SA)

- *Crown Land Management Act 2009* (SA)
- *Planning, Development and Infrastructure Act 2016* (SA)
- *Explosives Act 2024* (SA)
- *Environment Protection Act 1993* (SA)
- *Fire and Emergency Services Act 2005* (SA)
- *Forestry Act 1950* (SA)
- *Heritage Places Act 1993* (SA)
- *National Parks and Wildlife Act 1972* (SA)
- *Native Title (South Australia) Act 1994* (SA)
- *Native Vegetation Act 1991* (SA)
- Native Vegetation Regulations 2017 (SA)
- *Landscape South Australia Act 2019* (SA)
- *South Australian Public Health Act 2011* (SA)
- *Work Health and Safety Act 2012* (SA).

2.2.3 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Cth)

Approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) is required for activities that impact on Matters of National Environmental Significance (MNES) including World Heritage properties, National Heritage places, Ramsar wetlands of international importance, listed threatened species and ecological communities, migratory species, Commonwealth marine areas, the Great Barrier Reef Marine Park, nuclear actions and a water resource in relation to coal seam gas development and large coal mining development.

With regard to operations in the onshore Otway Basin, issues that may trigger approval requirements under the EPBC Act can generally be avoided by site selection. Based on current expectations, Beach believes the requirement for approval under the Act is not likely to be triggered.

2.2.4 *Native Vegetation Act 1991* (SA)

Exploration activities that are approved under the ER Act do not require approval under the *Native Vegetation Act 1991* (SA) for clearance of native vegetation, provided that the activities are undertaken in accordance with approved industry standards that are directed towards minimising impact and encouraging regrowth of any native vegetation that is cleared (see Regulation 15 of the Native Vegetation Regulations 2017 (SA)).

As discussed in Section 5.2.9, Beach plans to avoid activities in areas of remnant vegetation as far as practicable.

2.2.5 *Environment Protection Act 1993 (SA)*

The *Environment Protection Act 1993 (SA)* (the EPA Act) establishes a general duty of care not to undertake an activity that pollutes, or might pollute, the environment unless all reasonable and practicable measures have been taken to prevent or minimise any resulting environmental harm.

The Act requires environmental authorisations for prescribed activities of environmental significance and sets out mandatory reporting obligations for incidents that cause or threaten to cause serious or material environmental harm in accordance with Sections 83 and 83A of the EPA Act.

Petroleum exploration activities undertaken in accordance with ER Act are generally exempt from requiring a separate environmental authorisation under the EPA Act provided the activity does not fall under Schedule 1 of the EPA Act which has the potential for significant environmental impact.

This exemption also applies to wastes generated and managed within the area of the relevant licence or lease provided waste is managed in accordance with the requirements of the ER Act and the activity's approved SEO.

2.2.6 *Landscape South Australia Act 2019 (SA)*

The *Landscape South Australia Act 2019 (SA)* (the LSA Act) provides the framework for managing soil, water and biodiversity resources in South Australia through regional Landscape Boards. The LSA Act requires water affecting activities including those which may affect watercourses, drainage patterns or surface water flows to obtain a permit. Careful planning and siting of infrastructure to avoid watercourses and surface water features and maintain water flows can often satisfy the requirements of the LSA Act without needing a permit. The LSA Act also governs the control of declared pest plants and animals which must be managed in accordance with the relevant regional Landscape Board's requirements.

2.2.7 *Planning, Development and Infrastructure Act 2016 (SA)*

The *Planning, Development and Infrastructure Act 2016 (PDI Act)* has special provisions relating to activities carried out under the *Petroleum and Geothermal Energy Act 2000* (now replaced by the ER Act) and it only applies in some cases. Activities classified as 'designated matters', including applications for production tenements or SEOs under the ER Act, may be subject to referral under the PDI Act. In prescribed cases, including where activities occur within sensitive areas such as Schedule 20 areas (previously designated under the Planning, Development and Infrastructure (General) Regulations 2017 and now under the Planning and Design Code), DEM must, or may, refer the designated matter to the Minister administering the PDI Act for planning advice, supported by the Department for Infrastructure and Transport (DIT).

2.2.8 *Aboriginal Heritage Act 1988 (SA)*

The South Australian *Aboriginal Heritage Act 1988 (SA)* provides protection for all Aboriginal sites, objects and remains across the state. The *Aboriginal Heritage Act 1988 (SA)* applies to all land and bodies of water, including Beach's Otway Basin operations. The *Aboriginal Heritage Act 1988 (SA)* is administered by the Minister for Aboriginal Affairs, who is responsible for ensuring the protection and preservation of Aboriginal heritage across the state. Under the *Aboriginal Heritage Act 1988 (SA)*, it is an offence to damage, disturb or interfere with an Aboriginal site, object or remains without an authorisation under Section 23. Any discovery of Aboriginal sites, objects or remains during activities must be reported to the Minister as soon as practicable.

Where Aboriginal sites, objects and remains are identified during activities, works must cease in the immediate vicinity of the discovery and measures implemented to ensure the heritage is protected. If the activity cannot be modified to avoid the site, object or remains, a section 23 authorisation is required before works can proceed. The *Aboriginal Heritage Act 1988* (SA) requires Beach to report these discoveries to the Minister for Aboriginal Affairs and Reconciliation as soon as practicable. Once reported, Aboriginal Affairs and Reconciliation (AAR) will notify the relevant Aboriginal group of the discovery.

Under section 28(1) of the *Coroners Act 2003* (SA), SA Police (SAPOL) must be notified if skeletal remains are discovered. SAPOL will determine whether the remains are Aboriginal ancestral remains. If the remains are determined to be Aboriginal remains, Beach must contact AAR. AAR will then liaise with Beach and the relevant Traditional Owners regarding the management and protection of the Aboriginal remains.

In the event of any heritage discovery, Beach must ensure that the heritage is not damaged, disturbed with or interfered. To achieve this, works should halt in the vicinity of the discovery and advice should be sought from the Traditional Owners, a qualified heritage consultant or from AAR.

2.2.9 *National Parks and Wildlife Act 1972* (SA)

The *National Parks and Wildlife Act 1972* (NPW Act) establishes and protects South Australia's system of national parks, conservation parks, wilderness protection areas and reserves. The Minister for Environment and Water, supported by the Department for Environment and Water (DEW), is responsible for administration of the NPW Act and management of park land. Where activities regulated by the ER Act are proposed within a national park, conservation park or reserve, approvals must be consistent with both Acts. In such instances, DEM remains the lead regulator for SEOs, but cannot authorise activities on NPW Act land without environmental input and agreement though formal consultation with DEW on the SEO.

The Impact Assessment Area overlaps nine conservation parks and one national park (refer to Section 4.6.2). Beach will aim to avoid undertaking geophysical operations within areas protected by the NPW Act. If geophysical activities are proposed to occur within a park or reserve established under the NPW Act, consultation will be undertaken with DEW to determine appropriate mitigation measures and additional environmental approval requirements.

3 Description of Activities

The following section provides an overview of geophysical operations. The descriptions focus on 2D and 3D seismic survey operations using a range of surface and underground source and receiver types. These surveys are the predominant geophysical survey methods proposed to be implemented by Beach in the South-East Otway Basin. Descriptions of other geophysical operations (such as uphole surveys) are also provided.

3.1 Grouping of Operations

Operations considered in this EIR include seismic line and access track preparation, shot hole / uphole drilling, surveying and recording, campsites and associated activities, monitoring and auditing, and rehabilitation / restoration where required.

To clearly outline the processes involved, and assess the impacts of geophysical operations on the environment, the activities have been grouped and considered as follows:

- overview of geophysical data acquisition methods (Section 3.2)
- seismic survey energy sources and receivers (Section 3.3)
 - energy source point types (Section 3.3.1)
 - receiver point types (Section 3.3.2)
- types of seismic survey (Section 3.4)
 - 2D and 3D seismic surveys (Section 3.4.1)
 - vertical seismic profiling (VSP) (Section 3.4.2)
 - uphole surveys (Section 3.4.3)
- history of seismic surveys in the Impact Assessment Area (Section 3.5)
- description of seismic survey planning and operations (Section 3.6)
 - planning (Section 3.6.1)
 - environmental and cultural heritage surveys (Section 3.6.2)
 - access track and seismic survey preparation activities (Section 3.6.3)
 - surveying operations (Section 3.6.4)
 - recording operations (Section 3.6.5)
 - laydown areas, accommodation associated activities (Section 3.6.6)
 - rehabilitation / restoration (Section 3.6.7)
 - monitoring and auditing (Section 3.6.8).

3.2 Overview of Geophysical Data Acquisition Methods

Geophysical data acquisition allows resource explorers to gather information about the location and characteristics of geological structures located beneath the earth's surface. This information is used to assist in identifying areas where hydrocarbons (and other natural resources) may be present.

Onshore geophysical surveys (seismic surveys) for petroleum hydrocarbon exploration predominantly utilise the principles of reflection seismology to collect geophysical data. The methods are largely based around how acoustic / sound waves change their speed (velocity) and direction (reflection and refraction³) as they pass through different types of soil and rock. Interpretation of changes in velocity

³ Seismic refraction is the change in direction of a sound wave as it passes from one medium to another

and direction of sound waves as they pass through soil and rock enables geophysicists to determine geological conditions and structures in a given survey area.

Seismic surveys require an energy source to create a sound wave on or near the earth's surface, and receivers to record the reflected waves (refer Figure 3-1). Prior to the 1970s, seismic surveys in Australia used small explosive charges placed in or on the surface or buried in shallow holes as the energy source to generate sound waves. Other systems to create a controlled seismic 'source point' have been developed over the years including 'vibroseis', which uses a vibrator on the surface to generate sound waves, and weight drop (or thumper) which uses a heavy weight dropped from a height as the energy source. Source point types are discussed further in Section 3.3.1.

The generated sound waves travel into the earth where they reflect off subsurface geological formations back to the surface. The returning sound waves are recorded by a series of sensors commonly referred to as 'receiver points'. These sensors include receivers such as geophones, accelerometers and fibre optic cables. Receiver point types are discussed in Section 3.3.2.

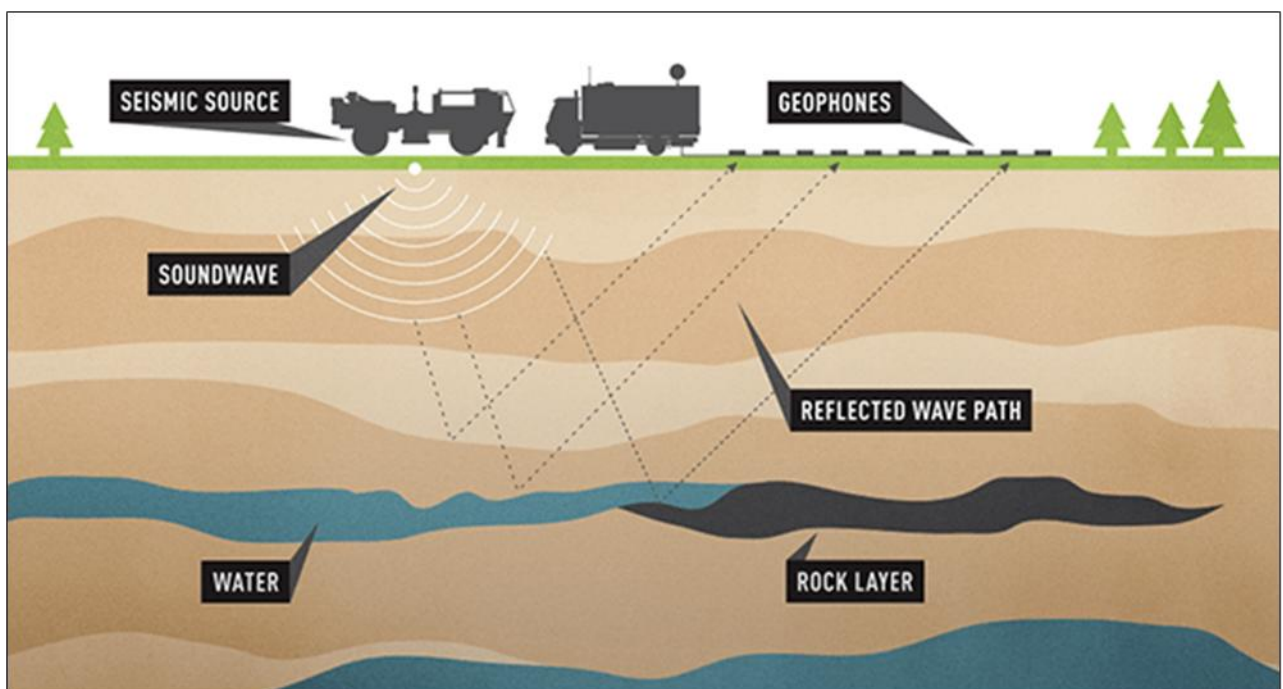


Figure 3-1: Typical Onshore Seismic Survey Outline (Source: APPEA, 2019)

Source and receiver points are typically laid out in relatively straight lines or multi-line grids (commonly referred to as 'seismic lines'), however survey designs will vary with survey requirements. Source and receiver points may be located on the surface, buried in trenches or placed in drilled holes, or used in combination depending on survey requirements, the surface environment and the nature of the geology in the survey area. All source and receiver points are numbered, and the position of each point is accurately mapped. The number of source points and their positions are carefully designed to improve the downward-going sound energy, minimise the energy going in other directions, and minimise impacts to surface and subsurface environments. The different types and methods of seismic survey are described further in Section 3.4.

3.3 Seismic Survey Energy Sources and Receivers

3.3.1 Energy Source Point Types

Seismic surveys can utilise a range of energy sources to generate sound waves. Modern onshore seismic surveys typically utilise either a 'vibroseis' system, weight drop system, small buried explosive charges (buried source) or Betsy seisgun.

Beach anticipate that the use of buried sources (explosives) can be avoided with a preference for non-buried sources, such as vibroseis. Buried sources are typically used in coal mining for shallow targets, whereas Beach's seismic surveys within the Otway Basin will target deeper structures and rely on high-resolution detail. Furthermore, ground conditions across the Limestone Coast region are expected to be well suited to vibroseis operations, with a low likelihood of encountering unavoidable near surface hard rock where buried sources or explosives may be preferred. Nevertheless, in the unlikely event that the ground conditions within survey areas are not suitable for non-buried sources, it is possible that buried sources could still be required. Therefore, although the use of buried sources is unlikely, it cannot be completely ruled out and is included within the scope of this EIR.

3.3.1.1 Vibroseis

Vibroseis is the most common energy source used for modern 2D and 3D seismic surveys. The vibroseis system is a truck-mounted system that uses a large oscillating mass (vibrator) to generate acoustic waves of varying frequencies. The vibrator is typically in the form of a retractable plate (mounted to the underside of a truck) that can be lowered to the ground with pressure applied (see Figure 3-2). The plate is applied to the ground for each vibration (source point), and then raised up as the truck moves to the next source point. Small vibrator pad marks (i.e. shallow indentations on the soil surface) may be left on soil where the vibrator pad was pressed against the ground surface. These indentions are temporary, and they typically naturally rehabilitate within a short period of time.

Vibroseis produces a low energy density, which allows it to be used in sensitive environments, cities and other built-up areas (e.g. the centre of Paris) without damaging buildings or the environment in close proximity to the energy source (APPEA, 2019). Vibroseis trucks typically use large balloon type tyres (or tracks less typically), to lower their surface pressure and footprint (see Figure 3-2).

The process of undertaking a seismic survey utilising vibroseis is described further in Section 3.6.5.



Figure 3-2: Vibroseis Trucks (Source: Sercel, 2020)

3.3.1.2 Weight Drop (or Thumper)

The weight drop system is a simple method used to generate a sound wave. A heavy weight is dropped from a height of 1-2 m onto a base plate located on the ground. When the weight makes contact with the base plate it generates a 'thump', which imparts a sound energy source into the ground. Weight drops are a common source used for uphole surveys (as described in Section 3.4.3). Weight drop units are commonly mounted to a small truck or tractor type vehicle (Figure 3 3). As with vibroseis, this method can result in shallow indentations on the ground surface, which are temporary, and typically naturally rehabilitate within a short period of time.



Figure 3-3: Weight Drop ('thumper') Unit Mounted to a Tractor

3.3.1.3 Buried Source

The buried source method involves the drilling of shallow holes, commonly referred to as 'shot holes' into which small explosive charges are placed to generate a 'buried source' of energy. Shot holes typically range between 5 to 80 m in depth and no more than 20 cm in diameter. For the scope of this activity, shot holes would typically be less than 20 m deep.

Buried sources are commonly used to generate higher quality acoustic source energy, and at the same time reduce disturbance to land and vegetation in sensitive environments (e.g. areas where large vehicle access is limited). This method also improves data quality in areas where near surface geology interferes with acoustic source energy transmission. Areas with karst structures (such as those present in the South-East Otway Basin) or areas with significant laterites⁴ can cause down-going acoustic waves to scatter and weaken at the near surface (see Figure 3-4) (Grimes, 1994; Crook *et al*, 2015). Placing energy sources (and / or receiver points) below these shallow structures can significantly improve data quality, and in some cases, it is the only way to acquire useable seismic survey data.

⁴ Laterites are soil and rock rich in iron and aluminium, that may form chunks and boulders.

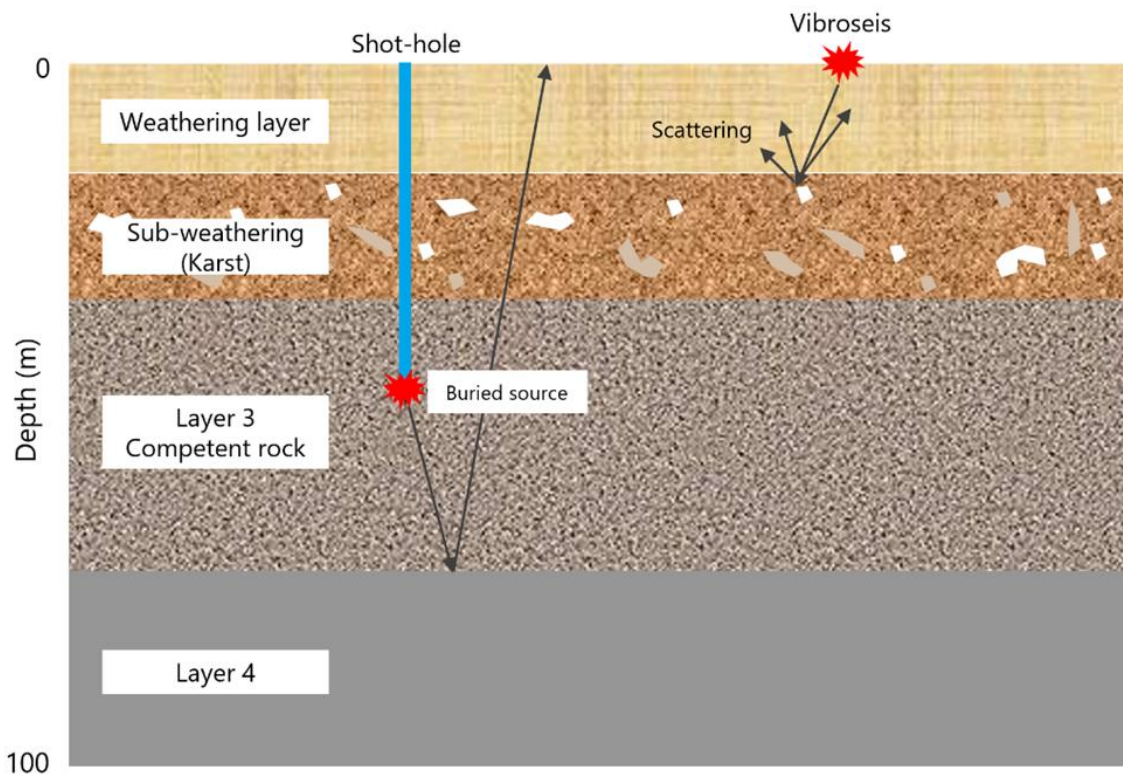


Figure 3-4: Schematic of Buried source vs. Vibroseis Source Type Behaviour in an Area with a Karst Layer

Shot holes can be drilled using hand-held motorised augers, small vehicle mounted drill rigs (e.g. bob cat or light vehicle), standard water bore truck-mounted mud / rotary rigs or heli-portable rigs, depending on terrain, access and depth requirements. Minimal to no site preparation is typically required to locate a drilling rig, and hand portable drilling rigs can be walked into sensitive areas with no vegetation clearing required.

A small charge (0.5 to 4 kg) is placed in each shot hole following drilling and a detonation wire is run to the surface. For the scope of this activity, the charge would typically be up to 2 kg. The hole is then immediately backfilled with drill cuttings, bentonite clay and / or gravel and capped to the surface with native soil. The backfilling process ensures the charge is secured in the bottom of the hole and limits energy loss up the hole. Shot hole depth and charge size requirements are dependent on near surface geological characteristics (typical shot hole depths and charge sizes are detailed in (Table 3-1). Seismic charges are solid (i.e. not a liquid or emulsion) and are typically encased in sealed hard-plastic shells (see Figure 3-5). Seismic charges typically contain several common types of explosives, including TNT (Trinitrotoluene), RDX (Cyclonite) and PETN (Pentaerythritol tetranitrate) (Orica, 2017). At least two detonators are typically placed with each charge to ensure that the charge is detonated.

During recording operations (as described in Section 3.6.5) each charge is individually detonated using specialised equipment, resulting in a minor sound at the surface (i.e. small thud). Following detonation, wiring is cut off a few centimetres below the surface level, and any subsidence in the hole is remediated using native soil. Localised disturbance associated with shot hole drilling activities is temporary, and sites typically naturally rehabilitate within a short period of time. Further detail on rehabilitation / restoration is provided in Section 3.6.7.

Table 3-1: Shot Hole Depths and Maximum Charge Sizes

Shot Hole Depth	Charge Size
5 to 10 m	0.5 kg
10 to 20 m	1 kg
20 to 30 m	2 kg
>30 m	4 kg



Figure 3-5: Orica Pento-Seis and Pentex Charges (Source: Orica, 2020)

3.3.1.4 Betsy Seisgun

A Betsy Seisgun is a portable, propellant based seismic source that fires a blank shotgun cartridge in a shallow hole to generate an impulsive seismic signal for near surface geophysical surveys. The method requires only small, temporary shot holes and produces minimal environmental disturbance. The system is remotely initiated for safety, does not require explosives licensing, and is suitable for high resolution refraction and reflection profiling in areas where low impact seismic acquisition is required.

3.3.2 Receiver Point Types

There are many types of seismic sensors (receivers), such as geophones, accelerometers and fibre optic cables. These sensors convert the extremely small returning sound waves into data that can be interpreted by geophysicists. Many thousands of sensor locations are required to record the returning acoustic waves and sensors are typically installed temporarily on the surface or downhole. Sensors are typically arranged in linear patterns along seismic lines, but arrangements vary with survey requirements (refer to Section 3.4.1). Sensors can also be installed permanently for long-term monitoring purposes (see Figure 3-8).

3.3.2.1 Geophones

Geophones located on the surface are typically pushed into the soil surface using small metal spikes to ensure a firm connection with the ground. A range of geophone types are shown in Figure 3-6 and Figure 3-7. Geophones may also be partially buried in small shallow holes for improved sensitivity (Figure 3-7).

Buried geophones (commonly referred to as 'downhole geophones') can be installed into drill holes of varying depths (typically ranging from 10 m to 300 m). Downhole geophones are typically deployed temporarily (1-2 hours) during 'uphole' surveys (refer to Section 3.4.3), semi-permanently (i.e. weeks to several months) to monitor ongoing data during a 2D or 3D seismic survey program (refer to Section 3.4.1), or permanently for passive monitoring or time-lapse applications. Downhole geophones can consist of a single geophone (typically used for uphole surveys) or for semi-permanent installations, a

string of multiple geophones (i.e. up to 20 individual geophones) may be installed (see Figure 3-8). Permanent installation of downhole geophones typically requires cementing the geophones in place in cased drill holes (up to 300 m deep).

3.3.2.2 Fibre Optic Cables / Sensors

Fibre optic cable and sensors can be deployed into drill holes in a similar way to geophones, either temporarily or cemented in place as described above (refer Figure 3-8). Fibre optic cables can also be deployed in a shallow trench (<50 cm deep) to either replace geophones and / or provide supplemental information, or installed into trenches over several kilometres (see Figure 3-8). The trenches are typically installed adjacent to 3D / 2D seismic lines. Upon completion of the survey, the cable and sensors are typically removed, and the trench is backfilled. Distributed Acoustic Sensing (DAS) technology is used to interrogate the cable and extract the required seismic information.



Figure 3-6: Geophone Types (Source: Dean & Sweeney, 2019)



Figure 3-7: Wireless Geophone ('node') with Sensor Installed in Shallow Hole

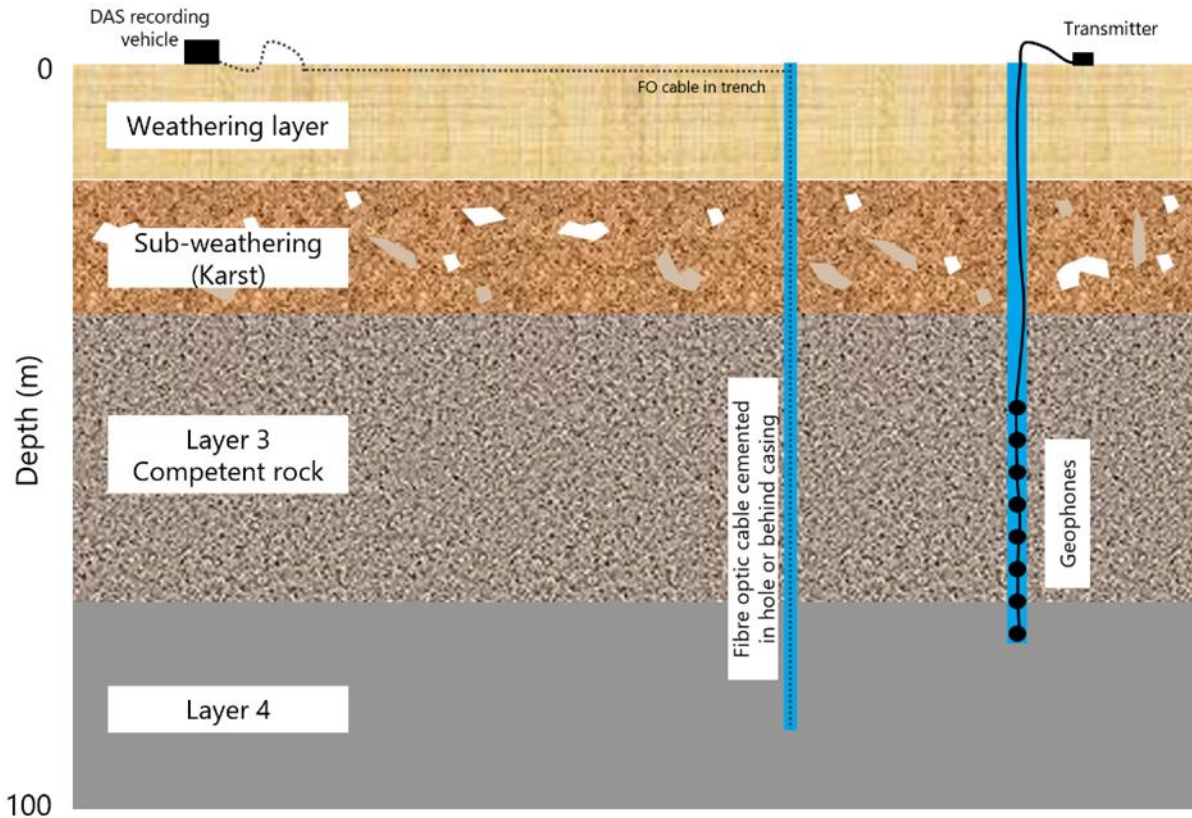


Figure 3-8: Schematic of Downhole Geophone and Fibre Optic Cable (DAS Technology) Installation

3.4 Types of Seismic Survey

3.4.1 2D and 3D Seismic Surveys

Until the early 1980s, onshore seismic surveys were typically conducted along single seismic survey lines with source and receiver points located along the same line. The resulting data creates a simplistic two-dimensional (2D) image representative of a slice through the subsurface structures beneath a particular seismic line (see Figure 3-10). 2D seismic surveys typically involve a series of seismic lines in the order of 10 km to 50 km in length, with spacing between lines of approximately 0.25 km to 5 km (see Figure 3-9). Spacing between shot and receiver points along the seismic lines for 2D surveys is typically in the range of 5 m to 50 m. The seismic line itself is usually 3 m – 5 m wide.

While 2D seismic is still undertaken, the majority of modern seismic surveying uses the three-dimensional (3D) survey method. The 3D methodology is similar to 2D, but instead of a single line of source and receiver points, the source and receiver points are located on dedicated source lines and receiver lines laid out in a grid pattern across a survey area (see Figure 3-9). Receiver points are laid down in parallel 'receiver lines', and the source points are laid out in perpendicular parallel 'source lines' to form a cross-hatched grid.

3D seismic surveys can range in size from several km² to several thousand km², and spacing between seismic lines is typically in the order of 100 m to 400 m. Spacing between source and receiver points typically ranges from 5 m to 50 m. The grid arrangement means that source and receiver points are spread across the entire survey area, which allows each receiver point to collect seismic reflections from multiple directions across the survey area (see Figure 3-9). This data can then be analysed to create a 3D image of the survey area subsurface (see Figure 3-10). Section 1.1 provides further detail on seismic survey planning, seismic line preparation, and 2D and 3D seismic survey operations.

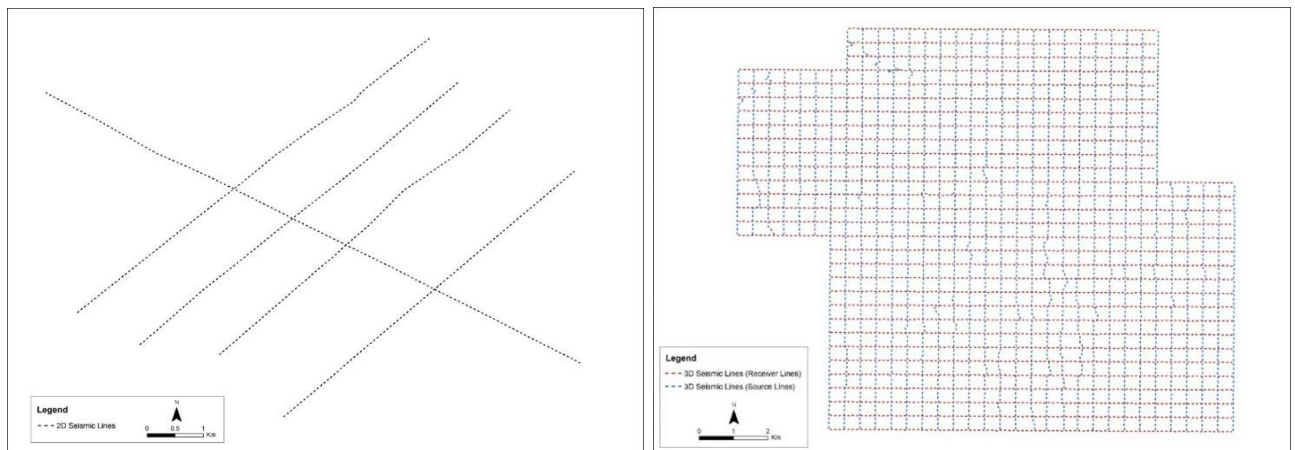


Figure 3-9: Comparison of 2D and 3D Seismic Survey Design

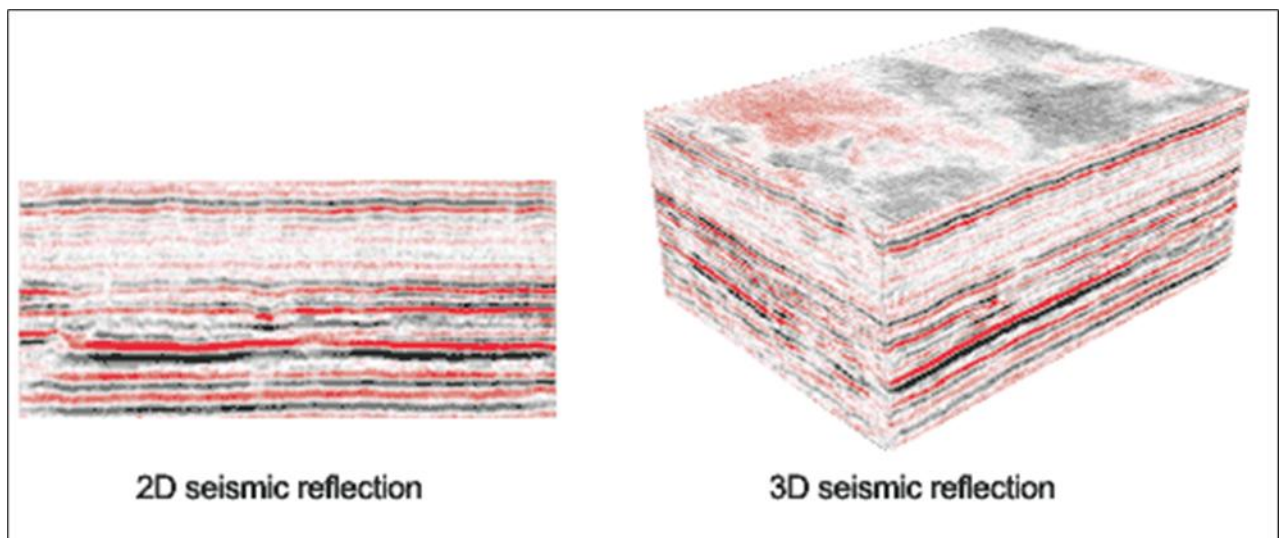


Figure 3-10: Comparison of 2D and 3D Seismic Survey images (Mari and Chapellier, 1999)

3.4.2 Vertical Seismic Profiling (VSP)

In addition to surface-based 2D and 3D seismic methods, Vertical Seismic Profiling (VSP) may on occasion be used to obtain high-resolution seismic information in the immediate vicinity of a well. Unlike surface seismic, VSP provides higher-resolution images and directly relates time-depth measurements to geological data.

A VSP uses a surface seismic source and geophones placed at multiple depths within a borehole to record both the direct downward wavefield and the upward reflected energy. Because the receivers are located below the weathered near-surface layer, VSP data provide a detailed time-depth relationship

and higher-resolution imaging around a wellbore. Common VSP configurations include zero-offset, offset, and walkaway surveys, all of which use a 2D source geometry aligned along a line relative to the well.

3.4.3 Uphole Surveys

Uphole surveys are another geophysical method that utilises drill holes to record and calibrate 2D / 3D seismic survey data. Uphole methods involve drilling holes usually within the range of 30 m to 90 m deep but up to 300m deep in some instances, and located 1 km to 5 km apart along 2D / 3D seismic lines. A downhole geophone is placed in the hole at varying depths, and the source energy (typically a weight drop as described in Section 3.3.1) is located at the surface.

Uphole drilling involves a very similar process to that required for shot hole drilling (refer Section 3.3.1), with key differences being that upholes may require a larger bore diameter, and potentially use of a larger drilling rig and additional equipment (Figure 3-11). Minimal site preparation is required for uphole surveys as the drilling rig uses existing seismic lines, roads and tracks to access drilling locations. Following the completion of drilling each uphole, the drill rig will mobilise to the next drilling location and a data logging vehicle (typically a 4WD light vehicle) will move in to record geophysical data.

On completion of data logging (usually 1-2 hours per uphole), drill cuttings are returned to the hole, and the hole is capped to the surface with native soil. Localised disturbance at uphole sites will typically naturally rehabilitate within a short period of time. A significant amount of uphole drilling / logging has been undertaken across South Australia to date, particularly in the Cooper and Otway Basins. This data has been captured in an open file database by DEM, which now minimises the need for new upholes in areas previously explored.



Figure 3-11: Truck Mounted Uphole Drilling Rig

3.5 History of Seismic Surveys in the Impact Assessment Area

Extensive 2D and 3D seismic surveying using vibroseis and buried sources has been undertaken in the onshore Otway Basin in the South East of South Australia. Seismic surveys were first undertaken in the South East by Beach and other exploration companies in the early 1960's.

2D seismic survey line and 3D seismic survey data are accessible via the South Australian Resource Information Gateway (SARIG) (DEM, 2026a). The location of historic 2D / 3D seismic surveys in the Beach Impact Assessment Area are shown in Figure 3-12 and a detailed list of historic seismic surveys undertaken in the Impact Assessment Area is provided in Appendix A.

Within the Beach Impact Assessment Area, sixty-one 2D and nine 3D seismic surveys were undertaken between 1960 and 2022. Of these surveys, 12 used buried sources, 50 used vibroseis and two used thumpers to provide the sound energy source (noting some surveys use a combination energy sources). The most recent surveys in the Impact Assessment Area were Domby and Lodwick in 2022, which both used vibroseis.

Seismic surveys using buried sources were first undertaken in the Impact Assessment Area in the 1960's and then again in the early 1990's. The last survey to use buried sources in the Impact Assessment Area was the 2010 Weatherall 2D Seismic Survey, which used a combination of vibroseis and buried energy sources.

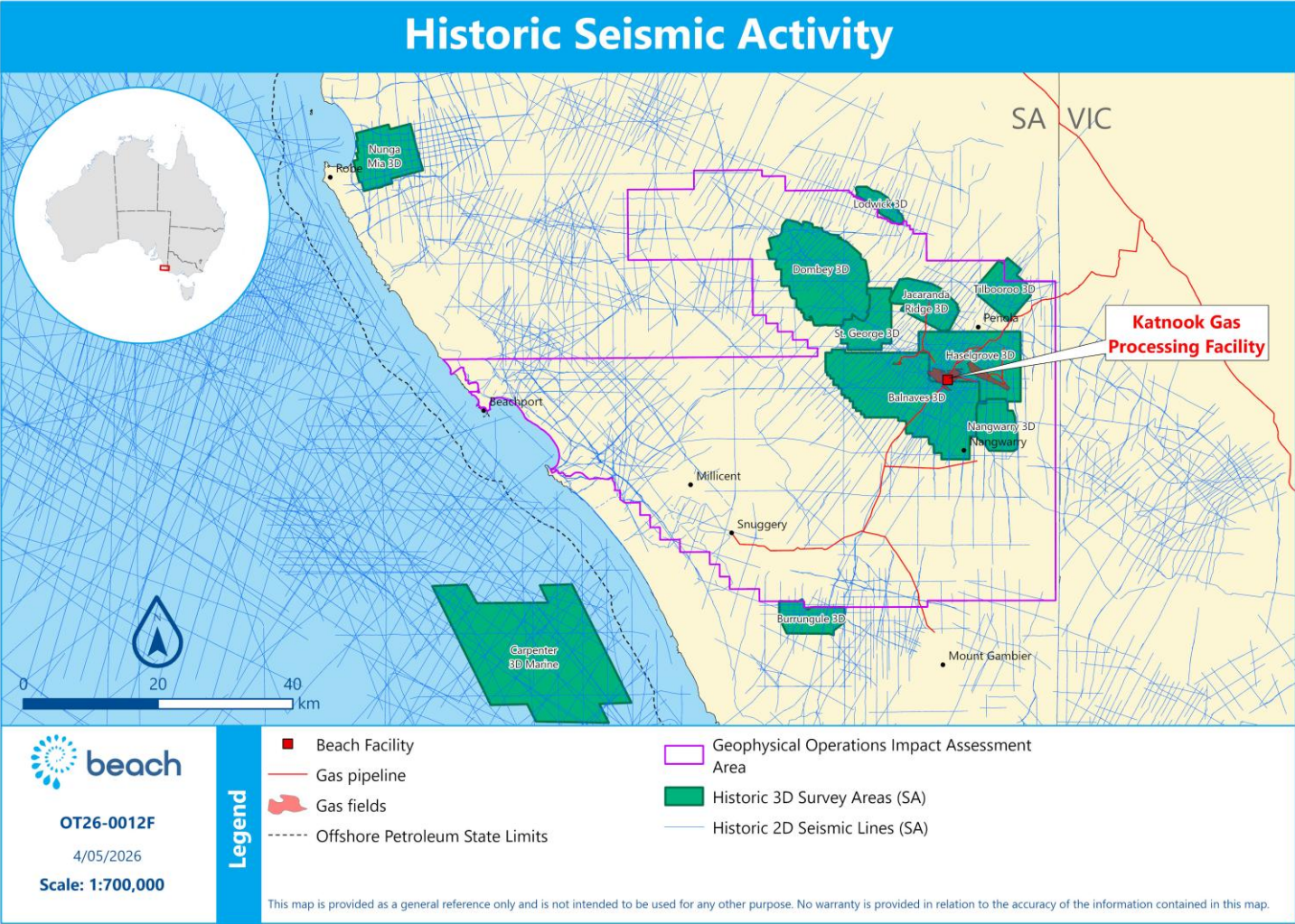


Figure 3-12: Historic Seismic Surveys in the Impact Assessment Area

3.6 Description of Seismic Survey Planning and Operations

3.6.1 Planning

Once a seismic survey program is proposed, the survey area is evaluated using a range of methods and desktop tools to identify and avoid sensitive areas and constraints. Typical desktop tools and resources include detailed maps, a Geographical Information System (GIS), satellite or aerial imagery, biological databases and spatial data for a range of infrastructure and landscape features.

The proposed locations of access tracks, camp sites, seismic lines and / or shot holes are assessed and modified using desktop tools to avoid sensitive infrastructure and environments such as high quality remnant vegetation, known cultural heritage sites, significant wetland areas, groundwater wells, stock yards and other agricultural infrastructure, buildings and houses. All potential disturbances are preferentially located to minimise impacts to sensitive locations and maximise placement in pre-disturbed areas.

The safety of field personnel is also a primary consideration alongside the logistical, environmental and economic viability of the proposed survey during the planning stage.

3.6.2 Environmental and Cultural Heritage Surveys

Site-specific environmental assessments undertaken during the planning phase and as part of the next phase of the activity notification/approvals process (refer to Section 2.1.3) will identify whether there are specific issues within a particular survey area which could trigger the requirement for site-specific surveys to ground-truth desktop assessments (e.g. ecological surveys or cultural heritage surveys/inspections).

The requirement for ecological surveys will be proportionate to the sensitivity in the area (e.g. presence of listed species or communities) and the level of impact. For example, Beach anticipate that ecological surveys may be required where native vegetation clearance is unavoidable in support of appropriate clearance permitting processes to mitigate impacts to priority areas, species and / or habitat. If ecological surveys are required, these will be undertaken by a suitably qualified ecologist.

In areas subject to surface disturbance, Beach will determine the requirement for cultural heritage surveys/inspections using a cultural heritage risk assessment. If cultural heritage surveys/inspections are deemed to be required, these will be undertaken with the South East Aboriginal Focus Group as the relevant Aboriginal heritage group. The survey method varies from project to project, and the method utilised for a particular project will be decided in consultation with the South East Aboriginal Focus Group.

3.6.3 Access Track and Seismic Survey Preparation Activities

As discussed in Section 3.6.1, planning is undertaken to minimise new disturbance and prioritise use of pre-disturbed areas wherever practicable. However, areas with limited access for vehicles or lacking other development (e.g. petroleum wells or production facilities) may require at least minor access track and seismic survey preparation activities to be undertaken (dependent on the proposed survey method). Following cultural heritage survey, access track and seismic survey preparation activities can commence.

3.6.3.1 Access Tracks

Seismic surveys in the Impact Assessment Area will preference the utilisation of existing roads and access tracks where practicable. While unlikely, but if required, access tracks are typically 4 m wide, except on bends and at entry and exit points to a camp site where the width may be as wide as 8 m.. Where particular access tracks may experience increased traffic loads (e.g. main access tracks leading into the survey area or a camp site), it may be necessary to lightly pave these tracks with gravel (imported from a licensed quarry) to prevent significant soil disturbance. Paving materials are usually removed during rehabilitation (unless the landholder requests they are retained) and stockpiled topsoil is re-spread over the site.

3.6.3.2 Seismic Survey Line Preparation

Light vehicles (e.g. 4WD vehicles), vibroseis trucks and drilling rigs generally require access along seismic lines in order to lay out geophones and input sound energy at source points. Vehicle access is less important for laying out receiver points (geophones) as walk-in methods can be utilised. Seismic lines are generally surveyed on the ground using GPS technology, and some surveys are also marked out using small pin flags or water-based paint so the 'grid' can be easily navigated.

As noted in Section 3.4.1, seismic lines are generally 3 m to 5 m wide, and in previously cleared agricultural land they typically do not require any line preparation. In areas of particularly tall or dense pasture grass, an agricultural slasher or vegetation mulcher (Figure 3-14) may be used to remove the top layer of vegetation (retaining rootstock and groundcover, and minimising disturbance to soil (Figure 3-15). This process may also be required to mitigate potential bushfire risk i.e. fire risk associated with vehicle exhausts.

In rough or highly vegetated terrain, seismic lines may require light preparation by earthmoving or vegetation slashing machinery to enable safe and efficient vehicle and equipment access. Large tree limbs overhanging existing access roads and tracks may need to be trimmed (using a chainsaw) to allow safe vehicle access. Appropriate impact management strategies will also be implemented as detailed below.

Disturbance to areas of remnant or significant vegetation, fauna habitat, cultural heritage sites, watercourses and waterbodies is avoided wherever practicable. Where sensitive areas such as remnant vegetation, swamps and lakes cannot be avoided, small low impact vehicles (e.g. quad bikes or off-road buggies) and hand carrying (walk-in) by field personnel can be used to transport and install geophones to avoid traversing the area with large vehicles. Where disturbance to native vegetation is unavoidable, ecological surveys and appropriate clearance permitting processes will be undertaken.

Seismic lines do not need to be perfectly straight and are regularly 'offset' and 'weaved' around environmental sensitivities such as large trees and areas of intact vegetation wherever practicable. This process also reduces the visual impact (linearity) of seismic lines (Figure 3-16). The location of seismic lines (including tolerances for weaving around sensitivities) is typically pre-programmed into a GPS linked computer display located in the cabin (this will generally be a tracked bobcat or similar machine (see Figure 3-14). In this manner, the vehicle operator can weave seismic lines within set tolerances to avoid obstacles and maintain compliance with cultural heritage conditions. In areas where visual impact is an issue, seismic lines may also be weaved to reduce the linearity of seismic lines where appropriate (e.g. every 75 m to 100 m). (However, weaving may be avoided on steep, fragile or wet soils as it may increase rutting and soil disturbance).

Preparation of seismic lines is undertaken to minimise ground and vegetation disturbance and allow natural processes and rainfall to rehabilitate the area in a short timeframe following completion of survey activities. In some cases, minor re-spreading of soil and vegetation following the completion of the activities may be required. Beach respects the rights and requirements of all landholders and will engage directly with landholders regarding the preparation and remediation of survey lines.

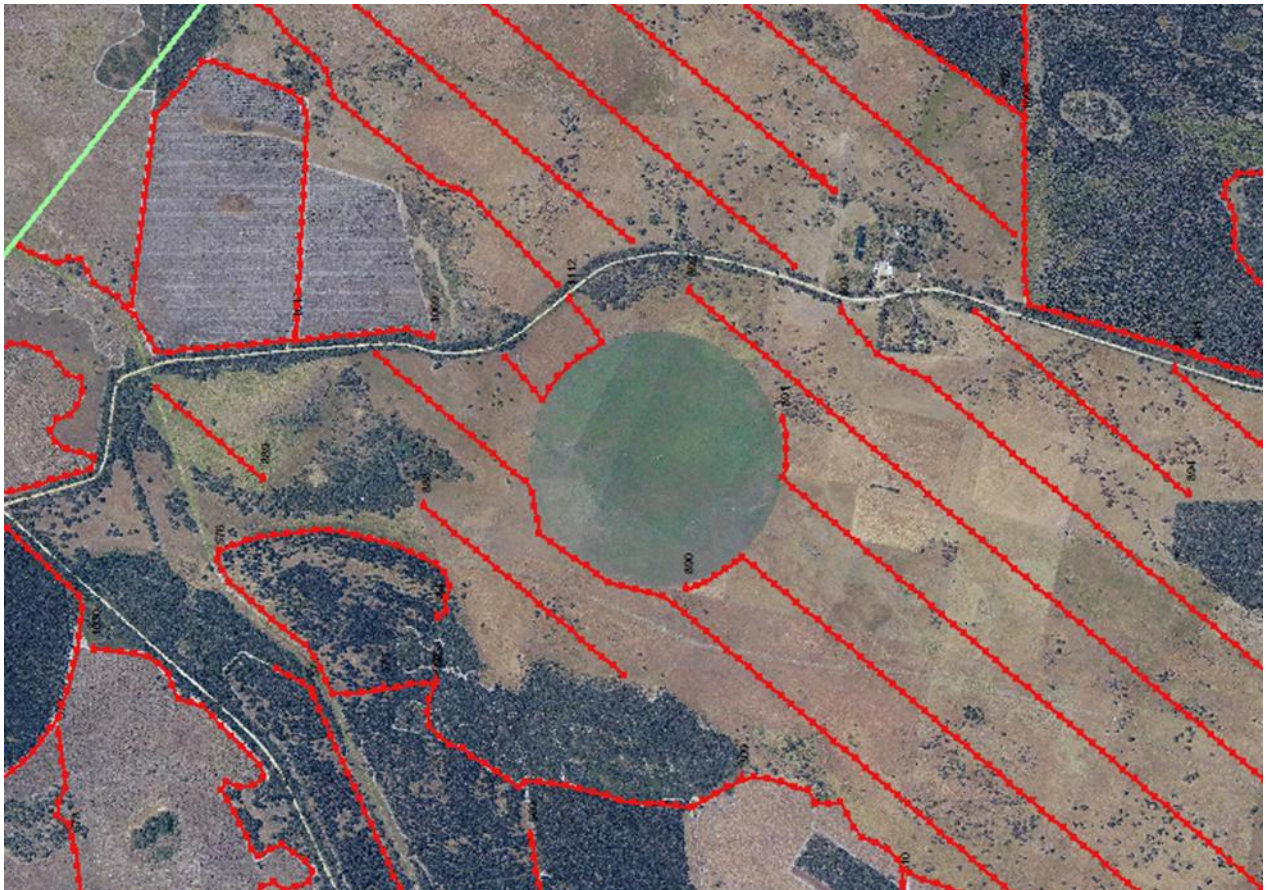


Figure 3-13: Example of Deviation of Seismic Lines to Avoid Sensitive Areas



Figure 3-14: Bobcats with Vegetation Mulching Attachments (Source: Roberts, 2001)



Figure 3-15: Prepared Seismic Line Following use of Bobcat Mounted Vegetation Mulcher in Tall / Dense Pasture Grass

3.6.3.3 Drilling Activities for Seismic Surveys

As discussed in Section 3.3.1, areas with limited access for large vehicles or challenging near surface geological conditions, may require use of buried sources as an alternative to vibroseis. This would typically involve the drilling of a sparse irregular pattern of shot holes across a given survey area. Drilling operations can take several weeks or months to complete dependent on the number of shot holes required for the survey. A single drilling rig (full size water bore drilling rig or similar) can complete up to 10 holes to a depth of approximately 40 m to 60 m per day. Multiple drilling rigs may be used to reduce time required.

Minimal site preparation is typically required to prepare drilling locations and shot holes can typically be located in areas with pre-existing disturbance (e.g. cleared paddocks) using existing access tracks and roads wherever possible. Shot hole locations only require an area large enough to accommodate a truck-based drilling rig and drilling sites located on previously cleared agricultural land typically require limited to no site preparation. Seismic line preparation methods discussed above may be used in areas of particularly tall or dense pasture grass (Figure 3-14). This process may also be required to mitigate potential bushfire risk i.e. fire risk associated with vehicle exhausts and drilling equipment.

In sensitive environments shallow shot holes can be drilled using hand portable drilling rigs with no vegetation clearing required. Where disturbance to native vegetation is unavoidable, ecological surveys and appropriate clearance permitting processes will be undertaken and obtained. Appropriate impact management strategies will also be implemented as detailed below.

Following the completion of drilling each shot hole, the drill rig will mobilise to the next drilling location, and a charge preparation team will prepare and insert the charge into the bottom of the hole

as described in Section 3.3.1. Following charge detonation, wiring is cut off a few centimetres below surface level, and any subsidence in the hole is remediated using native soil.

Monitoring bores (e.g. fibre optic monitoring bore holes) may also be drilled using similar drilling techniques. A standard truck mounted mud or air drilling rig would typically be used to drill to a maximum depth of several hundred metres. Bores would be cased with PVC and cemented in place. Fibre optic cable would be placed in the well bore and then the hole would be filled with cement to within a few metres of the surface then backfilled with soil or other suitable material. Further detail on buried source surveys and reinstatement / rehabilitation processes is provided in Sections 3.3.1 and Section 3.6.7, respectively.

3.6.3.4 Impact Mitigation / Management Strategies

Various mitigation / management measures will be employed to minimise disturbance to the environment during survey activities, as discussed in more detail in Section 5.2. By implementing best practice mitigation / management measures, vegetation clearance is reduced, topsoil and groundcover is generally not disturbed, and vegetation rootstock is retained, facilitating rapid natural vegetation rehabilitation / regeneration (Figure 3-15).

It should be noted that in sensitive areas, low impact vehicles (e.g. quad bikes and off-road buggies) and hand carrying by field personnel can be used to transport and install geophones on receiver lines with limited to no line preparation required. Walk-in methods are commonly used to lay out geophones in sensitive areas such as swamps and dense remnant vegetation.

Following completion of seismic survey operations, evidence of operations is typically limited to weaved lines of lower height vegetation, some localised disturbance at drilling sites, and minor wheel tracks. These disturbances generally naturally rehabilitate within a short period of time following natural processes e.g. rainfall and regrowth vegetation. Further detail on reinstatement and rehabilitation processes is provided in Section 3.6.7.

3.6.4 Surveying Operations

Surveying typically commences shortly before the start of seismic line preparation and drilling. Surveying is required to ensure all source and receiver point locations are accurately recorded.

Surveying typically involves a team of field surveyors recording the location of all source and receiver points using high accuracy GPS technology. Source and receiver points are commonly referred to as 'stations'. The location of stations may also be marked on the ground using biodegradable paint, pin flags or wooden pegs. Line detours may also be marked with biodegradable flagging tape, which is removed on completion of recording. However, mark-less systems using GPS technology are also commonly used. If pins or pegs are used, these are removed on completion of recording.

Each survey team (one to two surveyors in a 4WD light vehicle, quad bike or off-road buggy) typically makes one pass over any given section of seismic line or source / receiver station area. Field surveyors may also need to walk into sensitive areas to survey and mark stations. Field survey crews may also use this period to construct temporary gates and fence crossings at property and paddock boundaries along seismic lines (where required or requested by the landholder). Pre-existing gates are used if possible.

3.6.5 Recording Operations / Data Acquisition

The commencement of recording activities (data acquisition) varies with seismic survey type. For 2D / 3D surveys using vibroseis, recording typically commences 1-3 weeks after the start of seismic line preparation. Surveys that use buried sources can require a significantly longer period of time between the start of drilling activities and the commencement of recording, depending on drilling rates and the number and depth of shot holes. As discussed in Section 3.6.3, this may require several weeks or months to complete, and it will vary based on the number of shot holes required and the number of drilling rigs utilised. The recording phase is the largest part of a seismic survey program in terms of personnel and vehicles required. A recording team will typically consist of:

- 2D surveys: 20-30 personnel and 10-16 vehicles
- 3D surveys: 40 to 80 personnel and up to 20 vehicles.

These figures will vary with survey size, recording technique, terrain, season and amount of access. Vibroseis surveys require drivers and mechanics to support 4 to 10 vibroseis trucks; whereas a seismic survey only using buried sources may require fewer personnel as they typically only require a small team of 'shot-firers'.

2D / 3D seismic operations commence with deployment of geophones. The geophones are installed into the ground by personnel on foot. In areas with harder soils, geophones may be installed using hand tools or small motorised augers to dig small holes to place geophones. As discussed above, geophone placement is typically a very low impact activity, and geophones can typically be placed in sensitive areas on foot, or with use of low impact vehicles. Seismic field crews are inducted and fully informed of all environmental requirements, and the need to respect the rights and interests of landholders and land users.

Recording for 2D and 3D surveys would normally commence when sufficient geophones have been laid out in accordance with the arrangements described in Section 3.4.1. This layout is termed 'the spread' and a pre-selected 'live' section of the spread will record energy reflected from subsurface layers while source energy is being input to that area. Prior to the start of data recording, the spread and all recording systems are tested. Once the spread is live, the chosen source energy will begin to be input to the ground.

Where the energy source is vibroseis, an array of one (1) to six (6) vibroseis trucks are typically used in array. The trucks are electronically synchronised to vibrate in phase with each other. The trucks line up along a source line separated by a few metres and centred on a source point. Each unit inputs one or more frequency sweeps into the ground at each source point. Each sweep lasts for only a few seconds. On completion of each source point the vibroseis trucks move to the next source point.

Where a buried source is used, the process is similar, but it involves a field crew traversing the survey area and detonating each individual shot hole charge. Charges are detonated using a small, specialised piece of equipment called a 'source management system'. A successful detonation should result in nothing more than the sound of a small thud at the surface.

The live spread is the only part of the survey area where data is recorded for any given source position. The live spread is moved as the vibroseis trucks or shot firers move across the survey area. As sections of the spread become redundant, geophones are picked up and transported to the front end of the

line. This cycle continues until the line is completed. Data recorded during this process is typically stored on internal memory modules within each geophone.

All operational vehicles stay on seismic lines. Non-operational vehicles are required to park off-line to avoid causing interference with collected data. Non-operational vehicles include 4WD vehicles for personnel access / transport, spare vibrators, vibrator service truck (if vibroseis is used) and a recording truck (if required).

Along any single seismic line, the following vehicle passes can be expected to occur during normal operations:

- vibroseis trucks and service truck (if vibroseis is used), 1 pass per truck
- recording truck, 1 pass (if required)
- light vehicles, 4-20 passes in total.

Vibroseis trucks and associated equipment may use 3D receiver lines for access from one source line to the next, and so traffic on 3D receiver lines will be very similar to a 2D seismic line. However, 3D source lines carry limited traffic in comparison to a 2D line i.e. traffic is limited to vibroseis trucks, potentially a service truck as required, and minor light vehicle traffic. All operational vehicles stay on existing access tracks and roads during recording operations. Non-operational vehicles are required to park away from geophones to avoid causing interference with collected data. Non-operational vehicles may include a small number of 4WD vehicles for personnel access / transport.

3.6.6 Laydown Areas, Accommodation and Associated Activities

3.6.6.1 Laydown Areas and Accommodation

Depending on the size and location of a seismic survey program, temporary camp sites may be required to house seismic survey personnel, and they may be used to locate a site office and store equipment and vehicles. Smaller seismic survey operations may utilise existing local private accommodation.

Temporary camps typically accommodate 15 to 80 personnel and require an area of up to 80 m x 50 m for locating self-contained re-locatable buildings equipped with wastewater processing facilities. Camps are typically established in pre-existing areas of disturbance (e.g. existing laydown areas) or on cleared agricultural land located as close as possible to existing access tracks / roads (see Figure 3-16 for an example of a typical camp). Disturbance to the soil surface will be kept to a minimum. It may be necessary to lightly pave the camp area and access track with gravel to prevent significant soil disturbance. Appropriate council permits / approvals will be attained for temporary camps (and for associated waste management requirements).

Aside from housing survey personnel, the camps may also act as a laydown / depot to store equipment, vehicles, site offices, and a rendezvous point for the crew each morning prior to commencing works. Equipment stored at camps may include vehicles, diesel fuel and lubricants (minor storage), vehicle maintenance equipment, star pickets / droppers and wooden stakes, plant and equipment components and materials. Where local private accommodation is used rather than an onsite camp, a lightly paved laydown area / depot will typically be required to be located near the survey area to store equipment, diesel fuel and a site office (as described above). For larger seismic

surveys, two to three temporary camp sites may be required to be in operation at any one time. These camps may include a drilling camp, line preparation / survey crew camp and recording camp. Seismic surveys utilising buried sources will require an explosives magazine (e.g. a transportable shipping container type structure) to be located within or in close proximity to the survey area to safely store explosives in accordance with relevant industry standards / guidelines and the *Explosives Act 2024* (SA) and its supporting regulations (to be commenced in 2026). Magazines may require construction of a small lightly paved site similar to a laydown area in size. Refer to Section 5.2.1 for further detail on explosive storage and handling.

Potable water for use at camps and operational sites may be obtained from commercial suppliers, landholders or appropriately licensed water bores.

Following completion of survey activities, all camp buildings, laydowns and fuel and equipment stores will be removed.

3.6.6.2 Fuel and Chemical Storage

Fuels and chemicals will be required for the survey activities. The volumes and types of fuels and chemicals used are dependent upon the type of operation. Fuels, oils and chemicals will be stored in accordance with applicable standards and guidelines (e.g. AS 1940, EPA guideline 080/16 Bunding and Spill Management) and appropriate spill containment measures will be implemented (e.g. storage of fuel at camp sites is contained within tankers utilising safety features such as double-skins) (refer to Section 5.2.3).

3.6.6.3 Waste

Waste management practices at campsites and laydown areas will be guided by the principles of the waste hierarchy (i.e. avoid, reduce, reuse, recycle, recover, treat, dispose) as set out in Section 4B of the *Environment Protection Act 1993* (SA) and the Environmental Protection (Waste to Resources) Policy, 2010. Waste streams are segregated on site and collected and stored in covered bins before being collected for transport off-site by a licensed regulated waste contractor to an appropriately licensed facility for reuse / recycling (where possible) or disposal (refer to Section 5.2.3).

Sewage wastes will be managed by approved self-contained on-site wastewater treatment systems that are regulated under the South Australian Public Health (Wastewater) Regulations 2013 and operated in compliance with the South Australian Health On-site Wastewater Systems Code. Toilet facilities with wastewater processing units and approved self-contained on-site wastewater treatment systems will be provided at camp sites. Where on-site wastewater treatment systems are used to contain black water and grey water, they will be pumped out by licensed contractors as required for disposal at a licensed facility consistent with the requirements of the Environment Protection (Water Quality) Policy 2015. Small pits may be constructed to house the tanks which will be removed after operations are completed. Any necessary approvals (e.g. local council) for the installation of the septic tanks will be obtained. Further details are included in Section 5.2.3.



Figure 3-16: Seismic Survey Laydown Area (Source: Wayne M, 2026)

3.6.7 Rehabilitation / Restoration

The majority of land disturbance associated with seismic survey operations does not require active rehabilitation / restoration following survey completion. This is because a key objective of seismic exploration is to prepare and utilise survey areas in such a way that minimises significant disturbance to land and allows for rapid natural recovery.

Areas prepared with gravel (e.g. some access tracks, camp sites, laydown areas and magazines) that the landholder does not want to retain, will have gravel removed and then be deep tine ripped, before being covered with stockpiled topsoil. This process alleviates soil compaction and enables good natural rehabilitation back to pasture or crops. Small stones not picked up by front end loaders or excavators (during initial gravel removal) will be rolled into the soil as is common farming practice. A final shallow ploughing / harrowing will be carried out to ensure soil aeration and permeability. A crop / pasture will then be sowed for additional soil stabilisation. Perimeter fencing may also be left in place until vegetation is well established.

If buried sources are used, additional rehabilitation / restoration activities may include:

- cutting detonation wiring a few centimetres below the surface level
- remediation of any subsidence in the hole using native soil

- excess drill cuttings will be removed from site and disposed of at a licensed waste management facility unless otherwise agreed with the landowner
- backfilling and plugging of all drill holes (shot holes and upholes) in accordance with relevant industry standards and guidelines including the SA Earth Resources Information Sheet M21 - Mineral Exploration Drillholes — General specifications for construction and backfilling (DSD, 2012)
 - drill holes that penetrate a single unconfined aquifer will be backfilled with drill cuttings, clean fill containing clay, or cement
 - drill holes that penetrate a single confined aquifer must be plugged from the level at which the aquifer was penetrated, with cement grout back to a minimum of 15 m into the confining bed above; and then backfilled with clean fill as described above.

All rehabilitation / restoration activities will be undertaken in consultation with landholders, and to meet the landholder's approved requirements. If the landholder wishes to retain suitable infrastructure such as access tracks or gravelled hard stand areas, they may be handed over under a deed of transfer or similar.

3.6.8 Monitoring and Auditing

Prior to, during and subsequent to geophysical survey operations, assessments may be undertaken to ensure operations have been conducted in compliance with the SEO (Beach Energy, 2020) and applicable regulatory requirements. These assessments can be implemented in several different ways. The following briefly describes the method utilised successfully by Beach and several other operators in the Cooper Basin and by Beach in the Otway Basin, and which would be applied in the Impact Assessment Area.

Prior to the commencement of any survey, several Environmental Monitoring Points (EMPs) are selected to provide a balanced representation of the environment of the survey area. EMP locations are positioned adjacent to existing roads or tracks to minimise any future access impacts upon the environment. EMP locations are recorded using a GPS and typically marked using star droppers prior to the start of seismic line preparation or drilling activities. Photographs are taken at these locations along the proposed seismic lines to provide a view of the terrain prior to any disturbance. All photographs should be captured using a standard setting to ensure consistent comparison. The process is repeated after line preparation / drilling and again after recording. These EMPs are then photo monitored over the ensuing five-year period to provide a visual representation of the natural gradual rehabilitation process. EMP revisit intervals are generally one year, two years and five years although the return period is determined by weather / road conditions and current activity in the region.

Additional photo monitoring points at a regular interval can also be utilised to monitor rehabilitation over time. The subsequent photo point report provides a more extensive photographic record of seismic survey activity and allows for a more liberal selection of locations for subsequent visits to record the rehabilitation of disturbed areas. Additional photo points are also useful if the original EMPs are difficult to access due to road damage or changes in land use over time.

4 Description of the Environment

This section provides an overview of the environment of the lower South East of South Australia, with a focus on the region encompassed by the Impact Assessment Area (Figure 1-2).

4.1 Climate

The climate of the South East of South Australia is described as Mediterranean, with warm dry summers and cold wet winters (SE NRM Board, 2010). The southern coastal zones of the region typically experience high average rainfall which gradually decreases inland and towards the north. Annual rainfall ranges from approximately 850 mm in the south of the region, to approximately 450 mm further north. Winds tend to come from the south during the morning, and from the east and north east during the afternoon.

A summary of climate records for Coonawarra, approximately 10 km north of Penola (Station no. 026091; BOM 2026) is provided in Table 4-1.

The Coonawarra climate data indicate that mean daily maximum temperatures across the Impact Assessment Area ranges from approximately 13.9°C in the coolest months (June to August) to 27.7°C in the hottest months (December to March). Mean daily minimum temperatures range from 5.1°C in the cooler months to 11.9°C in the hottest months.

Average annual rainfall at Coonawarra is 570 mm. Maximum rainfall occurs during July and August. The highest monthly rainfall recorded was 168.9 mm in June 2003. The highest daily rainfall event on record (79.6 mm) occurred in January 2007.

Table 4-1: Temperature and Rainfall Records for Station #026091 at Coonawarra

	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Mean Daily Max (°C)	27.7	27.5	25.1	21.1	17.3	14.5	13.9	14.9	17.0	19.6	22.6	25.1	20.5
Mean Daily Min (°C)	11.9	11.8	10.3	7.9	6.8	5.4	5.1	5.4	6.5	7.4	8.9	10.2	8.1
Mean Rainfall (mm)	25.4	17.8	26.9	34.5	54.0	74.2	79.9	79.9	60.8	46.0	36.3	35.3	557.9
Median Rainfall (mm)	17.9	13.9	21.8	29.0	51.0	69.0	76.5	76.8	62.8	43.8	35.3	26.8	539.7
Highest Rainfall (mm)	101.7	55.6	80.0	83.6	120.2	168.9	143.0	160.8	134.4	90.8	80.3	105.4	746.4

Source: BOM, 2026

4.2 Bioregions, Topography, Landforms and Soils

The South East, known as the Limestone Coast region, is characterised by a series of stranded dune ranges that rise between 20 m and 50 m above interdunal plains. The region hosts an extensive

network of limestone sinkholes and caves (Limestone Coast Landscape Board, 2026a), including the World Heritage-listed Naracoorte Caves (located approximately 19.1 km to the north of the Impact Assessment Area) as described in Section 4.6.2.

Soils in the broader region vary from sandy pedal mottled-yellow duplex soils, red weakly structured sandy soils, bleached sands and black organic soils. Wetland areas, such as Bool Lagoon (located approximately 6 km north of the Impact Assessment Area) are black self-mulching cracking clays. The dunal ranges are comprised of a mix of deep sands and interdunal flats characterised by either heavier clays, that overlie limestone or sands that overlie clay. The swamps are comprised of medium and fine textured saline soils. Along the coast soils are mostly calcareous sand with some small areas of acidic and alkaline peats (SENRCC, 2003). A summary of land systems and associated soils present in the Impact Assessment Area is provided in Appendix B.

The Impact Assessment Area falls within the Bridgewater, Lucindale and Glenelg Plain IBRA (Interim Biogeographical Regionalisation for Australia) sub-regions of the Naracoorte Coastal Plain IBRA region. The Naracoorte Coastal Plain IBRA region is a broad coastal plain of Tertiary and Quaternary sediments with a regular series of calcareous sand ridges separated by inter-dune swales, and closed limestone depressions (NatureMaps, 2026). The majority of the Naracoorte Coastal Plain IBRA region has been cleared for agriculture (Government of South Australia, 2026a). The Impact Assessment Area is also located within the Mount Gambier IBRA sub-region of the Southern Volcanic Plain IBRA region. The Southern Volcanic Plain IBRA region is primarily located within western Victoria and the area overlapping the Impact Assessment Area is the only portion of this IBRA region located in South Australia (NatureMaps, 2026). The land within the Southern Volcanic Plain IBRA region is mainly used for agriculture and to a lesser extent forestry (Government of South Australia, 2026b).

The area is primarily a coastal plain with clayey lagoon deposits and isolated sand and calcarenite dunes. Adjacent to the coast are indurated dunes of calcareous sand and dunes of orange sand. In some areas, particularly within the Dismal Swamp IBRA association of the Glenelg Plain sub-region, are plains that are locally veneered with sand, frequent swamps and lakes backed by low lunettes (crescent shaped clay dunes).

4.3 Petroleum Geology

The Otway Basin began to form in the Late Jurassic / Early Cretaceous as Australia began to separate from Antarctica about 145 million years ago.

Basement in the Otway Basin generally consists of Paleozoic igneous rocks and metasediments of the Kanmantoo Fold Belt. Some minor hydrocarbon recovery has occurred from fractured basement sections, when the fault geometry is favourable.

The earliest sediments to be deposited in the subsiding basin were shales of the Casterton Formation. This unit was deposited in a low energy environment (Kopsen and Schofield 1990) such as a lake and the organic material within is interpreted to be the source of the gas, condensate and oil discoveries in the South East of South Australia.

Overlying the Casterton Formation are the Lower Sawpit Shale, Sawpit Sandstone, Upper Sawpit Shale, Pretty Hill Sandstone, Laira Formation and Katnook Sandstone. These were deposited during episodic rifting, driving crustal extension during the Lower Cretaceous. Like the Casterton Formation, the Lower

Sawpit Shale was also deposited in a low energy environment and it may also be the original source of oil, gas and condensate discoveries.

The overlying Sawpit Sandstone and the younger sand units, the Pretty Hill Sandstone and Katnook Sandstone, are interpreted to be deposited in a braided stream environment and these units have traditionally been the main target of oil and gas exploration in the South East of South Australia as they are reservoir rocks. All three units have flowed gas or gas / oil and condensate upon testing. For example, the Katnook Field produces gas that flows out of the Pretty Hill Sandstone reservoir.

The Upper Sawpit Shale and Laira Formations are comprised of siltstone and shale and were deposited in a low energy environment such as a floodplain or lake. Both of these units are important as they act as seals to the Sawpit Sandstone and Pretty Hill Sandstone respectively thereby trapping hydrocarbons at depth and isolating the reservoirs from the shallower aquifers.

A period of structural geological activity occurred after the Katnook Sandstone was deposited about 125 million years ago. The surface was uplifted and eroded before this period of activity waned and a thick sequence of interbedded shales, siltstones and fine-grained sandstones of the Eumeralla formation was deposited on a fairly low relief, slowly subsiding surface possibly in an expansive system of shallow lakes.

The overlying Sherbrook Group of Late Cretaceous age is a thin sandstone sequence in the northerly part of the South Australian Otway Basin, but in the south and particularly offshore, it thickens and can be subdivided into lithological units representing the facies of a delta system.

The overlying Tertiary aged sediments are also relatively thin onshore, consisting mainly of sandstones of the Dilwyn Formation and shales of the Pember Mudstone and fossiliferous limestones of the Gambier Limestone. The Dilwyn, Pebble Point and Pember formations were probably deposited in a fluvial-deltaic setting (Gravestock *et al.* 1986) and the overlying Gambier Limestone in a prograding marine sequence. All the Tertiary units thicken offshore. The Gambier Limestone and the Dilwyn Formation are important aquifers for the South East of South Australia.

The Haselgrove-3 ST1 well was drilled in January 2018 as a deviated well to a total measured depth of 4,331 m and targeted the Sawpit Sandstone and shallower Pretty Hill Sandstone.

Figure 4-1 shows an indicative cross-section in the onshore Otway Basin. The deep formations that are being targeted for hydrocarbon exploration are shown, along with the near-surface aquifers of the Gambier Limestone and Dilwyn Formation.

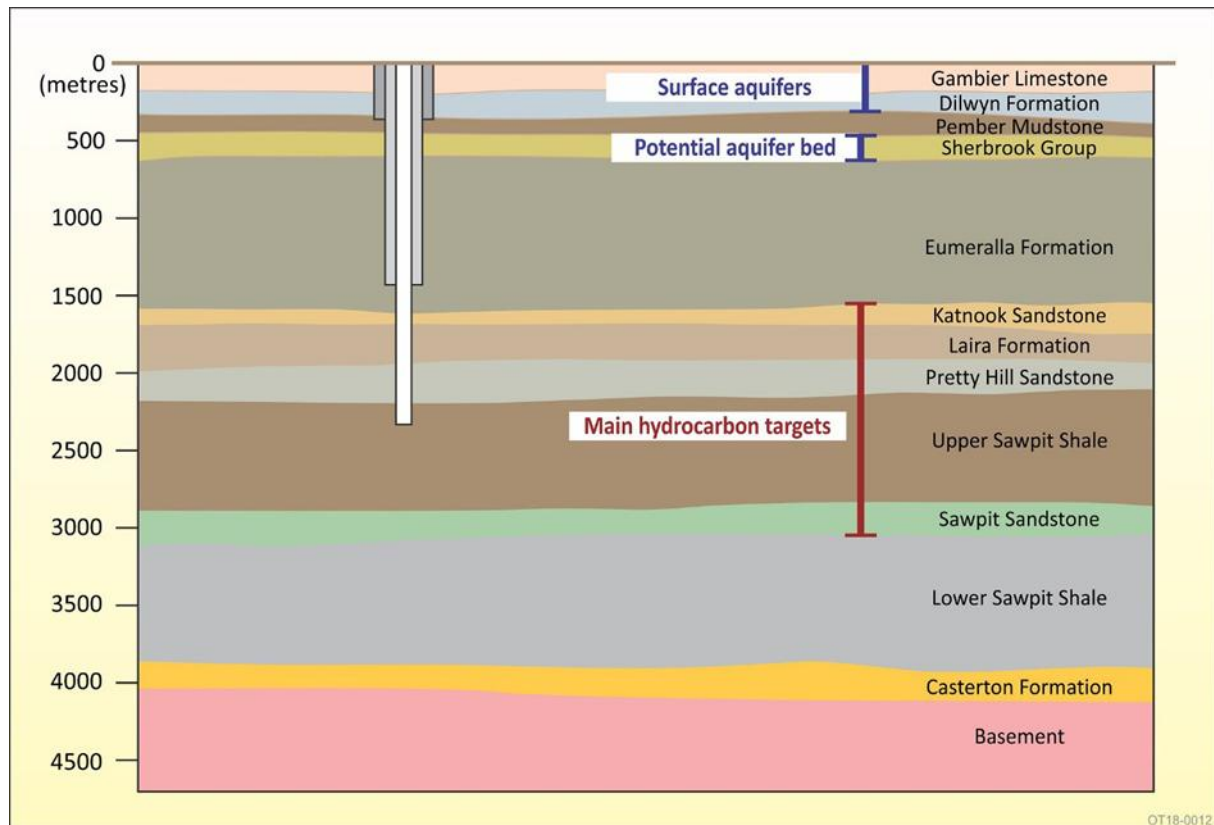


Figure 4-1: Indicative Cross-Section in the Onshore Otway Basin, Showing Geological Formations, Shallow Aquifers and the Main Hydrocarbon Targets

4.4 Flora and Fauna

4.4.1 Vegetation Communities

There has been widespread vegetation clearance across the Limestone Coast region. Remnant vegetation mapping in the Impact Assessment Area indicates native vegetation cover ranging approximately from 0% to 50% (Figure 4-2). The majority of the region contains 0-5% native vegetation cover, with areas consistent with higher levels of native vegetation centred around the coast at Lake Frome, further inland within the Hundreds of Hindmarsh, Young and Riddoch in the south, and in the east in the Hundred of Nagwarry (Figure 4-2) (NatureMaps 2026).

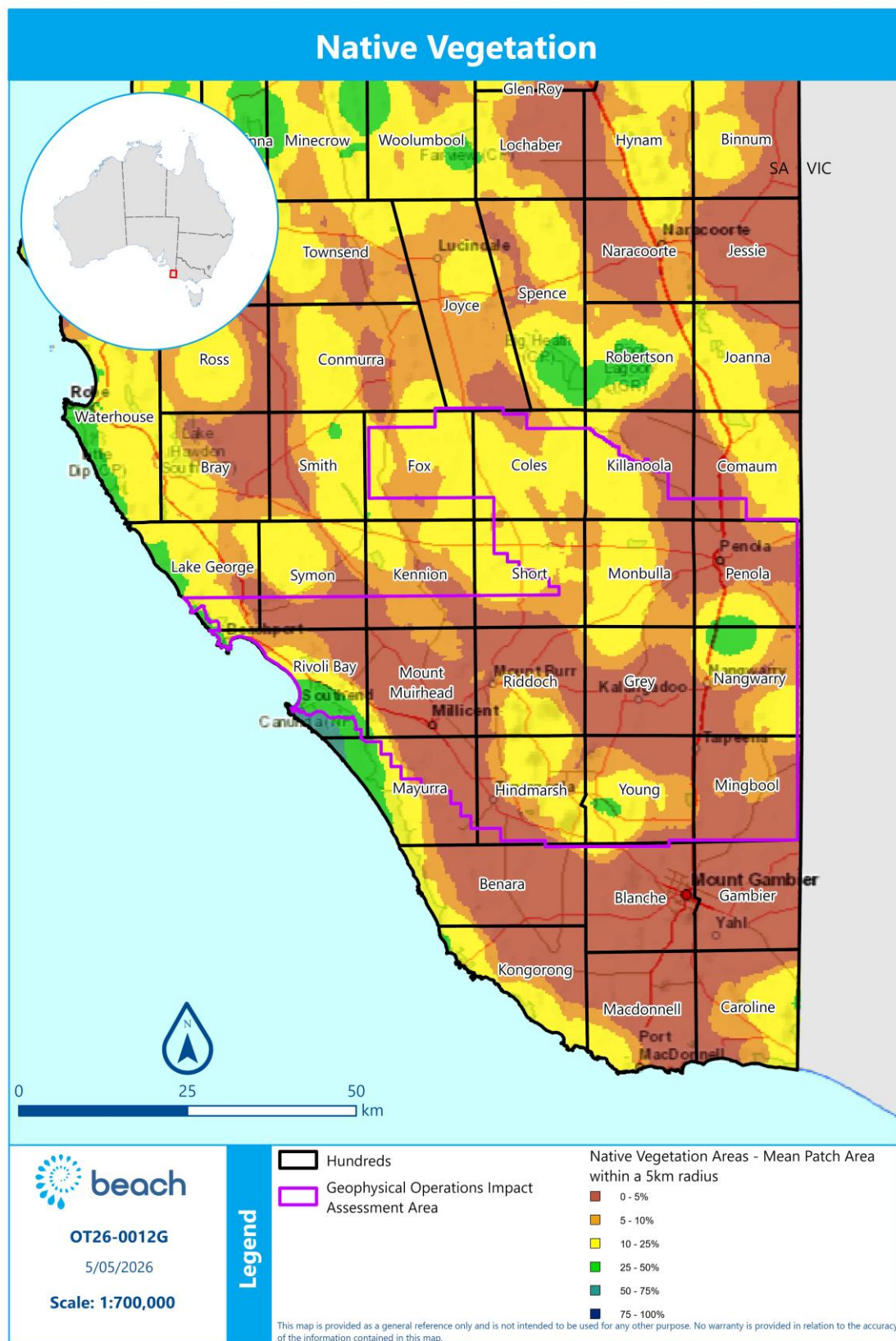


Figure 4-2: Average Proportion of Land Containing Mapped Patches of Native Vegetation within a 5 km Radius (NatureMaps, 2026)

Broad vegetation communities present within the Impact Assessment Area include:

- shrublands – including Melaleuca shrubland, samphire shrubland, coastal shrubland, Acacia shrubland
- rushland/sedgeland
- grassland (including Tussock grassland)
- melaleuca forest and woodland
- eucalyptus forest and woodland
- eucalyptus mallee forest and mallee woodland
- allocasuarina forest and woodland
- fernland/herbland
- acacia shrubland.

A list of vegetation communities mapped in areas of remnant vegetation in the Impact Assessment Area is provided in Appendix C, based on the Native Vegetation Floristic Areas (NVIS) dataset sourced from NatureMaps, 2026).

4.4.2 Biodiversity Values

The Limestone Coast of South Australia, together within adjacent areas in Victoria, is considered one of Australia's 15 national biodiversity hotspots (DSEWPC, 2019). The Limestone Coast region includes two Ramsar listed wetlands, with one (Bool Lagoon) located approximately 6 km north of Impact Assessment Area and the Piccaninnie Ponds Karst Wetland located at the coast approximately 32 km south of the boundary of the Impact Assessment Area. Nonetheless, the Impact Assessment Area is located predominantly in areas classified as 'degraded lands' with low ecological intactness, largely avoiding areas of 'wilderness' which are concentrated along the coastal regions at Canunda National Park, Lake George and Lake Eliza (Watson *et al.*, 2023).

The region is a transition zone, grading from the temperate climate to a more arid landscape in the west. As a result, species adapted to temperate environments as well as species adapted to more arid environments are both present.

More than 1,300 native flora species and 750 native fauna species have been recorded in the Limestone Coast (Croft *et al.*, 1999). Many of these species are restricted to the Limestone Coast region, including 4% of the plants, 16% of the mammals, 9% of the birds (excluding vagrants and seabirds), 8% of the reptiles (excluding sea turtles), 4% of the frogs and 5% of the fish.

4.4.3 Threatened Ecological Communities

Many ecological communities in the Limestone Coast region are now considered threatened, principally as a result of widespread vegetation clearance. Under the EPBC Act, an ecological community is a naturally occurring assemblage of native plants, animals and other organisms that interact with each other within a distinct habitat (DCCEEW, 2026a). The structure, species composition

and distribution of an ecological community are shaped by environmental factors such as soil type, landscape position, altitude, climate and water availability (DCCEEW, 2026a). An ecological community may be listed as a Threatened when it is at risk of extinction at a national scale and therefore requires protection under the EPBC Act. Communities that can be listed include a wide range of habitat types, such as woodlands, grasslands, shrublands, forests, wetlands, marine environments, ground springs and cave systems (DCCEEW, 2026a).

There are 12 TECs that are listed in the Limestone Coast region. A search of the EPBC Act Protected Matters Database (DCCEEW, 2026b) identified three nationally listed TECs potentially present within Impact Assessment Area (refer to Table 4-2).

Table 4-2: EPBC Act Listed TECs Potentially Occurring in the Impact Assessment Area

TEC	EPBC Act Status	Type of Presence
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	CE	Likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	V	Likely to occur within the area
Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion	E	Likely to occur within the area

Source: EPBC Act Database (DCCEEW, 2026b)

A review of the DCCEEW Species profile and threats (SPRAT) Database indicated that records of Seasonal Herbaceous Wetlands and Karst Springs and Alkaline Fens of the Naracoorte Coastal Plain Bioregion overlap with the Impact Assessment Area. In contrast, the Subtropical and Temperate Coastal Saltmarsh has no recorded overlap with the Impact Assessment Area based on the SPRAT database and is largely confined to coastlines around Adelaide further west.

The Seasonal Herbaceous Wetlands ecological community was formally listed as a Critically Endangered TEC under the EPBC Act in March 2012. The Seasonal Herbaceous Wetlands occur on lowland plains, where they are generally associated with fertile, poorly draining clays; in some cases, including Gilgai (shrinking / swelling mounded clay soil formations). Seasonal Herbaceous Wetlands typically fill and dry annually, however, in a drought or unseasonal wet phase they may appear respectively ephemeral or permanent for occasional periods. They are generally very fresh, with salinities of less than 1,000 mg/L, however, during drying it is possible that they may evapo-concentrate, with salinities increasing up to 3,000 mg/L (Dickson *et al*, 2014).

The Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion ecological community was formally listed as an Endangered threatened ecological community under the EPBC Act in December 2020 (DAWE, 2020). The ecological community comprises permanent to semi-permanent freshwater springs, pools, soaks and outflow channels, together with fringing alkaline fens that support peat forming sedgeland, herblands and shrublands. This TEC is strongly groundwater dependent, with wetlands typically maintained by discharge from the unconfined Tertiary limestone aquifer. The community supports distinctive aquatic and semi aquatic vegetation, often dominated by Silky Tea tree (*Leptospermum lanigerum*), Cutting Grass (*Gahnia trifida*) and freshwater macrophytes, and provides important habitat for a range of nationally threatened fauna, including fish, amphibians, mammals and waterbirds (DAWE, 2020).

4.4.4 Threatened Flora

The Limestone Coast region supports a large number of threatened plant species, which predominantly occur within patches of remnant native vegetation. A search of the Impact Assessment Area in the Biological Databases of South Australia (BDSA) has been carried out via NatureMaps (2026). The search identified a total of 288 flora species recorded and listed as rare or threatened at State level: including, 57 endangered species, 81 vulnerable species and 150 rare species. Further detail on these species is provided in Appendix C.

A search of the EPBC Act Protected Matters Search Tool (PMST) was also conducted (DCCEEW, 2026b). Twenty-four plant species that are listed under the EPBC Act have been recorded in, are likely to occur or may occur within the Impact Assessment Area and these species are listed in (refer to Table 4-3). Table 4-3 identifies the EPBC Act threatened species recorded within the Impact Assessment Area on the BDSA database.

Table 4-3: EPBC Act Listed Flora Species Recorded in the Impact Assessment Area

Species	Common Name	Conservation Status		Type of Presence
		EPBC	SA	
<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass, Floating Swamp Wallaby-grass	V	-	May occur as listed on PMST database Recorded on BDSA database
<i>Caladenia colorata</i>	Coloured Spider-orchid, Small Western Spider-orchid, Painted Spider-orchid	E	-	May occur as listed on PMST database
<i>Caladenia concolor</i>	Crimson Spider-orchid, Maroon Spider-orchid	V	-	Known to occur as listed on PMST database Recorded on BDSA database
<i>Caladenia formosa</i>	Elegant Spider-orchid, Blood-red Spider-orchid	V	V	Likely to occur as listed on PMST database Recorded on BDSA database
<i>Caladenia richardsiorum</i>	Little Dip Spider-orchid	E	-	Likely to occur as listed on PMST database
<i>Caladenia tensa</i>	Greencomb Spider-orchid, Rigid Spider-orchid	E	E	May occur as listed on PMST database Recorded on BDSA database
<i>Caladenia versicolor</i>	Candy Spider-orchid	V	E	May occur as listed on PMST database Recorded on BDSA database
<i>Cassinia rugata</i>	Wrinkled Cassinia, Wrinkled Dollybush	V	-	May occur as listed on PMST database
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	-	May occur as listed on PMST database

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Species	Common Name	Conservation Status		Type of Presence
		EPBC	SA	
<i>Dipodium campanulatum</i>	Bell Flower Hyacinth Orchid	E	V	Known to occur as listed on PMST database Recorded on BDSA database
<i>Dodonaea procumbens</i>	Trailing Hop-bush	V	V	Likely to occur as listed on PMST database Recorded on BDSA database
<i>Glycine latrobeana</i>	Clover Glycine, Purple Clover	V	V	Known to occur as listed on PMST database Recorded on BDSA database
<i>Ixodia achillaeoides subsp. arenicola</i>	Sand Ixodia, Ixodia	V	-	May occur as listed on PMST database
<i>Olearia pannosa subsp. pannosa</i>	Silver Daisy-bush, Silver-leaved Daisy, Velvet Daisy-bush	V	V	May occur as listed on PMST database Recorded on BDSA database
<i>Pomaderris halmaturina subsp. halmaturina</i>	Kangaroo Island Pomaderris	V	V	Known to occur as listed on PMST database Recorded on BDSA database
<i>Prasophyllum spicatum</i>	Dense Leek-orchid	V	-	Known to occur as listed on PMST database
<i>Pterostylis chlorogramma</i>	Green-striped Greenhood	V	E	Known to occur as listed on PMST database Recorded on BDSA database
<i>Pterostylis cucullata</i>	Leafy Greenhood	V	-	Likely to occur as listed on PMST database
<i>Senecio macrocarpus</i>	Large-fruit Fireweed, Large-fruit Groundsel	V	-	May occur as listed on PMST database
<i>Senecio psilocarpus</i>	Swamp Fireweed, Smooth-fruited Groundsel	V	V	Known to occur as listed on PMST database Recorded on BDSA database
<i>Thelymitra epipactoides</i>	Metallic Sun-orchid	E	E	Known to occur as listed on PMST database Recorded on BDSA database
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	E	E	Known to occur as listed on PMST database Recorded on BDSA database

Species	Common Name	Conservation Status		Type of Presence
		EPBC	SA	
<i>Thelymitra orientalis</i>	Hoary Sun-orchid	CE	R	Known to occur as listed on PMST database Recorded on BDSA database
<i>Xerochrysum palustre</i>	Swamp Everlasting, Swamp Paper Daisy	V	-	Likely to occur as listed on PMST database

Source: EPBC Act Database (DCCEEW, 2026b); BDSA Database (NatureMaps, 2026)

EPBC: *Environment Protection and Biodiversity Conservation Act 1999* ((Cth); SA: *National Parks and Wildlife Act 1972* (SA)

Status: V: Vulnerable; R: Rare; E: Endangered; CE: Critically Endangered.

4.4.5 Threatened Fauna

A search of the BDSA via NatureMaps (2026) for the Impact Assessment Area identified a total of 118 fauna species recorded and listed as rare or threatened under the NPW Act⁵ including 31 endangered species, 25 vulnerable species and 62 rare species. Further detail on these species is provided in Appendix C.

A search of the EPBC Act PMST (DCCEEW, 2026b) identified twenty-six fauna species listed as threatened under the EPBC Act as potentially occurring in the Impact Assessment Area and these species are listed in Table 4-4. Table 4-4 identifies the EPBC Act threatened species recorded within the Impact Assessment Area on the BDSA database.

Table 4-4: EPBC Act Listed Fauna Species Recorded in the Impact Assessment Area

Species	Common Name	Conservation Status		Type of Presence
		EPBC	SA	
Birds				
<i>Aphelocephala leucopsis</i>	Southern Whiteface	V	-	Likely to occur
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	Known to occur as listed on PMST database Recorded on BDSA database
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	E	-	Known to occur
<i>Calyptorhynchus banksii graptogyne</i>	Red-tailed Black-cockatoo (south-eastern)	E	E	May occur as listed on PMST database Recorded on BDSA database

⁵ The total species count includes only species that have been explicitly listed at the species level as Endangered, Vulnerable or Rare. Species listed as sp. or ssp., have been excluded from the overall count of state listed species. Listings marked ssp. indicate that conservation status has been applied to one or more subspecies rather than the species, while listings marked sp. indicate that the species has not been assessed at the subspecies level.

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Species	Common Name	Conservation Status		Type of Presence
		EPBC	SA	
<i>Falco hypoleucos</i>	Grey Falcon	V	-	Known to occur as listed on PMST database
<i>Grantiella picta</i>	Painted Honeyeater	V	-	May occur as listed on PMST database
<i>Hirundapus caudacutus caudacutus</i>	White-throated Needletail	V	V	Likely to occur as listed on PMST database Recorded on BDSA database
<i>Lathamus discolor</i>	Swift Parrot	CE	E	Known to occur as listed on PMST database Recorded on BDSA database
<i>Leipoa ocellata</i>	Malleefowl	V	-	May occur as listed on PMST database
<i>Melanodryas cucullata cucullata</i>	South-eastern Hooded Robin, Hooded Robin (south-eastern)	E	R	Likely to occur as listed on PMST database
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	CE	E	Likely to occur as listed on PMST database Recorded on BDSA database
<i>Neophema chrysostoma</i>	Blue-winged Parrot	V	V	Known to occur as listed on PMST database Recorded on BDSA database
<i>Rostratula australis</i>	Australian Painted Snipe	E	E	Known to occur as listed on PMST database Recorded on BDSA database
<i>Stagonopleura guttata</i>	Diamond Firetail	V	V	Known to occur as listed on PMST database Recorded on BDSA database
Frogs				
<i>Litoria raniformis</i>	Southern Bell Frog	V	V	Known to occur as listed on PMST database Recorded on BDSA database
Mammals				

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Species	Common Name	Conservation Status		Type of Presence
		EPBC	SA	
<i>Antechinus minimus maritimus</i>	Swamp Antechinus (mainland)	V	E	Known to occur as listed on PMST database Recorded on BDSA database
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern)	E	V	Known to occur as listed on PMST database Recorded on BDSA database
<i>Miniopterus orianae bassanii</i>	Large Bent-wing Bat / Southern Bent-wing Bat	CE	E	Roosting known to occur as listed on PMST database Recorded on BDSA database
<i>Petaurus australis australis</i>	Yellow-bellied Glider (south-eastern)	V	-	May occur as listed on PMST database
<i>Pseudomys shortridgei</i>	Heath Mouse, Dayang, Heath Rat	E	-	May occur as listed on PMST database
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	R	Foraging may occur as listed on PMST database Recorded on BDSA database
Fish				
<i>Nannoperca obscura</i>	Yarra Pygmy Perch	V	-	Known to occur as listed on PMST database Recorded on BDSA database
Reptiles				
<i>Aprasia aurita</i>	Eared Worm-lizard, Mallee Worm-lizard	E	E	Known to occur as listed on PMST database Recorded on BDSA database
<i>Delma impar</i>	Striped Legless Lizard, Striped Snake-lizard	V	-	Likely to occur as listed on PMST database Recorded on BDSA database
<i>Lissolepis coventryi</i>	Swamp Skink, Eastern Mourning Skink	E	E	Known to occur as listed on PMST database Recorded on BDSA database

Species	Common Name	Conservation Status		Type of Presence
		EPBC	SA	
<i>Pseudemoia rawlinsoni</i>	Glossy Grass Skink, Swamp Cool-skink, Rawlinson's Window- eyed Skink	V	V	Known to occur as listed on PMST database Recorded on BDSA database

Source: EPBC Act Database (DCCEEW, 2026b); BDSA Database (NatureMaps, 2026)

EPBC: *Environment Protection and Biodiversity Conservation Act 1999* (Cth); SA: *National Parks and Wildlife Act 1972* (SA). Status: V: Vulnerable; R: Rare; E: Endangered, CE: Critically Endangered

4.4.6 Significant Migratory Species

The EPBC Act PMST (DCCEEW 2026b) identified 15 additional migratory species listed under the EPBC Act as potentially occurring or having suitable habitat within the Impact Assessment Area, as listed in Table 4-5. Table 4-5 identifies the EPBC Act migratory species recorded within the Impact Assessment Area on the BDSA database.

Table 4-5: Listed Migratory Species Recorded in the Impact Assessment Area

Species	Common Name	Migratory Status		Type of Presence
		EPBC	SA	
<i>Actitis hypoleucos</i>	Common Sandpiper	M	R	Known to occur as listed on PMST database Recorded on BDSA database
<i>Calidris alba</i>	Sanderling	M	R	Known to occur as listed on PMST database Recorded on BDSA database
<i>Calidris melanotos</i>	Pectoral Sandpiper	M	R	Likely to occur as listed on PMST database Recorded on BDSA database
<i>Calidris ruficollis</i>	Red-necked Stint	M	-	Known to occur as listed on PMST database
<i>Charadrius bicinctus</i>	Double-banded Plover	M	-	Known to occur as listed on PMST database
<i>Gallinago megala</i>	Swinhoe's Snipe	M	-	Likely to occur as listed on PMST database
<i>Gallinago stenura</i>	Pin-tailed Snipe	M	-	Likely to occur as listed on PMST database
<i>Limosa lapponica</i>	Bar-tailed Godwit	M	ssp	May occur as listed on PMST database Recorded on BDSA database

Species	Common Name	Migratory Status		Type of Presence
		EPBC	SA	
<i>Motacilla flava</i>	Yellow Wagtail	M	-	May occur as listed on PMST database
<i>Numenius minutus</i>	Little Curlew, Little Whimbrel	M	-	Likely to occur as listed on PMST database
<i>Pandion haliaetus</i>	Osprey	M	-	Likely to occur as listed on PMST database
<i>Pluvialis fulva</i>	Pacific Golden Plover	M	R	Known to occur as listed on PMST database Recorded on BDSA database
<i>Thalasseus bergii</i>	Greater Crested Tern	M	-	Known to occur as listed on PMST database
<i>Tringa glareola</i>	Wood Sandpiper	M	R	Known to occur as listed on PMST database Recorded on BDSA database
<i>Tringa stagnatilis</i>	Marsh Sandpiper, Little Greenshank	M	-	Known to occur as listed on PMST database

Source: EPBC Act Database (DCCEEW, 2026b); BDSA Database (NatureMaps, 2026)

EPBC: *Environment Protection and Biodiversity Conservation Act 1999* (Cth); SA: *National Parks and Wildlife Act 1972* (SA).

Status: EPBC Act / NPW Act Conservation Status: R = Rare; V = Vulnerable; E = Endangered; CE = Critically Endangered; MiG = Migratory; MAR = Marine, ssp = subspecies listed as threatened.

4.4.7 Introduced Species

Eighty-nine regional species (69 plant species and 20 animal species) declared under the LSA Act have been identified as priority pests by the Limestone Coast Landscape Board Pest Plant and Animal Strategy 2021-2026 (Limestone Coast Landscape Board, 2022). Management actions for these species in the Limestone Coast Landscape Region aim to:

- eradicate: eradicate the species from the region (3 plant species, 10 animal species)
- destroy infestations: significantly reduce the extent of the species in the region (10 plant species)
- contain spread: prevent the ongoing spread of the species in the board region (21 plant species, 2 animal species)
- protect: prevent spread to key sites or assets (22 plant species, 1 animal species)
- manage pests: reduce the overall impact through targeted management (three plant species, seven animal species)
- manage sites: reduce the overall impact through targeted management (four plant species)

- monitor: detect any significant changes (five plant species)
- Limited action: undertake control measures if required (one plant species).

An additional 37 declared plant and 12 animal species have been identified as alert species, which although not present in the Limestone Coast (LSA Act) Region, or present in very limited numbers, are species with the potential for significant negative impacts if they become established (Limestone Coast Landscape Board, 2022). A list of priority and alert weed species in the Limestone Coast Landscape Region is provided in Appendix C.

4.4.7.1 Pathogens

Pathogens of potential concern in the region include the soil-borne fungus *Phytophthora cinnamomi*, which affects a wide range of native plant species but is yet to be recorded in the region (SE NRM Board, 2010), the grape vine insect pest *Phylloxera* (which has to date been excluded from South Australia), and diseases such as Ovine / Bovine Johne's Disease (OJD / BJD).

4.5 Water Resources

4.5.1 Surface Water

The Limestone Coast region has a low relief, with a general gradient toward the coast of 1:1600 and to the north less than 1:5000 (Croft *et al*, 1999). Across most of the region, surface water historically moved slowly towards the coast until meeting one of the ranges (the north-north-west trending low ridges), where it was directed northwards along the eastern side of the range. This resulted in extensive swamps and lakes, which were prevalent at the time of European settlement. There is generally a lack of surface streams and rivers, but where they exist, such as Morambro, Mosquito and Naracoorte Creeks, their catchments originate in western Victoria. Mosquito Creek discharges into the Ramsar listed wetlands of Bool and Hacks Lagoons.

Over the years an extensive drainage system has been constructed throughout the lower Limestone Coast region to drain water from inundated land. This network has altered the movement of surface water, directing it in an east-west direction and discharging it to wetlands, lakes or the coast. The implementation of the drainage system has allowed formerly inundated land to be developed, minimising the effects of water logging and removing salt from the region. In some areas the drainage network has prevented wetlands from receiving water thus altering the usual wetting and drying process typical of these ecosystems. This has caused a decline or change in the biodiversity in some areas (Paydar *et al*, 2009).

4.5.2 Groundwater

Groundwater is the primary source of water for the Limestone Coast and the region's economy, environment and community are all reliant upon this resource. Water resources in the area are also important from a social perspective as they provide drinking water, support recreation activities and enhance the appearance of the landscape. Many ecosystems are dependent on the groundwater of the region including wetlands, riparian vegetation and near coastal marine environments which are important tourist attractions that contribute to the regional economy (Brown *et al*, 2006).

The groundwater resource that underlies the Limestone Coast encompasses some of the largest groundwater systems in Australia (Brown *et al*, 2006). The resource is made up of two distinct systems, which form part of the Lower Limestone Coast (LLC) Prescribed Wells Area (PWA): an upper unconfined

aquifer referred to as the Tertiary Limestone Aquifer (TLA) and a deeper confined aquifer referred to as the Tertiary Confined Sand Aquifer (TCSA). The flow of groundwater is generally in an east to west direction and originates from the topographic high of the Dundas plateau located in south-western Victoria (Paydar *et al.*, 2009). Low permeability aquitards separate the two aquifers. Leakage through the aquitard has been assumed to be generally very low, except in areas where the aquitard is very thin, absent or fractured, such as around Tarpeena-Nangwarry (SE NRM Board, 2019). However, recent work has revealed moderate to good hydraulic connection between the two aquifers and indicated that they are more highly connected than previously assumed (SE NRM Board, 2019). Regional-scale groundwater flow modelling confirmed that the inter-aquifer connectivity is spatially variable but regionally significant, with vertical leakage between the TLA and TCSA explicitly reviewed. Downward leakage from the TLA to the TCSA is estimated at around 83–97 GL/year, confirming earlier concepts with modelled values (DEW, 2025).

The unconfined TLA is utilised more extensively than the TCSA, however there has been increased interest in the resource of the lower TCSA due to the recent allocation of most of the available groundwater from the TLA.

4.5.2.1 Tertiary Limestone Aquifer (unconfined)

The unconfined TLA is comprised mostly of Gambier Limestone with a water table depth varying both spatially and temporally (across the Limestone Coast region). Paydar *et al.* (2009) and South East NRM Board (2019) report depths to the water table as varying from 20 m in the south to under 5 m, with depths being highest in the Mount Burr Range and lowest in the plains. DEW (2018) also indicates that the water table can be above the surface in some region for several months. The aquifer thickness varies over the region with a maximum of 300 m occurring south of Mount Gambier and a minimum of 10 m thick northwest of Mount Gambier (South East NRM Board, 2019). As well as primary porosity, the aquifer has significant secondary porosity resulting from karstic features within the limestone. The secondary porosity creates paths for preferential flow and gives rise to high transmissivity (200 m² / day to 10,000 m² / day). Groundwater flow at the local scale can vary, largely as the result of spatial variability of recharge and discharge (Paydar *et al.*, 2009). At the regional scale, groundwater flow mainly occurs through porous rock, despite the presence of local karst features (DEW, 2025).

Recharge of the aquifer occurs primarily through the diffusion of rainfall on the flats and dunal ranges. Local contributions include seepage from wetlands and swamps, surface water discharge into sinkholes and returns from irrigation drainage. Upward seepage of water from the TCSA may also recharge the TLA in locations where differences in hydraulic head between the aquifers permit flow. Mean annual rates of recharge vary from a few mm / year to more than 150 mm / year with higher rates occurring in locations of higher rainfall or highly permeable soils. Recharge has declined since the 1970s as winter rainfall has decreased, although stormwater recharge in Mount Gambier has increased and now contributes a notable local input (DEW, 2025). Groundwater discharge from the TLA occurs mostly to the sea in the area south of Mount Gambier. Model results indicates that about 94 GL per year of groundwater discharges through coastal karst springs south of Mount Gambier, with a similar amount discharging offshore (DEW, 2025). Some minor drainage also occurs via drains, wetlands, streams, springs and seeps (Paydar *et al.*, 2009).

Groundwater salinity varies extensively over the aquifer with less than 500 mg/L Total Dissolved Solids (TDS) found in the south and 3,000 mg/L to 7,000 mg/L in the north and is increasing at a significant rate in some locations (Paydar *et al.*, 2009). Wells located between the townships of Naracoorte and Penola commonly exceed the resource salinity trigger value of annual average 2% increase (measured

against the preceding five years), defined in the LLC PWA Water Allocation Plan (South East NRM Board, 2019). The increase in salinity levels is likely to be due to either the recycling of irrigation drainage water, vegetation clearance or forestry harvesting with the resulting mobilisation of salt caused by an increase in vertical recharge (South East NRM Board, 2019). Modelling also indicates that land-use change, particularly forestry establishment and clearance, has impacted groundwater levels and associated salinity trends in these areas (DEW, 2025).

The water table has declined in some areas over the last 30 to 40 years and in other areas it has risen. Throughout the Lower Limestone Coast, a review of the change in depth to the water table in the 10 years to March 2012 revealed a general decline in depth to water, ranging from 0.5 metres to greater than two metres, possibly caused by underground water extraction, reduced rainfall and land use change (South East NRM Board, 2019).

A recent assessment of the groundwater trends in the Limestone coast region indicates that the groundwater levels and salinity were generally stable in the wider Limestone Coast region between 2018 and 2022 (DEW, 2023). Within the LLC PWA, 68 wells in the Coastal Plain and Donovans sub-region recorded declining water levels over the last five-years, 15% recorded rising water levels and 17% were stable (DEW, 2023).

4.5.2.2 Tertiary Confined Sand Aquifer

The TCSA occurs in the Dilwyn Formation within an interbedded sequence of sands, gravel and clays. The aquifer has varying depth and increases in thickness towards the south reaching more than 500 m near the coast. The flow of groundwater is generally in a westerly or southerly direction towards the sea. The aquitard separating the TCSA from the upper TLA is comprised of clay and marl units at the base of the Gambier Limestone and a clay unit at the top of the Dilwyn Formation (SENRCC, 2003).

Recharge of the TCSA occurs at a slow rate (Brown *et al.* 2001), primarily on the eastern edge of the aquifer in Victoria and over some areas in SA. As there are very few areas in which the TCSA is exposed at the surface, vertical recharge is primarily through downward leakage of groundwater from the above TLA. This occurs mostly in the east where the head differences between the aquifers and the confining layer permit flow. The opposite is found in the west and south where the hydraulic head gradient provides the potential for upward flow of groundwater from the TCSA to the TLA (Brown *et al.*, 2001).

Salinity of the groundwater within the TCSA is generally low, associated with low TDS (less than 700 mg/L); however, there are areas where high salinity levels are found (associated with TDS of more than 1,500 mg/L) (Brown *et al.*, 2001).

4.5.2.3 Deeper Units

Beneath the Dilwyn Formation is a number of deeper aquifers from the Late Jurassic, Early and Later Cretaceous and Tertiary ages of variable water quality and lateral extent down to over 4000 m, which demonstrate increasing salinity with depth (South East NRM Board, 2019). These aquifers are not used for irrigation, industrial or town water supplies due to their depth and generally high salinity (South East NRM Board, 2019). The aquifers within these deeper formations are noted in the LLC Water Allocation Plan (South East NRM Board, 2019) as being of potential value as targets for petroleum and geothermal exploration and production. The value of these for alternate water supplies has not been investigated and evaluated.

4.5.3 Water Use

Groundwater resources in the Lower Limestone Coast Area are managed under the Lower Limestone Coast Water Allocation Plan. The Plan manages groundwater across both unconfined and confined aquifers through defined management areas and ensures access to allocated resources while protecting groundwater-dependent ecosystems. The Lower Limestone Coast Water Allocation Plan is due to be revised, following a formal review undertaken in 2022–23 (Limestone Coast Landscape Board, 2026b).

The most significant user of groundwater in the Limestone Coast region is the irrigation industry, accounting for 95% of total volume used (ABS, 2016). The main irrigated crops are pasture grasses and lucerne. Groundwater is also used for grapevines, fruit and vegetables for human consumption, cereals, nurseries, stock water and domestic supplies. Most groundwater for consumption is extracted from the Gambier Limestone aquifer. Groundwater from the Dilwyn Formation aquifer is used as the primary water supply for Penola and Kalangadoo. Utilisation of Dilwyn Formation groundwater is likely to increase in the future as shallower groundwater becomes fully allocated. Plantation forests are also a considerable user of groundwater with over 150,000 ha of plantations located in the South East.

The total volume of water extracted from the unconfined aquifer in the LLC PWA was approximately 567,000 ML in 2010/11 (South East NRM Board, 2019).

The TCSA is used as the primary water supply for eight towns in the region (Beachport, Kalangadoo, Kingston, Lucindale, Naracoorte, Port MacDonnell, Robe and Tarpeena) and is an important source of water for irrigation and aquaculture, particularly around Kingston and Robe (South East NRM Board, 2019).

The aquifers that supply the surrounding populations and industry are separated from gas bearing reservoirs by a number of major regional aquitards (low permeability rocks) including the Eumeralla formation, Pember Mudstone and Dilwyn Clay. The major regional aquitards can be more than 1,000 m in thickness.

4.6 Land Use

4.6.1 General Land Use

The Limestone Coast region of South Australia is comprised of exceptionally fertile land accounting for three-quarters of the State's forests and one-third of its pastures. The area supports a diverse range of industries including wool, meat, dairy, cereal cropping, wine grapes, horticulture crops and crop and pasture seed production, all of which are heavily dependent upon water resources in the region. In general, the northern areas of the Limestone Coast are used for cropping and the cooler, wetter southern areas are used for livestock grazing and forestry (Binks, 2000). Beef cattle are found throughout the region and are the most prominent livestock in the Limestone Coast region. The Limestone Coast region has a regional plan that was published in January 2026, which sets out the long-term strategic direction for land use, growth management and infrastructure planning, including the identification of key land-use areas and priority regions across the Limestone Coast (SPC & DHUD, 2026). The key economic features and drivers of the region, include:

- wine industry (export values of over \$50 Mil in 2022)
- tourism (\$529 mil visitor expenditure in 2023)

- agriculture (contributes over 30% of the state's agriculture GSP)
- fishing (Known for the southern rock lobster, the region's fishing industry contributes over 30% to South Australia's seafood GSP)
- transport (the region's road and rail network provide connections to the high-value markets of Adelaide, Geelong and Melbourne)
- forestry (the region is part of the Green Triangle which expands into south west Victoria, the largest plantation forestry area in Australia. The industry produces \$1.64 billion direct annual turnover).

There are approximately 2,300 farms in the Limestone Coast region with over 80,000 ha of this land being irrigated. Crops include cereals, pasture for seed, vegetables, vegetable seeds, oil seed, fruit and nuts and fodder crops. The largest areas of grapevines are seen in the long-established Coonawarra district and more recently in the Padthaway area (to the north of the Impact Assessment Area). The vineyards are located on slightly elevated areas within the plains in friable, highly permeable clays of moderate to high fertility. The lucerne seed industry is concentrated around the town of Keith (north of the Impact Assessment Area) and there is limited horticultural activity on the loams derived from volcanic ash and drained clay soils of Mount Gambier and Millicent respectively.

Since the establishment of forestry plantations in the late nineteenth century, the commercial forestry industry has thrived in the area with over 150,000 ha currently planted, representing 84% of the State's total, encapsulating 35% of employment in the region and contributing an estimated \$759 million and directly and indirectly to gross regional product (PIRSA, 2017). Radiata Pine (*Pinus radiata*) and Tasmanian Blue Gum (*Eucalyptus globulus*) are the species most commonly planted and are located in the areas of highest rainfall on sandy soils.

Tourism is a large contributor to the local economy, in 2023-24 there were over 2.1 million overnight visitors to the South East region, directly employing 41,600 people (Tourism Research Australia, 2025). Key attractions include coastal resorts at Robe and Beachport, Naracoorte Caves and Tantanoola Caves, Coonawarra, Wrattobully, Padthaway and Mount Benson wine regions, Bool Lagoon and the Blue Lake (South Australian Tourism Commission, 2025).

Gas production occurs at Beach's Katnook Gas Processing Facility (located approximately 10 km south of Penola), which is fed by a network of pipelines from approximately 12 wells in surrounding gas fields. Since the 1960's approximately 80 oil and gas wells have been drilled in the region. The Katnook Gas Processing Facility feeds into the South East Pipeline System, which supplies gas to regional industries and the town of Mount Gambier. Gas production from the Katnook facility had declined in recent years, with the majority of the gas fed into the South East pipeline system being obtained from the SEA Gas pipeline via the SESA pipeline, which runs from Poolajelo in Victoria to Katnook. Origin Energy's 86 MW Ladbroke Grove power station is located adjacent to the Katnook plant, and it provides peaking power from its gas-fired turbines during periods of high demand for electricity.

4.6.2 Conservation Areas

The Limestone Coast region contains three National Parks, 53 Conservation Parks and four Game Reserves established under the NPW Act (SE NRM Board, 2010). Nine Conservation parks and one National Park occur within the Impact Assessment Area and are shown in Figure 4-3:

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- Beachport Conservation Park
- Belt Hill Conservation Park
- Calectasia Conservation Park
- Gower Conservation Park
- Lake Frome Conservation Park
- Mullins Swamp Conservation Park
- Penola Conservation Park
- Tantanoola Caves Conservation Park
- Telford Scrub Conservation Park
- Canunda National Park.



Figure 4-3: Terrestrial Protected Areas within the Impact Assessment Area

The region also includes a number of other protected areas occur within the Impact Assessment Area and are shown in Figure 4-3:

- thirty Native Forest Reserves established under the *Forestry Act 1950* (SA)
- fifteen Heritage Agreement Areas established under the *Native Vegetation Act 1991* (SA).

Bool and Hacks Lagoons lie to the north of the Impact Assessment Area and are listed as wetlands of international importance under the 1971 Ramsar Convention and are consequently covered by the Commonwealth EPBC Act.

The World Heritage-listed Naracoorte Caves are located in the Naracoorte Caves National Park and lie to the north of the Impact Assessment Area. This site is also covered by the EPBC Act.

4.7 Social Environment

The Limestone Coast region covers seven local government areas (LGAs) (Figure 4-4). The Impact Assessment Area is situated in three LGAs, including:

- Wattle Range Council
- Naracoorte Lucindale Council
- Grant District Council.

Penola is the largest population centre in the Impact Assessment Area. Penola has a population of approximately 3,107 (ABS, 2021). Other population centres within the Impact Assessment Area include Naracoorte), Millicent, Lucindale, as well as popular holiday destinations including Robe and Beachport along the coast.

Population statistics for the LGAs are provided in Table 4-6. Census data from 2021 for the three LGAs indicates that the population of 29,210 is distributed relatively evenly across the ages 0 to 74, with steady proportional population decline in older age cohorts. The median weekly household income across the three LGAs ranged from \$1,180 to \$1,747; this compares to a median weekly household income of \$1,455 across South Australia.

Table 4-6: Population by Local Government Area

Local Government Area	Male	Female	Total
Wattle Range Council	6,012	5,877	11,888
Naracoorte Lucindale District Council	4,513	4,177	8,686
Grant District Council	4,752	3,881	8,636

Source: Australian Bureau of Statistics Census Data 2021 (ABS, 2021)

The main industries of employment in the region are agriculture, forestry and fishing, with manufacturing employing the second highest number of workers. The high levels of employment within the agriculture, forestry and fishing industry reflects the economic importance of agricultural production within the region.

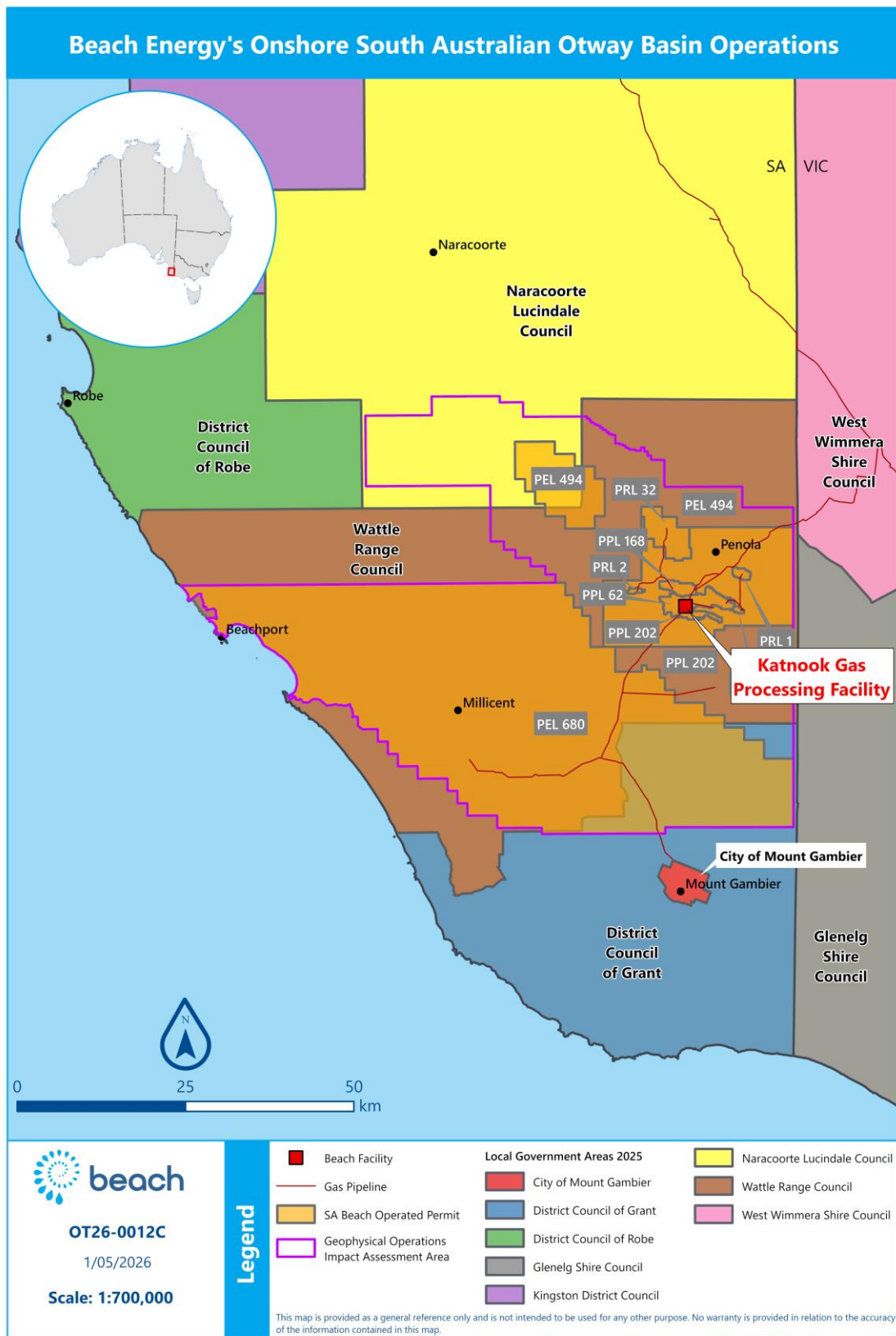


Figure 4-4: Local Government Areas within the Impact Assessment Area

4.8 Aboriginal Cultural Heritage

The Impact Assessment Area is located within the First Nations of the South East#1 (SC2017/002) Native Title claim area (Registered November 2017) (Figure 4-5). The South Australian Native Title Services (SANTS) are the contact group for the claim, and the claimants have instructed Beach that the South East Aboriginal Focus Group will continue to manage heritage matters for Beach's operational area.

Beach has completed a search of the Aboriginal Affairs and Reconciliation central database '*Taa Wika*' which contains records of Aboriginal sites, objects, and remains across South Australia. This search has identified records for Aboriginal heritage sites within the Impact Assessment Area. Beach will ensure that all activities undertaken in South Australia are planned and carried out in accordance with the *Aboriginal Heritage Act 1988 (SA)*. Beach recognises its obligation to avoid damage, disturbance or interference with any Aboriginal site, object or remains unless authorised under the Act.

For each proposed activity, Beach will undertake Aboriginal heritage risk assessments to identify and manage potential impacts. Where required by legislation or identified through risk assessment, Beach commits to engaging with the relevant local Traditional Owner groups to support appropriate heritage management and the protection of Aboriginal cultural heritage.

4.9 Non-Aboriginal Cultural Heritage

A desktop review of South Australian heritage places was undertaken using the South Australian Heritage Places Dataset (SAHPD). The datasets provide a comprehensive listing of:

- state heritage places from the South Australian heritage register
- local heritage places from South Australian development plans
- contributory items from South Australian development plans.

A search of heritage places in the Grant District Council, Wattle Range Council and Naracoorte Lucindale Council using the SAHPD identified 1 State Heritage Area, 38 State Heritage Places and 85 local heritage places that overlap the Impact Assessment Area (SAHPD, 2026) (Figure 4-5). The majority of the heritage places are buildings (including churches, farmhouses, barns, hotels and shops), as well as cemetery features, and plantations (a sugar gum plantation north of the Impact Assessment Area).

State heritage places located in the region vary with sites including former dwellings, farming homesteads, railway stations, schools, churches, hotels and cemeteries. Local heritage places located in the region are also diverse, ranging from houses, sheds, homesteads and churches to bridges, shopping centres, and recreational parks.

There are no World, Commonwealth or National heritage listed places in the Impact Assessment Area. The Australian Fossil Mammal Sites (Naracoorte), which is registered as a World Heritage and National Heritage site is located to the north of Impact Assessment Area.

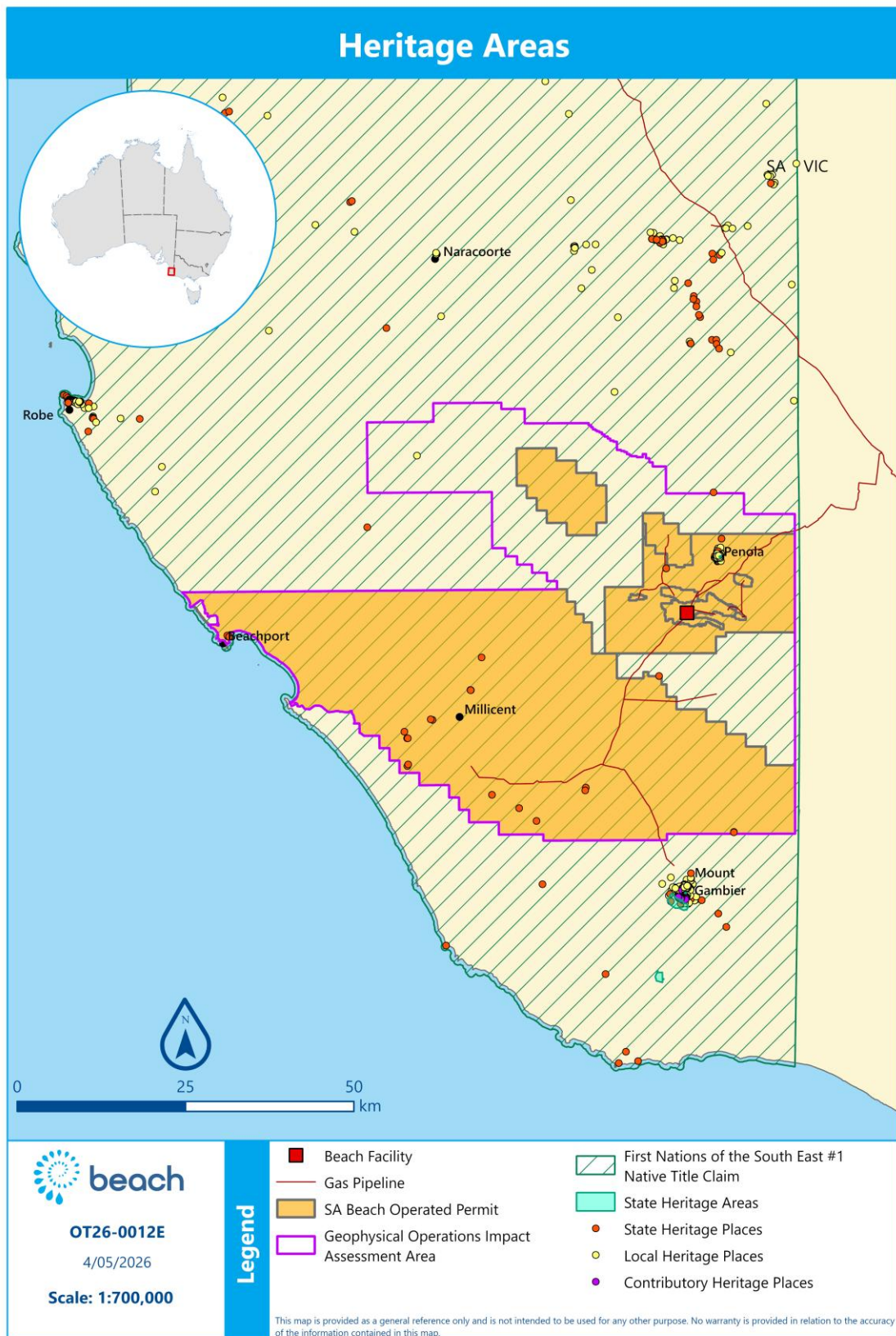


Figure 4-5: Aboriginal and Non-Aboriginal Heritage Areas within the Impact Assessment Area

5 Environmental Impact Assessment

This section discusses potential environmental impacts related to undertaking geophysical survey activities in the onshore Otway Basin.

5.1 Methodology

The environmental impact assessment has been prepared in accordance with the following criteria and guidelines, relevant to the ER Act and ER Regulations:

- Environmental Impact Assessment Criteria ('the Criteria') (DEM, 2024a).
 - provides the six criteria, against which environmental impacts of a regulated activity must be assessed, including:
 - criteria 1: elements of the environment
 - criteria 2: potential impact events
 - criteria 3: confirmation of impact events
 - criteria 4: control and management strategies and uncertainty assessment
 - criteria 5: environmental significance assessment
 - criteria 6: statement of environmental objectives.
- Environmental Impact Assessment Criteria Guidelines ('the Guideline') (DEM, 2024b).
 - provides guidance on undertaking an environmental impact assessment to satisfy the Criteria.

The impact assessment includes an evaluation of the impact significance to satisfy the Criteria. The methodology for undertaking the environmental impact assessment is described in Sections 5.1.1 to 5.1.7

5.1.1 Identifying Elements of the Environment

The first step of the environmental impact assessment involves describing the elements of the environment that may reasonably be expected to be impacted by the regulated activities. The Guidelines specify that the following information must be gathered for each environmental element:

- views of affected parties in relation to the environmental element
- applicable legislated and Australian Standards that relate to the environmental element
- environmental receptors identified prior to the implementation of any control measures.

Table 5-1 contains information on the environmental elements in accordance with the requirements of the Criteria and the Guidelines.

Table 5-1: Environmental Elements, Views of Affected Parties, Legislation, Standards and Receptors

Environmental element	Views of Affected Parties ⁶	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
Public health and safety	Stakeholders have identified concern for the following values and impacts: - fire risk associated with site activities, vehicles and equipment - traffic and vehicle movements during geophysical operations - potential human health impacts from seismic testing, noise and vibration.	<i>Fire and Emergency Services Act 2005 (SA)</i> <i>Radiation Protection and Control Act 2021 (SA)</i>	AS 1940-2017: The storage and handling of flammable and combustible liquids AS 1692-2006: Steel tanks for flammable and combustible liquids	Local community Local landholders
Heritage (Aboriginal and non-Aboriginal)	Stakeholders have identified concern for the following values and impacts: - appropriate language, clarity and transparency in documentation - effectiveness of heritage control and avoidance measures - adequacy of engagement and consultation, including notification processes - protection of cultural heritage sites during seismic operations.	<i>Aboriginal Heritage Act 1988 (SA)</i> <i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i> <i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)</i> <i>Native Title Act 1993 (Cth)</i>	AAR's Managing Aboriginal Heritage in South Australia Dhawura Ngilan Vision and Best Practice Standards Interim Engaging with First Nations People and Communities on Assessments and Approvals under the EPBC Act	Aboriginal heritage sites Non-Aboriginal heritage sites Aboriginal communities Traditional owners
Soil	Stakeholders have identified concern for the following values and impacts: - adequacy of monitoring and compliance auditing - potential contamination from spills, leaks and drill cuttings - spill and leak reporting and management frameworks - long-term implications of buried materials (e.g. shot hole wiring, plastics).	<i>Landscape South Australia Act 2019 (SA)</i>	No applicable non-legislated standards.	Soil quality Landholders and users Groundwater dependant ecosystems Groundwater Surface water
Groundwater, including quality and quantity	Stakeholders have identified concern for the following values and impacts: - groundwater dependent ecosystems - contamination from spills, leaks or downhole activities - aquifer depth, transmissivity and physical integrity - groundwater salinity - cement or casing contamination - stygofauna and subterranean ecosystems - wastewater disposal practices - impacts to other groundwater users, particularly agriculture and viticulture - spill and leak reporting and management - long-term protection of high-value and pristine aquifers.	Environment Protection (Water Quality) Policy 2015 <i>Landscape South Australia Act 2019 (SA)</i> <i>Native Vegetation Act 1991 (SA)</i> Environment Protection (Waste to Resources) Policy 2010 (SA) <i>Radiation Protection and Control Act 2021 (SA)</i>	Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000) Environmental management of dewatering during construction activities (EPA1093/21)	Groundwater (quality and quantity) of the aquifer Groundwater users Groundwater dependent ecosystems

⁶ Based on consultation during the preparation of the previous revision of the EIR and SEO (2021)

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Environmental element	Views of Affected Parties ⁶	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
Surface water, including quality and quantity	Stakeholders have identified concern for the following values and impacts: - discharge of solid or liquid waste (including wastewater) to surface water - disturbance to drainage patterns - disturbance of wetlands and wetland-dependent ecosystems - secondary impacts to above-ground waterways from subsurface activities.	Environment Protection (Water Quality) Policy 2015 <i>Landscape South Australia Act 2019 (SA)</i> <i>Native Vegetation Act 1991 (SA)</i> Environment Protection (Waste to Resources) Policy 2010 (SA)	Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000) Environmental management of dewatering during construction activities” (EPA1093/21)	Surface water quality Water users Native flora and fauna Wetlands
Air quality	Stakeholders have identified concern for the following values and impacts: - air emissions and greenhouse gas contributions - monitoring and reporting of emissions - adequacy and transparency of emissions data.	Environmental Protection (Air Quality) Policy 2016 (SA) <i>National Greenhouse and Energy Reporting Act 2007 (Cth)</i> National Environment Protection (National Pollutant Inventory) Measure 1998 (Cth)	No applicable non-legislated standards.	Air Quality
Existing land use and infrastructure	Stakeholders have identified concern for the following values and impacts: - stock accessing contaminants or disturbed areas - damage to infrastructure, including residences, buildings, water infrastructure and farm assets - impacts to land values and insurability - clarity around assessment, responsibility and remediation of damage - noise and vibration impacts to livestock.	<i>Planning, Development and Infrastructure Act 2016 (SA)</i>	No applicable non-legislated standards.	Existing land uses
Native fauna	Stakeholders have identified concern for the following values and impacts: - habitat of red-tailed black cockatoos - native and honeybees - noise and vibration impacts to fauna - injury or disturbance to wildlife - adequacy of fauna avoidance measures - stakeholder interest in observing and reviewing monitoring plans.	<i>National Parks and Wildlife Act 1972 (SA)</i> <i>Environmental Protection and Biodiversity Conservation Act 1999 (Cth)</i> <i>Landscape (South Australia) Act 2019 (SA)</i> <i>Fire and Emergency Services Act 2005 (SA)</i> <i>Planning, Development and Infrastructure Act 2016 (SA)</i>	AS 1940-2017: The storage and handling of flammable and combustible liquids	Native fauna Fauna habitat
Native vegetation	Stakeholders have identified concern for the following values and impacts: - removal or trimming of large, old or hollow-bearing trees - habitat of red-tailed black cockatoos - disturbance to remnant and high-quality native vegetation - rehabilitation effectiveness and long-term outcomes - stakeholder interest in observing and reviewing monitoring plans.	<i>Native Vegetation Act 1991 (SA)</i> <i>National Parks and Wildlife Act 1972 (SA)</i> <i>Environmental Protection and Biodiversity Conservation Act 1999 (Cth)</i> <i>Landscape South Australia Act 2019 (SA)</i> <i>Fire and Emergency Services Act 2005 (SA)</i> <i>Planning, Development and Infrastructure Act 2016 (SA)</i>	AS 1940-2017: The storage and handling of flammable and combustible liquids	Native vegetation Habitat areas

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Environmental element	Views of Affected Parties ⁶	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
General amenity	No significant stakeholder concerns have been identified.	<i>Planning, Development and Infrastructure Act 2016 (SA)</i> <i>Local Nuisance and Litter Control Act 2016 (SA)</i>	AS 4282-1997 Control of the obtrusive effects of outdoor lighting	Local community Landholders and users

5.1.2 Identifying Potential Impact Events

The second step of the impact assessment is to identify potential impact events for each relevant project phase, prior to the implementation of any controls. The potential impact event source, pathway and environmental receptor must be described in accordance with the Guidance, as follows:

- source – all project activities that could reasonably expected to negatively impact an environmental receptor for that environmental element
- pathway – the pathway by which the environmental receptor could be exposed to the source
- environmental receptor – the component of the environmental element that could be negatively affected by exposure to the potential impact.

The Guidelines state that the following information should be documented when identifying potential impact events:

- the environmental element
- the phase of operation
- an impact assessment number (ID)
- description of the potential impact events, including the source, pathway and receptor.

As required by the Guidelines, uncertainties, assumptions and knowledge gaps in the identification of each potential impact event are also described.

5.1.3 Confirmation of Impact Events

A complete source, pathway and environmental receptor linkage must be present for an impact event to be credible. Where an impact event is credible, it is assumed that it has the potential to occur and to subsequently require control and management. Where a complete source, pathway and environmental receptor linkage cannot be identified, the impact event is not credible and there is considered to be no potential for the impact event to occur.

5.1.4 Identifying Control and Management Strategies and Undertaking an Uncertainty Assessment

For each credible impact event, control measures to prevent, management and limit impacts are identified, such that they are As low as Reasonably Practicable (ALARP). Control measures are identified in line with the following principles set out in the Guidelines:

- they are proportionate to the consequence of the impact
- they achieve compliance with other applicable statutory requirements
- they are technically and economically achievable
- they are identified in line with the hierarchy of controls:
 - elimination of the impact source

- substitution of the impact source to a less hazardous one
- physical controls to break the linkage between the source, pathway and receptor to either avoid or reduce the likelihood or consequence of the impact event
- procedural controls to implement a procedure or management system to either avoid or reduce the likelihood or consequence of the impact event.

Any uncertainties in the effectiveness of proposed control measures are described.

5.1.5 Assessing Environmental Significance

The assessment of environmental significance has been conducted in accordance with the following factors listed within the Criteria and the Guidelines (DEM, 2024b):

- the level to which a potential impact can be avoided through elimination (prevention)
- the estimated frequency of the potential impact occurring
- the anticipated duration of the potential impact
- the extent of the potential impact
- the severity of the potential impact
- the cumulative effects (if any) of the potential impact when considered in conjunction with other impacts on the same receptor
- The sensitivity of the receiving environment.

The overall significance has been evaluated using a significance matrix that combines the sensitivity of the environment and the magnitude of impact, aligning with the factors outlined above. Sensitivity of the receiving environment considers the vulnerability of the receptor (i.e. ability to withstand the impact) and its value / importance, as defined in Table 5-2.

Table 5-2: Sensitivity Criteria

Sensitivity	Definition
High	• The receptor holds a statutory protection (e.g. Australian Marine Park) or is protected at an international or national level. • The receptor is unique to the environment which may be impacted. It is not common or widespread. • The receptor has no capacity to accommodate the impact and will not recover or adapt.
Moderate	• The receptor is regionally or locally important. • The receptor occurs in several environments and is not localised to the area which may be impacted. It has a moderate representation at a regional and national level. • The receptor has some tolerance to accommodate a particular effect, will recover or adapt over time.
Low	• The receptor is of a low importance and is common and widespread at a regional and national level.

Sensitivity	Definition
	The receptor is considered to be tolerant of the impact and can accommodate a particular effect without the need to recover or adapt.

The magnitude of impact considers the extent, duration, extent, the severity of the potential impact, and the potential for cumulative effects. The definitions for magnitude are provided in and Table 5-3, which should be treated as guidance rather than rigid thresholds. While frequency, duration, extent and severity are each considered individually, the overall magnitude reflects a balanced interpretation of all of these factors, acknowledging that some factors may offset or reinforce one another. For example, effect with a high value in one factor (e.g. high frequency) may still be assessed as moderate overall if other criteria (e.g. duration or extent) are low. Professional judgement is applied to determine the most appropriate overall magnitude.

Table 5-3: Magnitude Criteria

Magnitude	Definition
High	Avoidance: Impact cannot be avoided through identified controls. Frequency: The impact is known and will occur at a high frequency (i.e. multiple times a year). Duration: The impact duration is permanent (irreversible). Extent: The impact occurs at a high spatial scale and is widespread, affecting the receptor at a regional/population level. Severity: The impact results in a change or major alteration to key elements / features of the baseline conditions (i.e. high severity), such as: - Destruction of highly significant ecosystems, endangered or highly valued species or habitats. - Loss or permanent damage to nationally listed cultural or historic heritage. - Public exposure to hazards that result in chronic or life-threatening health impacts. - Socio-economic disruption that results in loss of businesses, suspension of community services over months or significant loss of employment or extensive damage to land and infrastructure. - Extensive and long-term damage to land and/or water that costs > \$1 million to remediate and/or exceeds statutory reference values/environmental quality standards. - Ongoing exceedance of noise and air quality standards that results in ongoing health impacts. - Widespread landscape and visual impacts that result in the project dominating the visual field for multiple sensitive receptors. Cumulative impact assessment: receptors are known to be impacted by similar activities. Cumulative effects are likely.
Moderate	Avoidance: Impact may avoided by identified controls but cannot be ruled out. Frequency: The impact is known and will occur at a moderate frequency (i.e. occasional over the project lifetime). Duration: The impact duration is medium to long-term (i.e. months to years) but reversible. Extent: The impact occurs at a moderate spatial scale, affecting a moderate proportion of the receptor's distribution but not to a regional/population level. Severity: The impact results in a minor or short-term change or alteration to key elements / features of the baseline conditions (i.e. moderate severity), such as:

Magnitude	Definition
	- Localised reduction in distribution/abundance of regionally important ecosystems or highly valued species or habitats, without reduction in ecosystem or population viability. - Damage to nationally listed cultural or historic heritage that can be rectified such that it does not alter its heritage significance. - Public exposure to hazards that result in short-term health impacts that require medical treatment that are recoverable. - Socio-economic disruption to businesses and/or community services at a local level, without the need for long-term business closures or significant loss of employment and only short-term suspension of services. - Regional and short-term damage to land and/or water that costs up to \$1 million to remediate and/or short-term and localised exceedance statutory reference values/environmental quality standards. - Short-term exceedance of noise and air quality standards to an extent which may result in complaints but no health impacts. - Localised landscape and visual impacts that result in a noticeable deterioration of the visual field for a small number of sensitive receptors. Cumulative impact assessment: receptors could be impacted by similar activities. Cumulative effects are possible.
Low	Avoidance: Impact will be avoided through identified controls. Frequency: The impact is unlikely to occur and if it does it will occur at a low frequency (i.e. once or twice over the project lifetime). Duration: The impact duration is short-term (i.e. days) and reversible. Extent: The impact occurs at a localised spatial scale and is confined to the project site and the immediate surrounds. Severity: The impact results only a very slight change to baseline conditions (i.e. low severity), such as. - Minor effects to ecosystem functions with no impact on valued species or habitats. No reduction to local community viability. - Minor damage to items of items of local cultural significance that can be easily rectified. - Only short-term health impacts, injuries or illnesses that do not require medical treatment and are easily recoverable. - Short-term (i.e. months) and recoverable socio-economic disruption without the need for business closures, suspension of services or loss of employment. - Localised and short-term damage to land and/or water that is easily repairable with no exceedance of statutory reference values/environmental quality standards. - Localised and short-term noise and air quality impacts with no exceedance of noise and air quality standards. - Barely perceptible deteriorations of the visual field for sensitive receptors. Cumulative impact assessment: receptors are unlikely to be impacted by similar activities. Low potential for cumulative effects.

The consideration of the magnitude of impact and sensitivity of the receptor will determine the overall significance as 'Negligible', 'Low', 'Moderate', 'High' or 'Major', which is used to understand potential significance (Table 5-4). Impacts are considered acceptable if they are categorised as 'Low' or below. Impacts in the 'Moderate' category are generally considered acceptable if they are ALARP, following the application of control measures. 'High' and 'Major' impacts are considered unacceptable necessitating redesign of the regulated activities.

In accordance with the Guidelines, the assessment of significance takes account of control measures identified using the principles described in Section 5.1.4.

Table 5-4: Significance Matrix

	Magnitude of Impact		
Sensitivity	High	Moderate	Low
High	Major	High	Moderate
Moderate	High	Moderate	Low
Low	Moderate	Low	Negligible

5.1.6 Assessing the Risk of Unplanned Events

Impact events are considered to be known/planned if they represent an inherent part of the activity that cannot be avoided. Where an impact event is planned, the impact assessment assesses the sensitivity of the receptor and impact magnitude only, as described above.

Alternatively, impact events may be uncertain/unplanned if they do not form an inherent part of the activity. For unplanned events, the assessment of significance is supplemented by a risk assessment which considers the worst-case consequence of the impact that could occur, in the scenario where controls are ineffective, and also the likelihood of that consequence occurring. The overall objective of the risk assessment is to determine if the risk associated with the unplanned impact event is managed to ALARP. This is a useful and commonly used approach for managing high consequence and low likelihood risks. The risk assessment has been conducted using The Beach Risk Matrix (Appendix D) which provides a six-level scale for assessing both consequence and likelihood and leads to an overall risk level which can be Low, Medium, High or Very High.

5.1.7 Developing Environmental Objectives and Assessment Criteria

Environmental objectives and assessment criteria are identified for confirmed impact events. The environmental objectives and criteria are described within each impact assessment table of those EIR and are reflected within the SEO (Beach Energy 2025).

One environmental objective may apply to individual or multiple impact events. In line with the Criteria and Guidelines, Beach have developed environmental objectives in accordance with the following principles:

- The environmental objectives are proportional to the level of significance.
- The environmental objectives are clear and unambiguous.
- The environmental objectives are reasonable and realistically achievable.

Assessment criteria have been identified for each environmental objective. The assessment criteria can be qualitative or quantitative and define how the achievement of the environmental objective is to be determined, with assessment criteria for each impact event. Leading performance criteria are identified for impact events that rely significantly on controls and provide an early indication of the effectiveness

of the control measure to understand whether the environmental objective is at risk of not being achieved.

5.2 Environmental Impact Assessment Findings

The Criteria and Guidelines do not specify the format in which the impact assessment should be presented. Beach has chosen to present the information clearly in a tabular format within each impact assessment section (Sections 5.2.1 to 5.2.10). Descriptive text is included to provide additional context and justification for the impact assessment conclusions and to introduce the potential impact events.

5.2.1 Public Health and Safety

5.2.1.1 Setting the Context

Table 5-5 summarises the view of affected parties, government legislation and non-legislated standards and key environmental receptors relevant to public health and safety.

Table 5-5: Public Health and Safety Views of Affected Parties, Legislation, Standards and Receptors

Environmental Element	Views of Affected Parties	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
Public health and safety	- Fire risk associated with site activities, vehicles and equipment. - Traffic and vehicle movements during geophysical operations. - Potential human health impacts from seismic testing, noise and vibration.	<i>Fire and Emergency Services Act 2005 (SA).</i> <i>Radiation Protection and Control Act 2021 (SA).</i>	- AS 1940-2017: The storage and handling of flammable and combustible liquids. - AS 1692-2006: Steel tanks for flammable and combustible liquids.	- local community. - local landholders.

5.2.1.2 Potential Impact Events

The potential impacts events for public health and safety include:

- increased traffic, use of roads and movement of vehicles and heavy machinery increases road safety risk
- explosive use, storage and handling increases health and safety risks to public
- unauthorised site access exposes members of the public to potential harm
- fire (resulting from activities) exposes public to potential harm (loss of property, injury and/or loss of life).

Impacts to the general public that cause disturbance or nuisance that may impact general amenity are described in Section 5.2.10.

5.2.1.3 Environmental Impact Significance Assessment

The results of the impact assessment for each impact event are presented in Table 5-6. There are no planned impacts to public health and safety and therefore the risk of unplanned events occurring has been considered, per the Beach Risk Matrix (see Section 5.1.6).

Table 5-6: Public Health and Safety Impact Assessment

Impact ID	PHS1
Potential Impact Event	<i>Increased traffic, use of roads and movement of vehicles and heavy machinery increases road safety risk</i>
Source/s	Increased use of roads, movement of vehicles and heavy machinery by project vehicles and traffic.
Pathway/s	- Increased road hazards to local road users causes road accident. - Use of roads and tracks, particularly unsealed roads or farm tracks can also cause damage or degradation, decreasing safety for existing road and track users.
Receptor/s	- Local community. - Landholders. - Road users.
Confirmation of Source – Pathway- Receptor	Yes – existing traffic by local community, landholders and users present in the area which could be impacted by project vehicles and traffic. Impact would only occur from an unplanned event.
Uncertainties and Assumptions	- Uncertainty in siting (e.g. access points) and location of activities. - Assumption that increase in traffic, especially from heavy vehicles or machinery, will lead to reduced public safety - uncertain as impact is unplanned.
Sensitivity to Change	- Likelihood of road accident will depend on volume of existing traffic. - Uncertain consequence - impact is unplanned.

Control Measures		
Type	Description	Effectiveness of controls
Elimination	-	- High certainty that proposed control measures will be effective. - Both Beach Energy and survey contractor have extensive experience in identifying and managing potential traffic disruptions associated with their activities.
Substitution	-	
Physical Controls	- Warning signage and traffic management measures installed where appropriate. - Project site mobilisation and demobilisations to detour around town centres where possible.	

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Control Measures

	Any deterioration of property tracks or other infrastructure as a result of operational traffic is rectified.
Procedural Controls	- Driver behaviour and vehicle speed limits to be included in compulsory induction. - Vehicle speed limits to be observed. - Landholders, local councils, potentially affected residents and emergency services will be informed of significant activities such as initial mobilisation and final demobilisation from project sites. - Compliance with relevant speed restrictions on access roads and tracks. - Where possible, peak traffic periods will be avoided. - Transport trucks to be restricted to daylight hours as far as possible. - All required authorisations (e.g. local council, DIT, police) obtained where required for movement of heavy vehicles (and transport of dangerous goods) along public roads, including joint inspections of roads before and after transport moves if necessary.

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Use of roads is unavoidable - controls in place to prevent road accidents.	Moderate (Table 5-3)
Frequency	Low - unplanned event. Vehicle movements will be occasional during the activity. Mobilisation and demobilisation of equipment and personnel will be staged (i.e. survey crew will arrive on site with staged mobilisation/demobilisation of equipment over several weeks), minimising volume of project-related traffic at any one time. With proposed controls, road accidents are not expected to occur, and if they do, they will be infrequent.	
Extent	Localised - impact confined to site boundary and surrounding roads.	
Duration	Short term - increases in traffic would be short-term. Peak traffic movements would occur during initial and final mobilisation.	
Severity	Low to high - varies greatly depending on type of accident - worst-case potential for chronic or life-threatening health impacts. Controls will minimise the risk to the public.	
Cumulative Impact Assessment	Possible - there could be increased use of shared roads from nearby activities (such as harvesting) which could increase the potential for incidents and the chance of repeated	

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Significance Assessment

	incidents. This is factored into control measures (e.g. mobilisation and demobilisation to detour around town centres where possible).
Sensitivity of Receptor/s	Moderate (Table 5-2) - activities will occur in areas with existing or historic oil and gas production, preferentially located in areas with low population densities and away from townships. Controls in place for site mobilisation and demobilisation to detour around town centres where higher levels of existing traffic hazards exist.
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where Increased traffic, use of roads and movement of vehicles and heavy machinery increases road safety risk, the worst-case consequence is Critical. The likelihood of the worst-case consequence is Remote, with the implementation of controls, resulting in a Medium risk to public health and safety that is considered ALARP.

SEO

Environmental Objective	No injuries, incidents or adverse health impacts involving the public or third parties from geophysical operations that could have been reasonably prevented by the operator.
Assessment Criteria	Any traffic-related injuries, incidents or adverse health impacts involving the public are investigated by a suitably-qualified and independent third party, and the investigation demonstrates that: - all traffic management controls were implemented - the incident could not reasonably have been prevented by the operator.
Leading Performance Criteria	Pre-start inspections confirm traffic management control measures are in place and effective. All personnel operating vehicles have completed site-specific inductions, including driver awareness training. Vehicle movements are monitored for compliance with designated routes and speed limits, with corrective actions documented and implemented where non-compliance is identified. All traffic-related incidents and hazards are recorded and investigated, with any identified corrective actions documented and implemented.

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Impact ID	PHS2	
Potential Impact Event	Explosive use, storage and handling increases health and safety risks to public	
Source/s	Explosives use, storage, handling and disposal.	
Pathway/s	Accidental detonation causes injury to public.	
Receptor/s	- Local landholders. - Local community.	
Confirmation of Source – Pathway- Receptor	Yes - although explosives are unlikely to be used, if used, landholders and local community present in the area that could be impacted. Impact would only occur from an unplanned event.	
Uncertainties and Assumptions	- Uncertainty in siting and location of activities (i.e. proximity to public). - Assumption that explosives are used / stored / handled during the activity.	
Sensitivity to Change	- Severity of impact would depend on proximity to public. - Uncertain consequence - impact is unplanned. If explosives are not used, impact will not occur.	
Control Measures		
Type	Description	Effectiveness of controls
Elimination	-	- High certainty that proposed control measures will be effective. - Industry standards, codes and guidelines that are well understood and have been successfully implemented.
Substitution	Preferential use of non-buried sources (vibroiseis).	
Physical Controls	- Explosives are required to be stored in an approved receptacle, store or magazine. Magazines will typically take the form of a transportable shipping container type structure. A licence to store explosives and a magazine licence may also be required depending on the volume of explosive stored at any one time. - Explosive components (charge, detonator and electronic firing unit) will be stored separately.	
Procedural Controls	Explosives use, storage, handling and disposal will be undertaken in accordance with relevant industry codes, standards and guidelines (e.g. Australian Dangerous Goods Code), and the requirements of the South Australian <i>Explosives Act 2024</i> (SA) and supporting regulations.	

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Control Measures

- Explosives will only be handled and utilised by appropriately trained and licensed personnel (i.e. holders of a SafeWork SA Blaster's Licence) in accordance with Beach health and safety and applicable legislative requirements.
- Ensure risks and requirements associated with explosive storage, handling and use is included in the induction and all personnel are fully informed of risks and associated restrictions.

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Use of explosives can be avoided. Preferential use of other non-buried seismic survey methods (e.g. vibroseis).	Low (Table 5-3)
Frequency	Low - unplanned event. Low likelihood that explosives will be used. If used, controls in place for safe handling and management of explosives to reduce potential for impacts on public (e.g. separate storage of explosive components, best practice handling and management of explosives). An accidental detonation would be impossible without deliberate assembly of components and mishandling of explosives. With proposed controls, the impact event is not expected to occur, and if it does, it will be infrequent.	
Extent	Localised - explosion would be limited to very localised environment where explosive source is stored and placed in ground.	
Duration	Short to long-term – explosions would be short-term. In unlikely event that impact to public occurs (e.g. chronic or life threatening impact), effects could be long-term.	
Severity	Low to high - varies greatly depending on exposure of public to explosions. Worst-case potential for serious health impacts, although this is extremely unlikely. When designed and managed appropriately, these activities present a low risk to public health and safety.	
Cumulative Impact Assessment	Low potential - incidents are isolated.	
Sensitivity of Receptor/s	Moderate (Table 5-2) - activities will occur in areas with existing or historic oil and gas production, preferentially located in areas with low population densities and away from townships.	
Likely Residual Significance	The predicted significance level is Low (Table 5-4).	

Significance Assessment	
	This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where explosive use, storage and handling increases health and safety risks to public, the worst-case consequence is Critical. The likelihood of the worst-case consequence is Remote, with the implementation of controls, resulting in a Medium risk to public health and safety that is considered ALARP.
SEO	
Environmental Objective	No injuries, incidents or adverse health impacts involving the public or third parties from geophysical operations that could have been reasonably prevented by the operator.
Assessment Criteria	No uncontrolled detonations from buried sources (explosives) reported.
Leading Performance Criteria	Regular safety audits confirm that explosives are used, stored, handled and disposed of in accordance with relevant industry codes, standards and guidelines (e.g. Australian Dangerous Goods Code), and the requirements of the <i>Explosives Act 2024</i> (SA) and supporting regulations. Records verify that all personnel handling and utilising explosives have been trained and licensed (e.g. a SafeWork SA Blaster’s Licence) in accordance with Beach health and safety and applicable legislative requirements. Explosive components are inspected and maintained in accordance to a documented schedule, with records demonstrating equipment is present, certified and serviceable. Site personnel are inducted to explosive storage, handling and use requirements including risks and associated restrictions. Emergency Response Plan is in place and reviewed following exercises, drills or incidents to incorporate lessons learned, and updated in line with regulatory requirements.

Environmental Impact Report

Impact ID	PHS3
Potential Impact Event	<i>Unauthorised site access exposes members of the public to potential harm</i>
Source/s	Presence of hazards (e.g. activities, equipment, vehicles, machinery, flammable or toxic substances).
Pathway/s	Unauthorised or uncontrolled access to geophysical survey site exposes members of the public to potential harm.
Receptor/s	Local community.
Confirmation of Source – Pathway- Receptor	Yes – public could access activity location. Impact would only occur from an unplanned event.
Uncertainties and Assumptions	• Uncertainty in siting and location of activities (i.e. proximity to public). • Assumption that any third parties who have accessed the site will be exposed to potentially dangerous sources.
Sensitivity to Change	• Exposure to potentially dangerous sources may be more or less likely across different sites (i.e. proximity to public). • Uncertain consequence - impact is unplanned.
Control Measures	
<i>Type</i>	<i>Description</i>
Elimination	-
Substitution	-
Physical Controls	• Signage warning of dangers associated with geophysical operations placed at the entry to access tracks or at geophysical operations specific work sites as appropriate. • Additional signage installed at operational areas where required / appropriate. • All minor excavations (e.g. for septic tank) to be backfilled following completion of operations. • Geophysical operation sites are typically located in areas with low population densities with restricted access to general public. • All drill holes are immediately covered, capped and backfilled on completion of survey activities to prevent injury or death to wildlife and stock in accordance with relevant industry standards and guidelines (e.g. SA Earth Resources Information Sheet M21 - Mineral Exploration Drillholes — General specifications for construction and backfilling).
<i>Effectiveness of controls</i>	
• High certainty that proposed control measures will be effective. • Signage and fencing have previously been shown to be effective in preventing third party access. • Industry standard measures that are well understood and have been successfully implemented.	

Environmental Impact Report

Control Measures

	Refer to measures listed for storage, handling and use of explosives.
Procedural Controls	Survey manager / site manager given authority to refuse entry of unauthorised third parties to geophysical operational areas.

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Controls to prevent public access to site will be implemented - but event cannot be completely ruled out.	Low (Table 5-3)
Frequency	Low - unplanned event. Hazardous substances will only be present during periods of active operation and will therefore occur intermittently. With proposed controls, access by public is not expected to occur, and if it does, it will be infrequent.	
Extent	Localised - impact confined to site boundary.	
Duration	Short to medium term - contaminants and waste may be present for weeks to months. Impacts to public expected to be reversible as most hazards and equipment pose a relatively low risk (comparable to agricultural machinery).	
Severity	Low to high - depends on the nature of the danger or injury, potential for serious but reversible health impacts. Most hazards and equipment are considered comparable to agricultural machinery, and therefore, risk to public is relatively low. Explosive components will be stored and managed to prevent exposure to public if unauthorised access occurs. Control measures will reduce public hazards at the site.	
Cumulative Impact Assessment	Low potential - incidents are isolated.	
Sensitivity of Receptor/s	Moderate (Table 5-2) - activities will occur in areas with existing or historic oil and gas production, preferentially located in areas with low population densities and away from townships.	
Likely Residual Significance	The predicted significance level is Low (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where unauthorised site access exposes members of the public to potential harm, the worst-case consequence is Serious. The likelihood of the worst-case consequence is Remote, with the implementation of controls, resulting in a Low risk to public health and safety that is considered ALARP.	

Environmental Impact Report

SEO

Environmental Objective	No injuries, incidents or adverse health impacts involving the public or third parties from geophysical operations that could have been reasonably prevented by the operator.
Assessment Criteria	Any notifiable incidents (as per s35 of the <i>Work Health and Safety Act 2012</i> (SA)) involving the public are investigated by a suitably-qualified and independent third party, and the investigation demonstrates that: • all relevant controls were implemented • the accident could not have been reasonably prevented by the operator.
Leading Performance Criteria	Regular safety audits confirm access control measures are in place and effective. Any additional reasonably practicable actions identified through audits or inspections to reduce risk to the public are documented and implemented. All security-related incidents and hazards are recorded and maintained, with any identified corrective actions documented and implemented.

Environmental Impact Report

Impact ID	PHS4
Potential Impact Event	<i>Fire (resulting from activities) exposes public to potential harm (loss of property, injury and/or loss of life)</i>
Source/s	Sparks from vehicles or equipment.
Pathway/s	Spread of fire can significantly impact public health through injury and potential loss of life.
Receptor/s	- Local community. - Landholders.
Confirmation of Source – Pathway- Receptor	Yes – presence of flammable substances on site. Impact would only occur from an unplanned event.
Uncertainties and Assumptions	- Uncertainty in siting and location of activities (i.e. proximity to public). - Assumption that the fire started due to failure to comply with control measures surrounding vehicles, machinery and weather.
Sensitivity to Change	- Exposure and potential spread of fire may be more or less likely across different sites (i.e. proximity to public and flammable sources). - Uncertain consequence - impact is unplanned.
Control Measures	
<i>Type</i>	<i>Description</i>
Elimination	-
Substitution	-
Physical Controls	- Confinement of flammable sources, restrictions on certain procedures and ready access to suitable fire-fighting equipment (e.g. fire tenders, such as water and, extinguishers). - Campsites (if required) and laydown areas will be preferentially sited in open areas to minimise fire risk. Construction of fire breaks are not anticipated to be required, however, these will be constructed if sufficient distance to vegetation cannot be maintained and if there is considered to be a potential fire risk (determined through liaison with the Country Fire Service (CFS)).
Procedural Controls	- Liaise with CFS regarding operations to ensure fire concerns are addressed and any <i>Fire and Emergency Services Act</i> (SA) requirements are met (e.g. permits for 'hot work' and suspension of activities on total fire days if required). - Response to fire included in Emergency Response Plan.

Environmental Impact Report

Control Measures

- Emergency response procedures included in staff training.
- Ensure fire risk is included in the induction and all personnel are fully informed on the fire danger season and associated restrictions.

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Proposed controls are in place to minimise the likelihood of a fire occurring and spreading (e.g. confinement of flammable sources, restriction of vehicles to tracks, seismic lines and cleared areas, maintenance of suitable fire-fighting equipment on site and liaison with the CFS).	Moderate (Table 5-3)
Frequency	Low - unplanned event. With proposed controls, spread of fire is not expected to occur. If it does, it will be infrequent.	
Extent	Moderate - non-confined. Fire can extend beyond site boundaries and endanger people external to site boundaries. With implementation of controls, fire expected to be controlled to minimise spread.	
Duration	Medium to long-term - depending on severity of fire.	
Severity	Moderate to high - impact can cause various injuries ranging from minor and severe burns to, smoke inhalation to death. Fire may also result in damage or loss of property with associated health and safety risks. Proposed controls will reduce risk to the public.	
Cumulative Impact Assessment	Possible - cumulative impacts of smoke inhalation may compound and affect a persons' health. It is unlikely that multiple events will occur, or that the same people are impacted if they do.	
Sensitivity of Receptor/s	Moderate (Table 5-2) - activities will occur in areas with existing or historic oil and gas production, preferentially located in areas with low population densities and away from townships.	
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where fire (resulting from activities) exposes public to potential harm (loss of property, injury and/or loss of life), the worst-case consequence is Critical. The likelihood of the worst-case consequence is Remote, with the implementation of controls, resulting in a Medium risk to public health and safety that is considered ALARP.	

SEO	
Environmental Objective	No injuries, incidents or adverse health impacts involving the public or third parties from geophysical operations that could have been reasonably prevented by the operator.
Assessment Criteria	No uncontrolled fires reported as a result of project activities.
Leading Performance Criteria	Engagement with local Emergency Service Providers is completed prior to commencement of activities, and any recommendations are documented and incorporated into site fire management planning. Pre-start audits confirm fire prevention controls are in place and effective. Fire prevention and firefighting equipment are inspected and maintained according to a documented schedule, with records demonstrating equipment is present, certified and serviceable. Emergency Response Plan is in place and reviewed following exercises, drills or incidents to incorporate lessons learned, and updated in line with regulatory requirements. Site personnel are inducted to fire prevention requirements including ignition source controls and emergency response procedures.

5.2.2 Heritage (Aboriginal and non-Aboriginal)

5.2.2.1 Setting the Context

Table 5-7 summarises the view of affected parties, government legislation and non-legislated standards and key environmental receptors relevant to heritage (Aboriginal and non-Aboriginal).

Table 5-7: Heritage (Aboriginal and non-Aboriginal) Views of Affected Parties, Legislation, Standards and Receptors

Environmental Element	Views of Affected Parties	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
Heritage (Aboriginal and non-Aboriginal)	- Appropriate language, clarity and transparency in documentation. - Effectiveness of heritage control and avoidance measures. - Adequacy of engagement and consultation, including notification processes. - Protection of cultural heritage sites during seismic operations.	<i>Aboriginal Heritage Act 1988 (SA).</i> <i>Environment Protection and Biodiversity Conservation Act 1999 (Cth).</i> <i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth).</i> <i>Native Title Act 1993 (Cth).</i>	- AAR's Managing Aboriginal Heritage in South Australia. - Dhawura Ngilan Vision and Best Practice Standards. - Interim Engaging with First Nations People and Communities on Assessments and Approvals under the EPBC Act.	- Aboriginal heritage sites. - Non-Aboriginal heritage sites. - Aboriginal communities. - Traditional owners.

5.2.2.2 Potential Impact Events

The potential impacts events for heritage (Aboriginal and non-Aboriginal) include:

- damage, disturbance, interference or loss of known and unknown Aboriginal heritage sites, objects or remains
- damage, disturbance, interference or loss of known and unknown non-Aboriginal heritage sites, objects or remains.

5.2.2.3 Environmental Impact Significance Assessment

The results of the impact assessment for each impact event are presented in Table 5-8. There are no planned impacts to heritage (Aboriginal and non-Aboriginal) and therefore the risk of unplanned events occurring has been considered, per the Beach Risk Matrix (see Section 5.1.6).

Table 5-8: Heritage (Aboriginal and non-Aboriginal) Impact Assessment

Impact ID	H1
Potential Impact Event	<i>Damage, disturbance, interference or loss of known and unknown Aboriginal heritage sites, objects or remains.</i>
Source/s	Earthworks during site preparation, construction, and rehabilitation / restoration activities.
Pathway/s	Damage or disturbance to Aboriginal cultural heritage site.
Receptor/s	Aboriginal cultural heritage sites.
Confirmation of Source – Pathway- Receptor	Yes – Aboriginal cultural heritage sites may be present in area - potential for unexpected find cannot be ruled out.
Uncertainties and Assumptions	- Uncertain presence of subsurface or obscured cultural heritage sites or artefacts - location of activities may alter potential impacts. - Assumption that unexpected find occurs during earthworks activity.
Sensitivity to Change	There is potential for change, as the discovery of cultural heritage sites or artefacts will increase the chance of additional finds.
Control Measures	
<i>Type</i>	<i>Description</i>
Elimination	-
Substitution	-
Physical Controls	Known sites identified and protected from operations using temporary flagging, fencing or exclusion zones to prevent damage, disturbance or interference.
Procedural Controls	- Site-specific desktop assessments undertaken as part of approvals process, which will include search of relevant cultural heritage registers. - Cultural heritage inspection of areas subject to surface disturbance to be undertaken with the relevant Aboriginal heritage group, informed by site-specific cultural heritage risk assessments. - Procedures consistent with the relevant obligations under the <i>Aboriginal Heritage Act</i> are in place to appropriately report and respond to any sites discovered during activities. - Records of sites forwarded to the Aboriginal Heritage Branch in compliance with the <i>Aboriginal Heritage Act</i>.
<i>Effectiveness of controls</i>	
- High certainty that proposed control measures will be effective. - Although stakeholders have expressed concerns over the effectiveness of control measures, Beach have managed cultural heritage issues at numerous sites without incident.	

Environmental Impact Report

Control Measures

- Where damage, disturbance or interference to Aboriginal sites, objects or remains is unavoidable, then an application for authorisation pursuant to section 23 of the *Aboriginal Heritage Act 1988* (SA) (Act) will be sought from the Minister for Aboriginal Affairs and Reconciliation (the Premier). Appropriate consultation with Aboriginal groups, traditional owners or Aboriginal persons with interests in the matter, as well as the State Aboriginal Heritage Committee, will be conducted by AAR in relation to the application (as per section 13 of the Act)
- Cultural heritage awareness and issues covered in inductions. Key personnel (e.g. supervisors, machinery operators) receive appropriate cultural heritage training.
- Records relating to sites of cultural heritage significance kept and available for audit.

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Impact can be avoided - control measures are proposed to minimise the possibility of unexpected finds and avoid disturbance to Aboriginal cultural heritage sites.	Moderate (Table 5-3)
Frequency	Low to moderate - surface disturbing activities will occur multiple times (intermittently). In any given area, surface-disturbing activities will be relatively infrequent, as geophysical surveys are progressive, rather than repeatedly disturbing the same location. Cultural heritage assessments and inspections will be undertaken, as per controls, to minimise potential for unexpected finds and avoid disturbance to non-Aboriginal cultural heritage sites (i.e. low frequency). Nevertheless, there is rich cultural heritage in the region and the potential for unexpected finds remains.	
Extent	Localised - confined to location of the cultural find, within the project site.	
Duration	Permanent - surface disturbing activities will last weeks to months. Irreversible damage to the heritage of Aboriginal groups and communities would be permanent.	
Severity	Low to high - potential for permanent impact to heritage sites and objects, depending on the extent of damage. Given the localised extent of the impact and the implementation of controls, significant damage to heritage sites and objects is not anticipated.	
Cumulative Impact Assessment	Possible - cumulative effects possible both due to the project and compounding on broader impact already within the community.	

Environmental Impact Report

Significance Assessment

Sensitivity of Receptor/s	Moderate to high (Table 5-2) - Aboriginal heritage has statutory protection. Pre-disturbed areas will be prioritised and surface water bodies will be avoided. Therefore, Aboriginal cultural significance is expected to be low. Site-specific cultural heritage assessments will further define the sensitivity for siting of surface disturbing activities, as part of approvals process.
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where damage, disturbance, interference or loss of known and unknown Aboriginal heritage sites, objects or remains, the worst-case consequence is Serious . The likelihood of the worst-case consequence is Unlikely , with the implementation of controls, resulting in a Medium risk to Aboriginal heritage that is considered ALARP.

SEO

Environmental Objective	No unauthorised damage, disturbance or interference to Aboriginal and non-Aboriginal heritage sites, objects, remains and places associated with geophysical operations.
Assessment Criteria	Records demonstrate that any Aboriginal heritage sites, objects or remains discovered during activities are managed in accordance with the operator's procedure, including immediate cessation of works in the vicinity and notification in accordance with the <i>Aboriginal Heritage Act 1988</i> (SA), the <i>Coroners Act 2003</i> (SA) and any applicable Native Title Agreement. Audit and inspection records demonstrate that no unauthorised damage, disturbance or interference to Aboriginal sites, objects or remains (all as defined under the <i>Aboriginal Heritage Act 1988</i> (SA)) has occurred, and that any authorised impacts have been undertaken in accordance with the relevant approvals under the <i>Aboriginal Heritage Act 1988</i> (SA).
Leading Performance Criteria	Records demonstrate that Aboriginal heritage risk assessments are completed prior to any ground-disturbing activity, and that pre-earthworks checklists confirm required controls are in place. Known Aboriginal heritage sites are clearly marked prior to and throughout activities to avoid disturbance. Procedures regarding unexpected finds are in place, with records demonstrating that, in the event of an unexpected find: • works ceased immediately upon discovery • Aboriginal heritage finds were reported and managed in accordance with the <i>Aboriginal Heritage Act 1988</i> (SA) and any applicable Native Title Agreement • any potential human remains were reported to SAPOL or the Coroner in accordance with the <i>Coroners Act 2003</i> (SA). Induction and training records demonstrate that personnel understand their responsibilities for identifying, protecting and reporting Aboriginal heritage.

Environmental Impact Report

Impact ID	H2
Potential Impact Event	Damage, disturbance, interference or loss of known and unknown non-Aboriginal heritage sites, objects or remains
Source/s	Earthworks during site preparation, construction, and rehabilitation / restoration activities.
Pathway/s	Damage or disturbance to non-Aboriginal cultural heritage site.
Receptor/s	Non-Aboriginal cultural heritage sites.
Confirmation of Source – Pathway- Receptor	Yes – non-Aboriginal cultural heritage sites may be present in area - potential for unexpected find cannot be ruled out.
Uncertainties and Assumptions	- Uncertain presence of subsurface or obscured cultural heritage sites or artefacts - location of activities may alter potential impacts. - Assumption that unexpected find occurs during earthworks activity.
Sensitivity to Change	There is potential for change, as the discovery of cultural heritage sites or artefacts will increase the chance of additional finds.

Control Measures		
Type	Description	Effectiveness of controls
Elimination	-	- High certainty that proposed control measures will be effective. - Although stakeholders have expressed concerns over the effectiveness of control measures, Beach Energy have managed non-aboriginal cultural heritage issues at numerous sites without incident.
Substitution	-	
Physical Controls	Known sites identified and protected from operations using temporary flagging, fencing or exclusion zones to prevent damage, disturbance or interference.	
Procedural Controls	- Site-specific desktop assessments undertaken as part of approvals process, which will include search of relevant cultural heritage registers. - Cultural heritage inspection of areas subject to surface disturbance, informed by site-specific cultural heritage risk assessment. - Cultural heritage awareness and issues covered in inductions. Key personnel (e.g. supervisors, machinery operators) receive appropriate cultural heritage training. - Records relating to sites of cultural heritage significance kept and available for audit. - Heritage site registers and Heritage Branch, DEW, consulted regarding the location of non-Aboriginal heritage sites where appropriate.	

Environmental Impact Report

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Impact can be avoided - control measures are proposed to minimise the possibility of unexpected finds and avoid disturbance to non-Aboriginal cultural heritage sites.	Moderate (Table 5-3)
Frequency	Low to moderate - surface disturbing activities will multiple times (intermittently). In any given area, surface-disturbing activities will be relatively infrequent, as geophysical surveys are progressive, rather than repeatedly disturbing the same location. Cultural heritage assessments and inspections will be undertaken, as per controls, to minimise potential for unexpected finds and avoid disturbance to non-Aboriginal cultural heritage sites (i.e. low frequency). Nevertheless, there is rich cultural heritage in the region and the potential for unexpected finds remains.	
Extent	Localised - confined to location of the cultural find, within the project site.	
Duration	Permanent - surface disturbing activities will last weeks to months. Irreversible damage to the heritage of non-Aboriginal groups and communities would be permanent.	
Severity	Low to high - potential for permanent impact to heritage sites and objects, depending on the extent of damage. Given the localised extent of the impact and the implementation of controls, significant damage to heritage sites and objects is not anticipated.	
Cumulative Impact Assessment	Possible - cumulative effects possible both due to the project and compounding on broader impact already within the community.	
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - non-Aboriginal heritage has statutory protection. However, surface disturbing activities will be conducted predominantly in pre-disturbed areas where non-Aboriginal cultural significance is expected to be low. Site-specific cultural heritage assessments will further define the sensitivity for siting of surface disturbing activities, as part of approvals process.	
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where damage, disturbance, interference or loss of known and unknown non-Aboriginal heritage sites, objects or remains, the worst-case consequence is Serious. The likelihood of the worst-case consequence is Unlikely, with the implementation of controls, resulting in a Medium risk to non-Aboriginal heritage that is considered ALARP.	

Environmental Impact Report

SEO

Environmental Objective	No unauthorised damage, disturbance or interference to Aboriginal and non-Aboriginal heritage sites, objects, remains and places associated with geophysical operations.
Assessment Criteria	Records demonstrate that any non-Aboriginal heritage sites discovered during activities are managed in accordance with the operator's procedure, including immediate cessation of works in the vicinity and notification to the South Australian Council in accordance with the <i>Heritage Places Act 1993</i> (SA). Audit and inspection records demonstrate that no unauthorised damage, disturbance or interference to non-Aboriginal heritage places or related objects has occurred, and that any authorised impacts have been undertaken in accordance with the relevant approvals under the <i>Heritage Places Act 1993</i> (SA).
Leading Performance Criteria	Records demonstrate that non-Aboriginal heritage risk assessments are completed prior to any ground-disturbing activity, and that pre-earthworks checklists confirm required controls are in place. Known non-Aboriginal heritage places and related objects are clearly marked prior to and throughout activities to avoid disturbance. Procedures regarding unexpected finds are in place, with records demonstrating that, in the event of an unexpected find: • works ceased immediately upon discovery • any non-Aboriginal heritage finds were reported and managed in accordance with the <i>Heritage Places Act 1993</i> (SA). Induction and training records demonstrate that personnel understand their responsibilities for identifying, protecting and reporting non-Aboriginal heritage.

5.2.3 Soil

5.2.3.1 Setting the Context

Table 5-9 summarises the view of affected parties, government legislation and non-legislated standards and key environmental receptors relevant to soil.

Table 5-9: Soil Views of Affected Parties, Legislation, Standards and Receptors

Environmental Element	Views of Affected Parties	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
Soil	- Adequacy of monitoring and compliance auditing. - Potential contamination from spills, leaks and drill cuttings. - Spill and leak reporting and management frameworks. - Long-term implications of buried materials (e.g. shot hole wiring, plastics).	<i>Landscape South Australia Act 2019 (SA).</i>	No applicable non-legislated standards.	- Soil quality. - Landholders and users.

5.2.3.2 Potential Impact Events

The potential impacts events for soil include:

- surface disturbing activities reduce soil quality
- contamination of soil from spills or leaks associated with storage and handling of fuel, oil and chemicals, seismic survey machinery and drilling equipment
- contamination of soil from storage, handling and disposal of waste.

5.2.3.3 Environmental Impact Significance Assessment

The results of the impact assessment for each impact event are presented in Table 5-10.

Table 5-10: Soil Impact Assessment

Impact ID	S1
Potential Impact Event	Surface disturbing activities reduce soil quality
Source/s	- Earthworks during site preparation, construction, and rehabilitation / restoration activities. - Completion of seismic survey operations and drilling activities.
Pathway/s	Localised impacts to soil through inversion, compaction or increased erosion risk.
Receptor/s	Soil quality.
Confirmation of Source – Pathway- Receptor	Yes – direct disturbance to soil is necessary for the project.
Uncertainties and Assumptions	- Uncertainty in the type and/or size of earthworks required, for example, paving of access tracks and campsites (existing roads and access tracks expected to be used). - Uncertainty in the survey source type - non-buried sources expected to be used which will not require drilling works.
Sensitivity to Change	- Topography and soil conditions at each site may vary. - Soil disturbance will be greater if buried sources are used.

Control Measures		
Type	Description	Effectiveness of controls
Elimination	-	High certainty, Beach Energy has extensive experience of undertaking earthworks and returning the land to its prior use.
Substitution	-	
Physical Controls	- Disturbance to soil during is minimised to as low as practicable. For example, seismic survey lines, drilling sites and associated infrastructure (camps / laydowns / magazines) will be located minimise disturbance to soil, in consultation with relevant landholders. - Soil removed during survey infrastructure construction to be stored on site, and returned to its original stratigraphic level upon rehabilitation / restoration. - Separate storage of topsoil, subsoil and clays will be undertaken to assist in regeneration of pasture or crops where appropriate.	Industry standard measures that are well understood and have been successfully implemented.

Environmental Impact Report

Control Measures

	• Soil profile and contours will be reinstated following completion of operations if required. Noting that it is highly unlikely that soil contours will be impacted to this level. • During rehabilitation / restoration of gravel paved areas, excess gravel is removed, and soils are then ripped (where appropriate), before returning stockpiled topsoil. • Imported paving materials (gravel) are removed from site, and soil profiles and contours restored unless otherwise agreed with the landholder. • Balloon tyres or tracked vibroseis trucks are used to reduce ground pressures and minimise impact on soil where necessary.
Procedural Controls	• Site preparation techniques are monitored and documented to minimise soil disturbance. • Landholders and relevant stakeholders (e.g. local council, industry associations) consulted regarding location of proposed activities where appropriate. • Areas subject to inundation are assessed for conduciveness to support vehicles prior to access.

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Avoidance is not possible - soil disturbance from will be required.	Low (Table 5-3)
Frequency	Moderate - surface disturbing activities will occur multiple times (intermittently). Seismic lines do not involve routine soil disturbance and this is only likely to occur at campsites and laydown areas.	
Extent	Localised - soil will only be disturbed within highly localised disturbance areas at each site. Disturbance to soil is restricted to a defined and agreed survey or work area.	
Duration	Short to medium-term – surface disturbing activities will last weeks to months. In any given area, surface-disturbing activities will be relatively short-term, as geophysical surveys are progressive, rather than repeatedly disturbing the same location. With the low levels of disturbance predicted, soil can generally rehabilitate naturally within a short period of time following natural processes.	

Environmental Impact Report

Significance Assessment

Severity	Low – impacts are reversible and are not expected to result in any long-term changes to baseline conditions with the implementation of control measures. No major socio-economic disruptions and only minor and recoverable damage to land / soil.
Cumulative Impact Assessment	Possible - soil disturbed by earthworks has the potential to also be impacted by contamination events. Controls are in place to manage these impacts.
Sensitivity of Receptor/s	Low (Table 5-2) - soil is an important component of the local environment. However, areas supporting sensitive or important vegetation will be avoided. Soil has capacity to tolerate localised and short to medium-term impacts.
Likely Residual Significance	The predicted significance level is Low (Table 5-4).

SEO

Environmental Objective	Land disturbed by geophysical operations is rehabilitated to a condition consistent with surrounding land and capable of supporting pre-disturbance land use.
Assessment Criteria	Audit and inspection demonstrate no evidence of significant soil disturbance attributable to the geophysical operations, or where this does occur, records demonstrate that rehabilitation measures are undertaken at the earliest practicable opportunity, including reinstatement of soil profiles and surface contours to be consistent with surrounding land and replacement of topsoil to support successful rehabilitation, where required. Records demonstrate that any reasonable landholder complaints regarding rehabilitation are addressed and resolved.
Leading Performance Criteria	Landholders are consulted prior to operations regarding location of proposed activities and rehabilitation expectations. Decommissioning and rehabilitation activities are undertaken in accordance with an approved decommissioning and rehabilitation plan and in consultation with landholders.
Environmental Objective	No significant adverse changes to soil stability, structure or composition as a result of geophysical operations.
Assessment Criteria	Audit and inspection records demonstrate that soil erosion, inversion and compaction is confined to the approved disturbance footprint, and has not resulted in significant adverse impacts (or where this does occur, remediation is undertaken, as described above). Records demonstrate that any reasonable landholder complaints regarding soil condition, erosion or land capability are addressed and resolved.
Leading Performance Criteria	Locations of proposed activities are selected to minimise soil disturbance and confine impacts to the smallest practicable footprint. Landholders are consulted prior to operations regarding location of proposed activities and rehabilitation expectations.

SEO	
	Gravel used for paving is sourced from licensed quarries, and paving materials are removed during rehabilitation unless otherwise agreed with the landholder.
	Vehicle and machinery movements are restricted to designated access tracks and work areas to minimise soil compaction.

Environmental Impact Report

Impact ID	S2
Potential Impact Event	<i>Contamination of soil from spills or leaks associated with storage and handling of fuel, oil and chemicals, seismic survey machinery and drilling equipment</i>
Source/s	- Improper transportation, storage and handling of fuel, oil and chemicals. - Vehicles, drilling equipment and seismic survey equipment (e.g. oil leak or hydraulic hose failure).
Pathway/s	Localised contamination of soil.
Receptor/s	Soil quality.
Confirmation of Source – Pathway- Receptor	Yes – presence of fuel, oil, chemicals and waste on site that could result in contamination in unplanned event that a spill or leak occurs.
Uncertainties and Assumptions	- Uncertain activity locations. - Uncertainty on extent and nature of impact (e.g. spill or leak volume). - Assumption that waste storage, handling or disposal incidents (such as spills and leaks) are not occurring indoors or in lined/bunded areas.
Sensitivity to Change	- Consequence will be greater for higher spill volumes. - Sites may have varying sensitivities. - Consequence is uncertain - impact is unplanned.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	High certainty that proposed control measures will be effective, which have been developed in line with standard industry practice and relevant environmental standards and policies.
Substitution	-	
Physical Controls	- All fuel and chemical storage areas will be in accordance with EPA guidelines 080/16 Bunding and Spill Management. - Hazardous materials stored, used and disposed of in accordance with relevant legislation on dangerous substances. - All hazardous materials including fuels, oils and chemicals are to be stored in approved containers in polythene lined bunded areas or on bunded pallets. - Bunded areas must have sufficient freeboard.	

Environmental Impact Report

Control Measures

- Appropriate drip capture / spill capture methods implemented in refuelling areas (e.g. use of drip trays or liners).
- Generators to be appropriately located to contain any spills (e.g. in polyethylene lined bunded areas or with suitable alternative spill containment).
- Appropriate spill response equipment is available on site.
- All contaminated soil will be removed for treatment / disposal at an EPA approved facility.
- If larger scale spills occur, that cannot be immediately contained and cleaned-up, they would be assessed and remediated in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999, amended 2013 (NEPM).

Procedural Controls

- No refuelling outside designated refuelling or servicing areas.
- Personnel have received training in the use of spill response equipment.
- Spills or leaks are immediately reported and clean up actions initiated.
- Landholders are immediately informed of spills or leaks.

Significance Assessment

<i>Consideration</i>	<i>Description</i>	<i>Overall magnitude</i>
Avoidance	Controls to prevent contamination from leaks, spills and accidental incidents will be implemented.	Low (Table 5-3)
Frequency	Moderate - minor spills and leaks are known to occur - although most can be avoided by application of controls. Frequency considered occasional.	
Extent	Localised - the spill or leak will impact the soil at a localised location, the size of which will depend on the nature of the incident.	
Duration	Short to medium-term - depending on volume and type of spills or leak. With the implementation of controls, minor spills are anticipated to be cleaned up and larger spills will be remediated.	
Severity	Low to moderate - depending on the size and type of contaminant involved in the spill or leak. Most common leaks and spills (e.g. hydraulic leaks) have a low impact, are localised and immediately cleaned up. Major spills are avoided through controls (e.g. bunded tanks)	

Environmental Impact Report

Significance Assessment

	and not expected to occur. If they do occur, they will be appropriately remediated. Therefore, no major socio-economic disruptions and only minor and repairable damage to land / soil.
Cumulative Impact Assessment	Possible – possible for existing contamination sources and for soil disturbed from contamination to also be disturbed by earthworks (e.g. soil inversion, erosion and compaction).
Sensitivity of Receptor/s	Low (Table 5-2) - soil is an important component of the local environment. However, soil has capacity to tolerate localised and small volume spills and leaks.
Likely Residual Significance	The predicted significance level is Low (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where contamination of soil from spills or leaks associated with storage and handling of fuel, oil and chemicals, seismic survey machinery and drilling equipment, the worst-case consequence is Serious . The likelihood of the worst-case consequence is Remote , with the implementation of controls, resulting in a Low risk to soil that is considered ALARP.

SEO

Environmental Objective	No significant adverse changes to soil stability, structure or composition as a result of geophysical operations.
Assessment Criteria	Audit and inspection records demonstrate appropriate storage and handling of fuel, oil and chemicals. Audit and inspection records demonstrate that spills or leaks of fuel, oil or chemicals are immediately contained, cleaned up and remediated in accordance regulatory requirements. Any reasonable landholder complaints regarding contamination or waste management are addressed and resolved.
Leading Performance Criteria	Fuel, oil and chemicals are stored and handled in accordance with AS 1940, EPA guidelines 080/16 Bunding and Spill Management and the Australian Dangerous Goods Code. Spill response equipment is available on site and personnel are trained in spill prevention, response and waste handling procedures. Inspection schedules are implemented to verify correct storage, handling and disposal of fuels, chemicals and oils.

Environmental Impact Report

Impact ID	S3	
Potential Impact Event	Contamination of soil from storage, handling and disposal of waste	
Source/s	Inappropriately managed waste.	
Pathway/s	Localised disturbance or contamination of soil from uncontrolled release of wastes.	
Receptor/s	Soil quality.	
Confirmation of Source – Pathway- Receptor	Yes - waste is planned to be stored on site. Contamination could occur in the unplanned event that waste is inappropriately managed.	
Uncertainties and Assumptions	Uncertain activity locations. Uncertain extent and nature of impact (e.g. release volume). Assumption that waste is inappropriately handled - impact is unplanned.	
Sensitivity to Change	Consequence will be greater for higher release volumes. Sites may have varying sensitivities. Consequence is uncertain - impact is unplanned.	
Control Measures		
Type	Description	Effectiveness of controls
Elimination	-	High certainty that proposed control measures will be effective, which have been developed in line with standard industry practice and relevant environmental standards and policies.
Substitution	-	
Physical Controls	- Excess drill cuttings (if buried sources used) will be removed from site and disposed of at an appropriately licensed waste management facility unless otherwise agreed with the landowner. - Covered bins are provided for the collection and storage of wastes. All loads of rubbish are covered during transport to an approved waste facility. - Waste streams are segregated on site and transported to appropriate facilities to maximise waste recovery, reuse and recycling. - Production of waste is minimised by purchasing reusable, biodegradable or recyclable materials where practical. - All waste disposal is at an EPA licensed facility.	

Environmental Impact Report

Control Measures

- Licensed contractors used for waste transport.
- Sewage wastes are handled using self-contained on-site treatment systems, to prevent release of untreated wastewater, that are approved and managed under the South Australian Public Health (Wastewater) Regulations 2013 and in compliance with the South Australian Health On-site Wastewater Systems Code.
- Toilet facilities with self-contained wastewater processing units will be provided at camp sites to prevent release of untreated wastewater.
- In the unlikely event that septic tanks are used to contain wastewater (black water and grey water), they will be pumped out by licensed contractors, as required, for disposal at a licensed facility.
- Small pits may be constructed to house the tanks which will be removed after operations are completed.
- Wastewater is not allowed to drain to surface water drainage features such as swamps.
- Survey areas and operational sites kept free of litter and rubbish.

Procedural Controls

- EPA's Waste Hierarchy model (avoid, reduce, reuse, recycle, recover, treat, dispose) should be complied with and waste management undertaken with regard to the Environment Protection (Waste to Resources) Policy 2010.
- Hazardous wastes handled in accordance with relevant legislation and standards.
- Any necessary approvals (e.g. local council) for use of wastewater disposal systems / installation of the septic tanks will be obtained.

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Controls to manage waste in accordance with relevant policies, guidelines and standards will be implemented to prevent unplanned release of waste.	Low (Table 5-3)
Frequency	Low - use of private accommodation is anticipated to be used to house survey personnel, where possible, minimising volume of waste to be managed during activity. Controls in place to prevent release. If this does occur, this will be infrequent.	
Extent	Localised - releases of waste will impact the soil at a localised location, the size of which will depend on the nature of the incident.	

Environmental Impact Report

Significance Assessment

Duration	Short to medium-term - releases of waste may have short or long-term impacts. With the implementation of controls, contamination is anticipated to be cleaned up and larger spills will be remediated.
Severity	Low to moderate - with the implementation of control measures, releases of waste are expected to be avoided. If a release does occur, it will be immediately cleaned up and any larger contamination events will be remediated. Therefore, no major socio-economic disruptions and only minor and repairable damage to land / soil.
Cumulative Impact Assessment	Possible – possible for existing contamination sources and for soil disturbed from contamination to also be disturbed by earthworks (e.g. soil inversion, erosion and compaction).
Sensitivity of Receptor/s	Low (Table 5-2) - soil is an important component of the local environment. However, soil has capacity to tolerate localised and small volume spills and leaks.
Likely Residual Significance	The predicted significance level is Low (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where contamination of soil from storage, handling and disposal of waste, the worst-case consequence is Minor . The likelihood of the worst-case consequence is Remote , with the implementation of controls, resulting in a Low risk to soil that is considered ALARP.

SEO

Environmental Objective	No significant adverse changes to soil stability, structure or composition as a result of geophysical operations.
Assessment Criteria	Activity sites, access tracks and camp areas are maintained in a clean and tidy condition. Audit and inspection records demonstrate appropriate storage and handling of wastes. Audit and inspection records demonstrate that uncontrolled releases of waste are immediately contained, cleaned up and removed for disposal at an appropriately licenced facility or, where required, assessed in accordance with NEPM guidelines and remediated in a timely manner.
Leading Performance Criteria	Waste is stored securely and transported by licensed contractors to licensed disposal or recycling facilities in accordance with relevant legislation and guidelines. Wastewater is disposed of in accordance with the South Australian Public Health (Wastewater) Regulations 2013 and relevant EPA guidelines. Reusable, biodegradable or recyclable materials are utilised where practicable.

5.2.4 Groundwater (including quality and quantity)

5.2.4.1 Setting the Context

Table 5-11 summarises the view of affected parties, government legislation and non-legislated standards and key environmental receptors relevant to groundwater, including quality and quantity.

Table 5-11: Groundwater (including quality and quantity) Views of Affected Parties, Legislation, Standards and Receptors

Environmental Element	Views of Affected Parties	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
Groundwater, including quality and quantity	- Groundwater dependent ecosystems. - Contamination from spills, leaks or downhole activities. - Aquifer depth, transmissivity and physical integrity. - Groundwater salinity. - Casing contamination. - Stygofauna and subterranean ecosystems. - Wastewater disposal practices. - Impacts to other groundwater users, particularly agriculture and viticulture. - Spill and leak reporting and management. - Long-term protection of high-value and pristine aquifers.	- Environment Protection (Water Quality) Policy 2015 (SA). <i>Landscape South Australia Act 2019</i> (SA). <i>Native Vegetation Act 1991</i> (SA). - Environment Protection (Waste to Resources) Policy 2010 (SA). <i>Radiation Protection and Control Act 2021</i> (SA).	- Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000). - Environmental management of dewatering during construction activities (EPA1093/21).	- Groundwater (quality and quantity) of the aquifer - Groundwater users - Groundwater dependent ecosystems

5.2.4.2 Potential Impact Events

The potential impacts events for groundwater include:

- contamination of groundwater from spills or leaks associated with storage and handling of fuel, oil and chemicals, seismic survey machinery and drilling equipment
- contamination of groundwater from storage, handling and disposal of waste
- contamination and crossflow of groundwater from drilling and use of explosives.

5.2.4.3 Environmental Impact Significance Assessment

The results of the impact assessment for each impact event are presented in Table 5-11.

Environmental Impact Report

Impact ID	GW1
Potential Impact Event	<i>Contamination of groundwater from spills or leaks associated with storage and handling of fuel, oil and chemicals, seismic survey machinery and drilling equipment</i>
Source/s	- Improper transportation, storage and handling of fuel, oil and chemicals. - Vehicles, drilling equipment and seismic survey equipment (e.g. oil leak or hydraulic hose failure).
Pathway/s	Localised contamination of shallow groundwater.
Receptor/s	- Groundwater dependant ecosystems. - Groundwater. - Groundwater users.
Confirmation of Source – Pathway- Receptor	Yes - presence of fuel, oil and chemicals on site that could result in contamination in unplanned event that a spill or leak occurs.
Uncertainties and Assumptions	- Uncertain activity locations. - Uncertain extent and nature of impact (e.g. spill or leak volume). - Site specific hydrogeological conditions of the potential project sites are not certain - Potential for groundwater crossflow is not certain - Assumption that this contamination will have economic and environmental impacts for other groundwater users - Assumption that contaminant will enter groundwater via seepage through soil.
Sensitivity to Change	- Consequence will be greater for higher spill volumes. - It is possible spills and leaks will not seep through soil into groundwater resources. - Differences in assumed understanding of the hydrogeological site will change the likelihood of this impact occurring.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	- High certainty that that proposed control measures will be effective. - The control measures outlined above are based on industry practice, and have been
Substitution	-	
Physical Controls	Refer to S2 (Table 5-10).	
Procedural Controls	Refer to S2 (Table 5-10).	

Environmental Impact Report

Control Measures

demonstrated to be effective at preventing and/or reducing the severity of the impact.

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Controls to prevent contamination from leaks, spills and accidental incidents will be implemented.	Low (Table 5-3)
Frequency	Low - minor spills and leaks are known to occur - although most can be avoided by application of controls. If spills, leaks or accidental incidents do occur, impacts to groundwater will be infrequent.	
Extent	Localised to moderate - the spill or leak will be confined to localised area. Extent may depend on volume of spill, permeability of soil and depth of groundwater. Contamination expected to be limited to shallow groundwater - typically unconfined with potential for downstream impacts.	
Duration	Short to medium-term - depending on volume and type of spill and leak and permeability of soil. With the implementation of controls, minor spills are anticipated to be cleaned up and larger spills will be remediated.	
Severity	Low to moderate - depending on the size and type of contaminant involved in the spill or leak. With the implementation of control measures, spills and leaks are expected to be localised and immediately cleaned up and any larger spills will be remediated. Spills and leaks are not anticipated to seep to groundwater (depth to water table is expected to be over 20 m in most instances). Therefore, no major degradation to groundwater resources anticipated.	
Cumulative Impact Assessment	Possible - groundwater could be affected by multiple incidences in the same area - however this is unlikely.	
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - groundwater is the primary source of water for the Limestone Coast and the region's economy, environment and community are all reliant upon this resource. Stakeholders raised several concerns over potential impacts to groundwater. Control measures will be implemented to avoid impacts to freshwater aquifers. Site-specific assessments will further define the sensitivity, as part of approvals process.	
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4).	

Environmental Impact Report

Significance Assessment

This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where contamination of groundwater from spills or leaks associated with storage and handling of fuel, oil and chemicals, seismic survey machinery and drilling equipment, the worst-case consequence is **Moderate**. The likelihood of the worst-case consequence is **Remote**, with the implementation of controls, resulting in a **Low** risk to ground water that is considered ALARP.

SEO

Environmental Objective	No impact to groundwater quality and quantity resulting from geophysical operations.
Assessment Criteria	Records from audits and inspections demonstrate no unauthorised release of fuels, oils and chemicals to land or groundwater. Spills or leaks are immediately contained, cleaned up and removed for disposal at an appropriately licensed facility, or where required, assessed and remediated in accordance with NEPM (Assessment of Site Contamination).
Leading Performance Criteria	Fuel, oil, chemicals and wastes are stored and handled in accordance with AS 1940, EPA Guideline 080/16 and the Australian Dangerous Goods Code. Spill response equipment is available on site and personnel are trained in spill prevention, response and waste handling procedures. Inspection schedules are implemented to verify correct storage, handling and disposal of fuels, chemicals and oils.

Environmental Impact Report

Impact ID	GW2
Potential Impact Event	Contamination of groundwater from storage, handling and disposal of waste
Source/s	Inappropriately managed waste.
Pathway/s	Localised disturbance or contamination of shallow groundwater from uncontrolled release of wastes.
Receptor/s	- Groundwater dependant ecosystems. - Groundwater. - Groundwater users.
Confirmation of Source – Pathway- Receptor	Yes - waste is planned to be stored on site. Contamination could occur in the unplanned event that waste is inappropriately managed.
Uncertainties and Assumptions	- Uncertain activity locations. - Uncertain extent and nature of impact (e.g. release volume). - Site specific hydrogeological conditions of the potential project sites are not certain. - Potential for groundwater crossflow is not certain. - Assumption that this contamination will have economic and environmental impacts for other groundwater users. - Assumption that contaminant will enter groundwater via seepage through soil.
Sensitivity to Change	- Consequence will be greater for higher release volumes. - It is possible waste releases will not seep through soil into groundwater resources. - Differences in assumed understanding of the hydrogeological site will change the likelihood of this impact occurring.

Control Measures		
Type	Description	Effectiveness of controls
Elimination	-	- High certainty that that proposed control measures will be effective. - The control measures outlined above are based on industry practice, and have been demonstrated to be effective at preventing and/or reducing the severity of the impact.
Substitution	-	
Physical Controls	Refer to S3 (Table 5-10).	
Procedural Controls	Refer to S3 (Table 5-10).	

Environmental Impact Report

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Controls to manage waste in accordance with relevant policies, guidelines and standards will be implemented to prevent unplanned release of waste.	Low (Table 5-3)
Frequency	Low - use of private accommodation is anticipated to be used to house survey personnel, where possible, minimising volume of waste to be managed during activity. Controls in place to prevent release. If this does occur, this will be infrequent.	
Extent	Localised to moderate - release of waste will be confined to localised area. Extent may depend on volume of spill, permeability of soil and depth of groundwater. Contamination expected to be limited to shallow groundwater - typically unconfined with potential for downstream impacts.	
Duration	Short to medium-term - depends on volume and type of release and permeability of soil. With the implementation of controls, contamination is anticipated to be cleaned up and larger spills will be remediated.	
Severity	Low to moderate - with the implementation of control measures, releases of waste are expected to be avoided. If a release does occur, it will be immediately cleaned up and any larger contamination events will be remediated. Contamination from releases of waste are not anticipated to seep to groundwater (depth to water table is expected to be over 20 m in most instances). Therefore, no major degradation to groundwater resources anticipated.	
Cumulative Impact Assessment	Possible - groundwater could be effected by multiple incidences in the same area - however this is unlikely.	
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - groundwater is the primary source of water for the Limestone Coast and the region's economy, environment and community are all reliant upon this resource. Stakeholders raised several concerns over potential impacts to groundwater. Control measures will be implemented to avoid impacts to freshwater aquifers. Site-specific assessments will further define the sensitivity, as part of approvals process.	
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where contamination of groundwater from storage, handling and disposal of waste, the worst-case consequence is Moderate. The likelihood of the worst-case consequence is Remote, with the implementation of controls, resulting in a Low risk to ground water that is considered ALARP.	

Environmental Impact Report

SEO

Environmental Objective	No impact to groundwater quality and quantity resulting from geophysical operations.
Assessment Criteria	Records from audits and inspections demonstrate no unauthorised release of wastes to land or groundwater. Audit and inspection records demonstrate appropriate storage and handling of wastes. Activity sites, access tracks and camp areas are maintained in a clean and tidy condition.
Leading Performance Criteria	Waste is stored securely and transported by licensed contractors to licensed disposal or recycling facilities in accordance with relevant legislation and guidelines. Wastewater is disposed of in accordance with the South Australian Public Health (Wastewater) Regulations 2013 and relevant EPA guidelines. Reusable, biodegradable or recyclable materials are utilised where practicable. Inspection schedules are implemented to verify correct storage, handling and disposal of wastes and wastewater.

Table 5-12: Groundwater Impact Assessment

Impact ID	GW3	
Potential Impact Event	Contamination and crossflow of groundwater from drilling and use of explosives	
Source/s	• Drilling fluids in the down-hole environment. • Undetonated seismic charges.	
Pathway/s	• Drilling fluids invade freshwater aquifers near the drill hole and cause localised contamination. • Migration of water-soluble components in undetonated seismic charges.	
Receptor/s	• Groundwater dependant ecosystems. • Groundwater. • Groundwater users.	
Confirmation of Source – Pathway- Receptor	Yes - although explosives and buried seismic sources are unlikely to be used - impact cannot be ruled out.	
Uncertainties and Assumptions	• Uncertain activity locations. • Site specific hydrogeological conditions of the potential project sites are not certain. • Potential for groundwater crossflow is not certain. • Assumption that this contamination will have economic and environmental impacts for other groundwater users. • Assumption that contaminant will enter groundwater via seepage through soil.	
Sensitivity to Change	• It is possible waste releases will not seep through soil into groundwater resources. • Differences in assumed understanding of the hydrogeological site will change the likelihood of this impact occurring.	
Control Measures		
Type	Description	Effectiveness of controls
Elimination	-	• High certainty that that proposed control measures will be effective. • The control measures outlined above are based on industry practice, and have been demonstrated to be effective at preventing and/or reducing the severity of the impact.
Substitution	Preferential use of non-buried sources (vibroseis).	
Physical Controls	• Seismic charges will be solid (not a liquid or emulsion) and encased in sealed hard-plastic shells to limit interaction with groundwater and soil. • Seismic charges designed to biodegrade if not detonated.	

Environmental Impact Report

Control Measures

	- Detonation of buried charges results in a small radius of rock around the charge to be fractured (typically less than 2 m radius). - Adequate buffer distances (vertical and horizontal) between buried seismic charges and groundwater wells will be incorporated into survey design.
Procedural Controls	Detonator installation practices (e.g. multiple detonators, appropriate waterproofing) to minimise chance of charge detonation failure.

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Use of buried seismic sources and explosives can be avoided. Preferential use of other non-buried seismic survey methods (e.g. vibroseis).	Low (Table 5-3)
Frequency	Low - unplanned event. Buried sources and explosives are unlikely to be used. Practices for installation and detonation minimise the chance of detonation failure and failure rates are very low (e.g. significantly less than 1%). Impact expected to be infrequent.	
Extent	Moderate - non-confined. May extend further than project boundary in event of crossflow. Appropriate barriers in place to prevent crossflow.	
Duration	Short to medium-term - dependent on the type and volume of contaminant that enters the groundwater.	
Severity	Low to moderate - dependent on level of contamination. Control measures are in place to avoid contamination to freshwater aquifers, including use of freshwater drilling muds and applying adequate buffer distances (vertical and horizontal) between buried seismic charges and groundwater wells will be incorporated into survey design. Therefore, significant degradation of groundwater resources is not anticipated.	
Cumulative Impact Assessment	Possible - groundwater could be affected by multiple incidences in the same area - however this is unlikely.	
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - groundwater is the primary source of water for the Limestone Coast and the region's economy, environment and community are all reliant upon this resource. Stakeholders raised several concerns over potential impacts to groundwater. Control measures will be implemented to avoid impacts to freshwater aquifers. Site-specific assessments will further define the sensitivity, as part of approvals process.	

Environmental Impact Report

Significance Assessment

Likely Residual Significance The predicted significance level is **Moderate** (Table 5-4).
This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where contamination and crossflow of groundwater from drilling and use of explosives, the worst-case consequence is **Moderate**. The likelihood of the worst-case consequence is **Remote**, with the implementation of controls, resulting in a **Low** risk to ground water that is considered ALARP.

SEO

Environmental Objective	No impact to groundwater quality and quantity resulting from geophysical operations.
Assessment Criteria	No detonation failure reported, or if this does occur, records demonstrate that risk assessments are completed to identify whether additional monitoring or mitigation measures are required (e.g. monitoring bore, sympathetic detonation). No uncontrolled flows to surface from aquifers intersected by drill holes are reported, or if this does occur, records demonstrate that risk assessments are completed to identify whether additional monitoring or mitigation measures are required. Landholder complaints regarding impact on groundwater users are documented and reasonable steps taken to resolve them can be demonstrated.
Leading Performance Criteria	Solid seismic charges encased in sealed hard-plastic shells are used, not liquid or emulsion charges. Biodegradable seismic charges are used. Records from audits and inspections verify that buried seismic charges are located an adequate distance (vertical and horizontal) from groundwater wells.

5.2.5 Surface Water (including quality and quantity)

5.2.5.1 Setting the Context

Table 5-13 summarises the view of affected parties, government legislation and non-legislated standards and key environmental receptors relevant to surface water, including quality and quantity.

Table 5-13: Surface Water Views of Affected Parties, Legislation, Standards and Receptors

Environmental Element	Views of Affected Parties	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
Surface Water	- Discharge of solid or liquid waste (including wastewater) to surface water. - Disturbance to drainage patterns. - Disturbance of wetlands and wetland-dependent ecosystems. - Secondary impacts to above-ground waterways from subsurface activities.	- Environment Protection (Water Quality) Policy 2015 (SA). <i>Landscape South Australia Act 2019</i> (SA). <i>Native Vegetation Act 1991</i> (SA). - Environment Protection (Waste to Resources) Policy 2010 (SA).	- Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000). - Environmental management of dewatering during construction activities" (EPA1093/21).	- Surface water quality. - Water users. - Native flora and fauna. - Wetlands.

5.2.5.2 Potential Impact Events

The potential impacts events for surface water include:

- surface disturbing activities disturb natural drainage patterns and increase sedimentation risk
- contamination of surface water from spills or leaks associated with storage and handling of fuel, oil and chemicals, seismic survey machinery and drilling equipment
- contamination of surface water from storage, handling and disposal of waste.

5.2.5.3 Environmental Impact Significance Assessment

The results of the impact assessment for each impact event are presented in Table 5-14 .

Table 5-14: Surface Water Impact Assessment

Impact ID	SW1
Potential Impact Event	<i>Surface disturbing activities disturb natural drainage patterns and increase sedimentation risk</i>
Source/s	- Earthworks during site preparation, construction, and rehabilitation / restoration activities. - Completion of seismic survey operations and drilling activities.
Pathway/s	Alter natural drainage patterns or result in increased sedimentation of surface water features.
Receptor/s	- Surface water quality. - Water users.
Confirmation of Source – Pathway- Receptor	Yes – presence of surface water bodies in the region which have the potential to be impacted.
Uncertainties and Assumptions	- Uncertain activity locations. - Uncertainty in the type and/or size of earthworks required, for example, paving of access tracks and campsites (existing roads and access tracks expected to be used). - Uncertainty in the survey source type - non-buried sources expected to be used which will not require drilling works.
Sensitivity to Change	- Impacts may vary across different sites (i.e. proximity to surface water bodies). - Topography and soil conditions at each site may vary. - Soil disturbance will be greater if buried sources are used.
Control Measures	
<i>Type</i>	<i>Description</i>
Elimination	Geophysical surveys and associated infrastructure appropriately located/prepared and constructed to avoid surface water features such as swamps, significant wetland areas, and to maintain pre-existing surface water flows.
Substitution	-
Physical Controls	Where necessary, temporary culverts will be installed to ensure natural surface drainage is maintained.
<i>Effectiveness of controls</i>	
- High certainty in effectiveness of controls. - Extensive experience in successfully implementing controls to prevent sediment entering surface waters and damage to drainage patterns.	

Environmental Impact Report

Control Measures

- Sediment and erosion control measures (e.g. sediment fences) installed where necessary (e.g. if in close proximity to drains or surface water features).
- Original drainage patterns will be restored.
- Low impact or hand carry / walk-in seismic survey methods used wherever practicable in sensitive aquatic environments.
- All access through watercourses/ drainage lines / water features are carefully assessed to determine the locations of least impact.

Procedural Controls	Landholders are consulted regarding crossings of features such as drainage channels and appropriate measures (e.g. culverts) are installed where required.
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Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	While avoidance of soil disturbance is not possible - activities and infrastructure will avoid surface water features such as swamps, significant wetland areas and pre-existing surface water flows will be maintained. Use of buried seismic sources and explosives can be avoided. Preferential use of other non-buried seismic survey methods (e.g. vibroseis).	Low (Table 5-3)
Frequency	Low - surface disturbing activities may occur multiple times (intermittently). However, controls will be implemented to avoid impacting surface water where possible (e.g. avoiding surface water features and maintaining surface water flows). Impact is not expected to occur.	
Extent	Moderate - non-confined. Depending on the type of surface water body, disturbance to natural drainage patterns and increased sedimentation has the potential to cause downstream impacts which could be external to project boundaries.	
Duration	Short-term - soil disturbing activities can last weeks to months. In any given area, surface-disturbing activities will be short-term, as geophysical surveys are progressive, rather than repeatedly disturbing the same location. Soil can generally rehabilitate naturally within a short period of time following natural processes. With implementation of control measures, no long-term impacts on surface water features anticipated - pre-existing surface water flows will be maintained.	

Environmental Impact Report

Significance Assessment

Severity	Low - controls in place to minimise disturbance to surface water (avoidance of surface water features, sediment and erosion control measures, if required). With the implementation of controls, drainage patterns will be restored - no long-term degradation of natural draining patterns is anticipated.
Cumulative Impact Assessment	Possible - surface water bodies can be also impacted by contamination from other activities. Other activities external to the project (e.g. located upstream of the site) may also contribute to surface water impact.
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - depending on the type of surface water body. Larger streams or creeks, particularly if important to local communities are of high sensitivity and importance. Control measures will be implemented to avoid impacts to surface water features.
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where surface disturbing activities disturb natural drainage patterns and increases sedimentation risk, the worst-case consequence is Moderate . The likelihood of the worst-case consequence is Highly Unlikely , with the implementation of controls, resulting in a Low risk to surface water that is considered ALARP.

SEO

Environmental Objective	No significant disturbance to drainage patterns and no adverse impacts to surface water quality or quantity associated with geophysical operations.
Assessment Criteria	Records from audits and inspections verify that activity sites are located, constructed and rehabilitated to maintain pre-existing surface water flows as far as practicable. Records from audits and inspections demonstrate that erosion and sediment control measures are implemented and effective in preventing sediment from entering surface water features. No visible sedimentation of surface water features attributable to geophysical operations is reported. No unauthorised 'water affecting activities' (as defined under the <i>Landscape Act 2019</i> (SA)) are undertaken without required permits. Any reasonable landholder complaints regarding altered drainage, surface water impacts, sedimentation or erosion impacts are documented and resolved.
Leading Performance Criteria	Desktop assessments and, where required, field assessments are undertaken to: • ensure activity sites are located to avoid significant alteration of natural drainage patterns; and • identify erosion and sedimentation risks prior to activities.

SEO	Temporary or permanent drainage structures (e.g., culverts) are installed where required to maintain surface water flows. Erosion and sediment control measures (e.g., sediment fences) are installed where required to prevent sediment from entering surface water features. Stockpiles, spoil and loose materials are managed to prevent sediment mobilisation. Site inspections are undertaken to ensure that drainage, erosion and sediment controls are installed correctly and functioning effectively, particularly after rainfall events. Landholders are consulted regarding drainage features and appropriate crossing methods. Disturbed areas are rehabilitated to restore natural surface profiles and drainage patterns, and to minimise erosion potential.
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Environmental Impact Report

Impact ID	SW2
Potential Impact Event	<i>Contamination of surface water from spills or leaks associated with storage and handling of fuel, oil and chemicals, seismic survey machinery and drilling equipment</i>
Source/s	- Improper transportation, storage and handling of fuel, oil and chemicals. - Vehicles, drilling equipment and seismic survey equipment (e.g. oil leak or hydraulic hose failure).
Pathway/s	Localised contamination of surface water from spills and leaks - principal risk to surface water.
Receptor/s	- Surface water quality. - Water users. - Native flora and fauna. - Wetlands.
Confirmation of Source – Pathway- Receptor	Yes - presence of fuel, oil and chemicals on site that could result in contamination in unplanned event that a spill or leak occurs.
Uncertainties and Assumptions	- Uncertain activity locations. - Uncertain extent and nature of impact (e.g. spill or leak volume). - Site specific hydrogeological conditions of the potential project sites are not certain. Uncertainty regarding the presence or absence of surface water as a result of rain. - Assumption that this contamination will have environmental impacts. - Assumption that contaminants will enter surface water.
Sensitivity to Change	- Consequence will be greater for higher spill volumes. - It is possible spills and leaks will not enter surface water. - Differences in assumed understanding of the hydrogeological site will change the likelihood of this impact occurring.

Control Measures

Type	Description	Effectiveness of controls
Elimination	Refer to SW1 (Table 5-14).	High certainty that proposed control measures will be effective.
Substitution	-	
Physical Controls	Refer to S2 (Table 5-10).	

Environmental Impact Report

Control Measures

Procedural Controls	Refer to S2 (Table 5-10).	Controls have been used at numerous sites and proven to be effective.
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Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Controls to prevent contamination from leaks, spills and accidental incidents will be implemented. Activities and infrastructure will be located/prepared and constructed to avoid surface water features such as swamps, significant wetland areas, and to maintain pre-existing surface water flows.	Low (Table 5-3)
Frequency	Low - minor spills and leaks are known to occur - although most can be avoided by application of controls. If spills, leaks or accidental incidents do occur, impacts to surface water will be infrequent.	
Extent	Moderate - non-confined, depends on the surface water body. Localised if a pond or confined water source, but non-confined if the contamination is to a creek or stream, in which case contamination has the potential to cause downstream impacts which could be external to project boundaries.	
Duration	Short to medium-term - depending on volume and type of spill and leak. With the implementation of controls, minor spills are anticipated to be cleaned up and larger spills will be remediated.	
Severity	Low to moderate - depending on the size and type of contaminant involved in the spill or leak. Most common leaks and spills (e.g. hydraulic leaks) have a low impact, are localised and immediately cleaned up. Major spills are avoided through controls (e.g. bunded tanks) and not expected to occur. If they do occur, they will be appropriately remediated. Therefore, no significant degradation of surface water quality anticipated.	
Cumulative Impact Assessment	Possible - surface water bodies can be also impacted by drainage pattern disturbance. Other activities external to the project (e.g. located upstream of the site) may also contribute to surface water impact.	
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - depending on the type of surface water body. Larger streams or creeks, particularly if important to local communities are of high sensitivity and importance. Control measures will be implemented to avoid impacts to surface water features.	

Significance Assessment	
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where of surface water from spills or leaks associated with storage and handling of fuel, oil and chemicals, seismic survey machinery and drilling equipment, the worst-case consequence is Moderate. The likelihood of the worst-case consequence is Remote, with the implementation of controls, resulting in a Low risk to surface water that is considered ALARP.
SEO	
Environmental Objective	No significant disturbance to drainage patterns and no adverse impacts to surface water quality or quantity associated with geophysical operations.
Assessment Criteria	No contamination of surface water attributable to spills or leaks. Records from audits and inspections demonstrate that no unauthorised release of fuel, oil, chemicals or other contaminants to surface water. Any reasonable landholder complaints regarding surface water impacts are documented and resolved.
Leading Performance Criteria	Fuel, oil and chemicals are stored and handled in accordance with AS 1940, EPA guidelines 080/16 Bunding and Spill Management and the Australian Dangerous Goods Code. Bunded storage areas are designed, installed and maintained to prevent contaminants entering surface water. Spill response equipment is available on site and personnel are trained in spill prevention, response and waste handling procedures. In the event of a spill or leak, fluids are immediately contained, recovered and removed for appropriate disposal, and surface water quality is assessed against relevant criteria. Runoff from high-risk areas (e.g., refuelling areas) is directed to lined containment structures and not allowed to drain off-site. Site inspections are undertaken to verify that spill prevention and containment measures are in place and functioning effectively. Records of spills, leaks containment actions and any potential impacts to surface water quality are maintained. Emergency Response Plan is in place and reviewed following exercises, drills or incidents to incorporate lessons learned, and updated in line with regulatory requirements.

Environmental Impact Report

Impact ID	SW3
Potential Impact Event	Contamination of surface water from storage, handling and disposal of waste
Source/s	Inappropriately managed waste
Pathway/s	Localised contamination of surface water from uncontrolled release of wastes
Receptor/s	• Surface water quality. • Water users. • Native flora and fauna. • Wetlands.
Confirmation of Source – Pathway- Receptor	Yes - waste is planned to be stored on site. Contamination could occur in the unplanned event that waste is inappropriately managed.
Uncertainties and Assumptions	• Uncertain activity locations. • Uncertain extent and nature of impact (e.g. release volume). • Site specific hydrogeological conditions of the potential project sites are not certain. Uncertainty regarding the presence or absence of surface water as a result of rain. • Assumption that this contamination will have environmental impacts. • Assumption that contaminants will enter surface water.
Sensitivity to Change	• Consequence will be greater for higher release volumes. • It is possible releases of waste will not enter surface water. • Differences in assumed understanding of the hydrogeological site will change the likelihood of this impact occurring.

Control Measures		
Type	Description	Effectiveness of controls
Elimination	Refer to SW1 (Table 5-14).	• High certainty that proposed control measures will be effective. • Controls have been used at numerous sites and proven to be effective.
Substitution	-	
Physical Controls	Refer to S3 (Table 5-10).	
Procedural Controls	Refer to S3 (Table 5-10).	

Environmental Impact Report

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Controls to manage waste in accordance with relevant policies, guidelines and standards will be implemented to prevent unplanned release of waste. Activities and infrastructure will be located/prepared and constructed to avoid surface water features such as swamps, significant wetland areas, and to maintain pre-existing surface water flows.	Low (Table 5-3)
Frequency	Low - use of private accommodation is anticipated to be used to house survey personnel, where possible, minimising volume of waste to be managed during activity. Controls in place to prevent release. If this does occur, this will be infrequent.	
Extent	Moderate - non-confined, depends on the surface water body. Localised if a pond or confined water source, but non-confined if the contamination is to a creek or stream, in which case contamination has the potential to cause downstream impacts which could be external to project boundaries.	
Duration	Short to medium-term - depends on volume and type of release of waste. With the implementation of controls, contamination is anticipated to be cleaned up and larger spills will be remediated.	
Severity	Low to moderate - with the implementation of control measures, releases of waste are expected to be avoided. If a release does occur, it will be immediately cleaned up and any larger contamination events will be remediated. Therefore, no major degradation to surface water quality anticipated.	
Cumulative Impact Assessment	Possible - surface water bodies can be also impacted by drainage pattern disturbance. Other activities external to the project (e.g. located upstream of the site) may also contribute to surface water impact.	
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - depending on the type of surface water body. Larger streams or creeks, particularly if important to local communities are of high sensitivity and importance. Control measures will be implemented to avoid impacts to surface water features.	
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where contamination of surface water from storage, handling and disposal of waste, the worst-case consequence is Moderate. The likelihood of the worst-case consequence is Moderate, with the implementation of controls, resulting in a Low risk to surface water that is considered ALARP.	

Environmental Impact Report

SEO

Environmental Objective	No significant disturbance to drainage patterns and no adverse impacts to surface water quality or quantity associated with geophysical operations.
Assessment Criteria	Records from audits and inspections demonstrate no unauthorised release of wastes to surface water. No contamination of surface water attributable to waste mismanagement. Audit and inspection records demonstrate appropriate storage and handling of wastes. Activity sites, access tracks and camp areas are maintained in a clean and tidy condition.
Leading Performance Criteria	Waste is stored securely and transported by licensed contractors to licensed disposal or recycling facilities in accordance with relevant legislation and guidelines. Wastewater is disposed of in accordance with the South Australian Public Health (Wastewater) Regulations 2013 and relevant EPA guidelines. Inspection schedules are implemented to verify correct storage, handling and disposal of wastes and wastewater.

5.2.6 Air Quality

5.2.6.1 Setting the Context

Table 5-15 summarises the view of affected parties, government legislation and non-legislated standards and key environmental receptors relevant to air quality.

Table 5-15: Air Quality Views of Affected Parties, Legislation, Standards and Receptors

Environmental Element	Views of Affected Parties	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
Air Quality	- Air emissions and greenhouse gas contributions. - Monitoring and reporting of emissions. - Adequacy and transparency of emissions data.	- Environmental Protection (Air Quality) Policy 2016 (SA). <i>National Greenhouse and Energy Reporting Act 2007 (Cth)</i> - National Environment Protection (National Pollutant Inventory) Measure 1998 (Cth)	No applicable non-legislated standards.	Air Quality

5.2.6.2 Potential Impact Events

The potential impacts events for air quality include:

- atmospheric emissions (excluding greenhouse gases) results in deterioration of air quality
- greenhouse gas emissions contribute to climate change.

5.2.6.3 Environmental Impact Significance Assessment

The results of the impact assessment for each impact event are presented in Table 5-16.

Table 5-16: Air Quality Impact Assessment

Impact ID	AQ1
Potential Impact Event	<i>Atmospheric emissions (excluding greenhouse gases) results in deterioration of air quality</i>
Source/s	- Earthworks during site preparation, construction, and rehabilitation / restoration activities - Movement of vehicles and heavy machinery. - Combustion of fuels from vehicles and equipment.
Pathway/s	- Dust generation (e.g. from earthworks and movement of vehicles). - Exhaust emissions from use of vehicles and equipment.
Receptor/s	Air Quality
Confirmation of Source – Pathway- Receptor	Yes - generation of dust and exhaust emissions will occur as part of the project.
Uncertainties and Assumptions	- Uncertain activity locations. - Assumption that unsealed roads are used. - Low rainfall volumes require dust suppression around times of heavy vehicle movements and earthworks.
Sensitivity to Change	- Consequence will be greater in closer proximity to sensitive receptors (e.g. residential locations) and on unsealed roads. - Consequence will be greater during periods of low rainfall. - Impact could change depending on fuel combustion.
Control Measures	
<i>Type</i>	<i>Description</i>
Elimination	-
Substitution	-
Physical Controls	- Dust generation will be minimised by restriction of speeds on unsealed roads and spraying of unsealed roads with water to moderate the potential for dust generation where required. - Compliance with relevant speed restrictions on access roads and tracks.
<i>Effectiveness of controls</i>	
- High certainty that proposed control measures will be effective. - Standard industry control measures that are well understand and successfully implemented.	

Environmental Impact Report

Control Measures

Procedural Controls	Equipment operated and maintained in accordance with manufacturer specifications.
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Significance Assessment

<i>Consideration</i>	<i>Description</i>	<i>Overall magnitude</i>
Avoidance	Dust generation and exhaust emissions cannot be completely avoided.	Low (Table 5-3)
Frequency	Moderate - dust and exhaust emissions may be generated intermittently.	
Extent	Short to medium-term - survey activities may last weeks to months. Air quality is likely to recover - no permanent reduction in air quality.	
Duration	Localised - temporary increases in dust and emission levels may extend marginally beyond the project boundaries and into nearby private or public land. Such exceedances are expected to be localised and transient, with concentrations returning rapidly to background levels.	
Severity	Low – reversible short to medium-term impact that will not cause significant long-term deterioration in air quality. Dust generation will be minimised by restriction of speeds on unsealed roads and spraying of unsealed roads with water to moderate the potential for dust generation where required. Exhaust emissions will be short-lived and comparable in magnitude to those generated by typical agricultural machinery and equipment, and are therefore not expected to result in a discernible change to baseline conditions.	
Cumulative Impact Assessment	Possible - air quality will likely be impacted by other non-project sources of contaminants.	
Sensitivity of Receptor/s	Low (Table 5-2) - receptors can recover from short-term reductions in air quality. Given existing development (e.g. existing and historic oil and gas development) and agricultural activities in the area, receptors expected to be able to tolerate project impact.	
Likely Residual Significance	The predicted significance level is Low (Table 5-4).	

SEO

Environmental Objective	Atmospheric emissions resulting from geophysical operations are kept to as low as reasonably practicable.
Assessment Criteria	Dust generation and exhaust emissions do not result in unreasonable impacts to air quality.

SEO	
	Any reasonable landholder complaints regarding dust or air quality impacts are documented and resolved.
Leading Performance Criteria	Stakeholder engagement and complaints reporting systems are in place to ensure dust and atmospheric emissions related concerns are captured and addressed. Personnel are trained through inductions and toolbox talks in importance of minimising dust generation. Records of dust suppression activities and any dust-related incidents or complaints are maintained. Disturbed areas are stabilised progressively to minimise dust generation. Vehicles and equipment are operated in a manner that minimises dust generation, including adherence to site speed limits. Site inspections are undertaken to verify that dust control measures are in place and functioning effectively. If pollutant thresholds are exceeded, appropriate NPI reporting will be completed.

Environmental Impact Report

Impact ID	AQ2
Potential Impact Event	<i>Greenhouse gas emissions contribute to climate change</i>
Source/s	Fuel burning equipment (e.g. vehicles).
Pathway/s	Greenhouse gas emissions.
Receptor/s	Climate.
Confirmation of Source – Pathway- Receptor	Yes - greenhouse gas emissions will occur and have the potential to contribute to climate change.
Uncertainties and Assumptions	Uncertainty regarding volume of GHG emissions produced.
Sensitivity to Change	Impact could change depending on fuel combustion.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	Moderate certainty that controls will be effective. Availability and feasibility of lower GHG emissions equipment options is not certain.
Substitution	-	
Physical Controls	-	
Procedural Controls	- Equipment operated and maintained in accordance with manufacturer specifications. - Operations planned to reduce fuel usage where possible, such as route planning to reduce the distance travelled. - Equipment options that generate less greenhouse gas emissions will be considered during the procurement process if they meet survey objective requirements.	

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Production of greenhouse gas emissions cannot be avoided.	Low (Table 5-3)

Environmental Impact Report

Significance Assessment

Frequency	Moderate - greenhouse gases will be produced intermittently through the use of vehicles and other equipment and machinery throughout the activity.
Extent	High - non-confined - greenhouse gas emissions contribute to global atmospheric pollution and global climate change.
Duration	Long-term - despite short-term emission of greenhouse gases, greenhouse gases remain as atmospheric pollution long-term and contribute to the long-term impacts of climate change.
Severity	Low - the greenhouse gasses produced by project activities represents an insignificant component of Australian and global greenhouse gas emissions.
Cumulative Impact Assessment	Possible - greenhouse gas emissions are cumulative over time and from a large range of contribution sources. Factors contributing to climate change can also be cumulative, for example the clearance of vegetation can exacerbate climate change effects.
Sensitivity of Receptor/s	Moderate (Table 5-2) - climate is a sensitive environmental factor worldwide. Within project context, emissions from project activities will have negligible impact.
Likely Residual Significance	The predicted significance level is Low (Table 5-4).

SEO

Environmental Objective	Atmospheric emissions resulting from geophysical operations are kept to as low as reasonably practicable.
Assessment Criteria	Greenhouse gas emissions from fuel combustion are minimised as much as reasonably practical. Any reasonable landholder complaints regarding dust or air quality impacts are documented and resolved. Greenhouse gas emissions are recorded and reported in accordance with statutory requirements (e.g. NGER requirements). ⁷
Leading Performance Criteria	Equipment is operated and maintained in accordance with manufacturer's specifications, relevant standards and legislative requirements (e.g. Environment Protection (Air Quality) Policy). Site inspections verify that where appropriate, emission control measures are in place and effective.

⁷ Note that Beach engages contractors to complete geophysical surveys. GHG emissions from this work are Scope 3 emissions for Beach, primarily Category 1 (Purchased Goods and Services) as described in the Greenhouse Gas Protocol's *Corporate Value Chain (Scope 3) Accounting and Reporting Standard* and Scope 3 guidance documents.

SEO	Opportunities to reduce emissions (e.g., efficient equipment selection, reduced idling, optimised logistics) are considered during planning.
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5.2.7 Existing Land Use and Infrastructure

5.2.7.1 Setting the Context

Table 5-17 summarises the view of affected parties, government legislation and non-legislated standards and key environmental receptors relevant to existing land use and infrastructure.

Table 5-17: Existing Land Use and Infrastructure Views of Affected Parties, Legislation, Standards and Receptors

Environmental Element	Views of Affected Parties	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
Existing land use and infrastructure	- Stock accessing contaminants or disturbed areas. - Damage to infrastructure, including residences, buildings, water infrastructure and farm assets. - Impacts to land values and insurability. - Clarity around assessment, responsibility and remediation of damage. - Noise and vibration impacts to livestock.	<i>Planning, Development and Infrastructure Act 2016 (SA).</i>	No applicable non-legislated standards.	Existing land uses.

5.2.7.2 Potential Impact Events

The potential impacts events for existing land use and infrastructure include:

- disturbance to land use from surface disturbing activities
- disturbance from site activities (e.g. light, noise, vibration, presence of machinery, camp sites and personnel)
- disturbance to existing land use from use of roads and movement of heavy vehicles and machinery
- access to contaminants (e.g. spills and leaks) and waste by stock
- risk of weed introduction.

5.2.7.3 Environmental Impact Significance Assessment

The results of the impact assessment for each impact event are presented in Table 5-18.

Table 5-18: Existing land use, infrastructure and general amenity Impact Assessment

Impact ID	LU1
Potential Impact Event	<i>Disturbance to land use from surface disturbing activities</i>
Source/s	- Earthworks and vegetation clearing activities during site preparation, construction, and rehabilitation / restoration activities. - Minor surface disturbance associated with seismic survey and drilling activities.
Pathway/s	- Disturbance to soil, groundwater, vegetation and surface water within the footprint of the activity. - Poor planning and execution of construction and rehabilitation activities also has the potential to impact land use beyond the activities' direct footprint, for example if campsites and access tracks are not sited to minimise the disruption to overall property access and management.
Receptor/s	Existing land uses.
Confirmation of Source – Pathway- Receptor	Yes – access to land is required.
Uncertainties and Assumptions	- Uncertain activity locations. - Uncertainty in the type and/or size of earthworks required, for example, paving of access tracks and campsites (existing roads and access tracks expected to be used).
Sensitivity to Change	Topography, hydrology and soil conditions at each site may vary.
Control Measures	
<i>Type</i>	<i>Description</i>
Elimination	-
Substitution	-
Physical Controls	- Activities are restricted to agreed / defined areas. - Adequate buffers maintained between proposed activities and residences. - In the case of a decommissioned restored site (e.g. camp site), the entire area will be restored to original land surface topography with no irregularities likely to cause injury to stock, unless otherwise agreed with the landholder. - Refer to S1 (Table 5-10)
<i>Effectiveness of controls</i>	
- High certainty in effectiveness of controls. - Controls have been used effectively on other projects within the Impact Assessment Area.	

Environmental Impact Report

Control Measures

Procedural Controls	- Landholders and relevant stakeholders (e.g. local council, industry associations) consulted regarding location of proposed activities where appropriate. - Systems in place for logging stakeholder complaints to ensure that issues are addressed as appropriate. - In the survey planning phase, consult landholders on location and schedule of seismic survey activities in order to minimise economic impacts and disruption to landholder activities. - Compensation agreements are agreed and put into place before any activities are undertaken. - Refer to S1 (Table 5-10).
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Significance Assessment

<i>Consideration</i>	<i>Description</i>	<i>Overall magnitude</i>
Avoidance	Land access required to undertake seismic surveys. Controls in place to avoid impacts to land use if possible (e.g. consultation with landowners regarding location, management and timing of activities).	Low (Table 5-3)
Frequency	Low to moderate - surface disturbing activities will occur multiple times (intermittently). Soil disturbance may not affect land use. If disturbance to land use does occur, this is anticipated to be infrequent or occasional.	
Extent	Localised - soil will only be disturbed within defined disturbance areas at each site (i.e. only a highly localised area for each landholder will be impacted).	
Duration	Short-term - surface disturbing activities may last weeks to months. However, impact to landholder during survey activities expected to be days to weeks - geophysical surveys are progressive, rather than repeatedly disturbing the same location.	
Severity	Low - with the implementation of controls, no long-term impacts to land use anticipated. Control measures will be implemented to ensure impacts are minimised and appropriate rehabilitation / restoration is undertaken. Any deterioration of property tracks or other infrastructure will be rectified.	

Environmental Impact Report

Significance Assessment

Cumulative Impact Assessment	Possible - soil disturbed by earthworks has the potential to also be impacted by contamination events. Controls are in place to manage these impacts. Impacts remain discrete and unlikely to overlap.
Sensitivity of Receptor/s	Moderate (Table 5-2) - variable sensitivity. Depends on the existing land use, agricultural land occurs in the region which may be sensitive to impacts.
Likely Residual Significance	The predicted significance level is Low (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where disturbance to land use from surface disturbing activities, the worst-case consequence is Minor . The likelihood of the worst-case consequence is Highly Unlikely , with the implementation of controls, resulting in a Low risk to land use that is considered ALARP.

SEO

Environmental Objective	Disturbance to existing land users and infrastructure associated with geophysical operations is kept to as low as reasonably practicable.
Assessment Criteria	Audits and inspections verify that project activities have not occurred outside approved areas. Audit and inspection demonstrate no evidence of significant soil disturbance attributable to the geophysical operations, or where this does occur, records demonstrate that rehabilitation measures are undertaken at the earliest practicable opportunity, including reinstatement of soil profiles and surface contours to be consistent with surrounding land and replacement of topsoil to support successful rehabilitation, where required. Any reasonable landholder or stakeholder complaint regarding surface disturbance is documented and resolved.
Leading Performance Criteria	Consultation with landholders is undertaken during planning and operations to identify and manage potential location and timing concerns. Stakeholder engagement and complaints reporting systems are in place to ensure concerns related to surface disturbance impacts to land use and infrastructure are captured and addressed. Rehabilitation is initiated as soon as practicable after operations cease in accordance with approved rehabilitation plans and landholder requirements.

Environmental Impact Report

Impact ID	LU2
Potential Impact Event	<i>Disturbance from site activities (e.g. light, noise, vibration, presence of machinery, camp sites and personnel)</i>
Source/s	Geophysical survey activities, transport moves and presence of machinery, camp sites and personnel.
Pathway/s	- Disturbance and possible impact to stock from light, noise, vibration and physical presence of machinery, camp sites and personnel. - Interference with other land use activities from light, noise, vibration and physical presence of machinery, camp sites and personnel. - The presence of excavations / voids on site may present short-term potential for localised impacts to stock.
Receptor/s	- Existing land uses. - Livestock.
Confirmation of Source – Pathway- Receptor	Yes - noise, light emissions and physical presence of infrastructure and machinery will occur which could disturb livestock and/or land use.
Uncertainties and Assumptions	- Uncertain activity locations. - Uncertain timing of activities.
Sensitivity to Change	- Consequence will be greater in closer proximity to sensitive receptors. - Consequence will be greater if light and noise emissions occur during hours of darkness.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	- High certainty in effectiveness of controls. - Controls have been used effectively on other projects within the Impact Assessment Area.
Substitution	-	
Physical Controls	- Activities are restricted to agreed / defined areas. - Machinery, equipment and camps removed from site promptly following completion of activities, particularly in visible locations. - Adequate buffers maintained between proposed activities and residences. - All drill holes are immediately covered, capped and backfilled on completion of survey activities to prevent injury or death to wildlife and stock in accordance with relevant industry standards and guidelines (e.g. SA Earth Resources Information Sheet M21 - Mineral Exploration Drillholes — General specifications for construction and backfilling).	

Environmental Impact Report

Control Measures

- All gates left in the condition in which they were found (open / closed). Temporary gates in fences are restored in accordance with landholder requirements.
- Seismic survey and infrastructure construction, activities restricted to daylight hours.
- Lighting (required for temporary campsite / laydown areas only) will be positioned to minimise light emanating from sites during operations.
- Machinery, equipment and camps will be promptly removed from site following the completion of operations, particularly in visible locations.
- Noise limitation (particularly during early morning and evening) to be included as part of induction procedures (e.g. unnecessary use of horns, reversing of machinery).
- Implementation of adequate buffer distances to ensure vibrations generated by the proposed activities do not result in significant disturbance to the community and residences or damage to buildings and other infrastructure (typically 500 m).

Procedural Controls

- Landholders and relevant stakeholders (e.g. local council, industry associations) consulted regarding location of proposed activities where appropriate.
- Systems in place for logging stakeholder complaints to ensure that issues are addressed as appropriate.
- Compensation agreements are agreed and put into place before any activities are undertaken.
- In the survey planning phase, consult landholders on location and schedule of seismic survey activities in order to minimise economic impacts and disruption to landholder activities.

Significance Assessment

<i>Consideration</i>	<i>Description</i>	<i>Overall magnitude</i>
Avoidance	Light emissions, noise emissions and physical presence of machinery and infrastructure cannot be avoided. Controls in place to avoid impacts to land use if possible (e.g. consultation with landowners regarding location, management and timing of activities). The presence of site personnel and the typically short period of excavations / voids on site will generally preclude impacts to medium to larger livestock.	Low (Table 5-3)
Frequency	Moderate - noise and light emissions will occur during the activity intermittently.	

Environmental Impact Report

Significance Assessment

Extent	Localised - generally confined to areas surrounding project site and access roads. Impacts confined to individual or small number of properties at any one time - geophysical surveys are progressive, rather than repeatedly disturbing the same location.
Duration	Short term - short term for the duration of the activity (weeks to months). However, impact to landholder during survey activities expected to be days to weeks - geophysical surveys are progressive, rather than repeatedly disturbing the same location.
Severity	Low - short term and localised increases in noise and light emissions are not anticipated to significantly impact or disturb land use (including livestock) - recoverable impact. Controls in place to minimise disturbance (e.g. noise limitations will be included as part of induction procedures, with a focus on noise minimisation during early morning and evening activities).
Cumulative Impact Assessment	Possible - land uses may be impacted by other activities or sources (e.g. nearby agricultural activities). However, impacts remain discrete and unlikely to overlap.
Sensitivity of Receptor/s	Moderate (Table 5-2) - variable sensitivity. Depends on the existing land use, agricultural land occurs in the region which may be sensitive to impacts.
Likely Residual Significance	The predicted significance level is Low (Table 5-4).

SEO

Environmental Objective	Disturbance to existing land users and infrastructure associated with geophysical operations is kept to as low as reasonably practicable.
Assessment Criteria	Inspections and audits verify that project activities have not occurred outside approved areas. Any reasonable landholder or stakeholder complaint regarding noise, light or vibration is documented and resolved.
Leading Performance Criteria	Consultation with landholders is undertaken during planning and operations to identify and manage potential noise, light or vibration concerns. Stakeholder engagement and complaints reporting systems are in place to ensure noise, light or vibration concerns are captured and addressed. Inductions include noise limitation training covering use of horns, reversing machinery and noise production in the early morning and evening. High noise emitting activities, seismic activities and transport trucks are restricted to daylight hours where practicable. Lighting in campsites is designed and positioned to minimise light spill, including the use of directional, shielded or downward-facing fixtures where practicable.

SEO	Inspections verify that lighting controls (e.g. shielding, direction, height, intensity) are implemented and effective, and noise-generating equipment is operated and maintained in accordance with manufacturer specifications and site procedures to minimise unnecessary noise. Camps and associated infrastructure are removed in accordance with approved project schedules following completion of activities. Rehabilitation is initiated as soon as practicable after operations cease in accordance with approved rehabilitation plans and landholder requirements.
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Environmental Impact Report

Impact ID	LU3
Potential Impact Event	<i>Disturbance to existing land use from use of roads and movement of heavy vehicles and machinery</i>
Source/s	Increased use of roads, movement of vehicles and heavy machinery by project vehicles and traffic.
Pathway/s	Interactions with domestic stock and agricultural operations, and degradation of unsealed roads and tracks.
Receptor/s	- Existing land uses. - Livestock.
Confirmation of Source – Pathway- Receptor	Yes – existing land uses and livestock presence in the area which could be impacted by the project vehicles and traffic.
Uncertainties and Assumptions	- Uncertain activity locations. - Uncertain timing of activities.
Sensitivity to Change	- Consequence will be greater in closer proximity to sensitive receptors. - Likelihood of interactions with stock higher during hours darkness.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	- High certainty in effectiveness of controls. - Controls have been used effectively on other projects within the Impact Assessment Area.
Substitution	-	
Physical Controls	Refer to PHS1 (Table 5-6).	
Procedural Controls	Refer to PHS1 (Table 5-6).	

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Use of roads is unavoidable.	Low (Table 5-3)
Frequency	Low - unplanned event. Vehicle movements will be intermittent. Mobilisation and demobilisation of equipment and personnel will be staged (i.e. survey crew will arrive on site with staged mobilisation/demobilisation of equipment over several weeks), minimising	

Environmental Impact Report

Significance Assessment

	volume of project-related traffic at any one time. Controls in place to avoid interactions with stock (e.g. speed restrictions, limitations of movements at night). Degradation of access tracks and unsealed roads is not anticipated with application of controls.
Extent	Localised - impact confined to site boundary and surrounding roads.
Duration	Short-term - increases in traffic would be short-term. Peak traffic movements would occur during initial and final mobilisation.
Severity	Low - controls in place to reduce severity of impact to livestock (e.g. speed restrictions, limitation of movements at night). Any deterioration of property tracks or other infrastructure as a result of geophysical survey related traffic will be rectified in consultation with landholders.
Cumulative Impact Assessment	Possible - there could be increased use of shared roads from nearby activities (such as harvesting). This is factored into control measures (e.g. mobilisation and demobilisation to detour around town centres where possible).
Sensitivity of Receptor/s	Moderate (Table 5-2) - variable sensitivity. Depends on the existing land use, agricultural land occurs in the region which may be sensitive to impacts.
Likely Residual Significance	The predicted significance level is Low (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where disturbance to existing land use from use of roads and movement of heavy vehicles and machinery, the worst-case consequence is Serious . The likelihood of the worst-case consequence is Highly Unlikely , with the implementation of controls, resulting in a Medium risk to land use that is considered ALARP.

SEO

Environmental Objective	Disturbance to existing land users and infrastructure associated with geophysical operations is kept to as low as reasonably practicable.
Assessment Criteria	No unreasonable disturbance to existing land uses (including livestock activities) outside agreed disturbance or compensation areas as a result of project activities. Any accidental or unforeseen impacts to existing land uses (including livestock activities) are reported and managed to the reasonable satisfaction of the landholder. Any reasonable landholder or stakeholder complaint regarding surface disturbance is documented and resolved.

SEO	
Leading Performance Criteria	Activities are planned and conducted to avoid unreasonable disturbance to livestock and other land uses. Speed limits, traffic management measures and (where required) fencing or gates are implemented to minimise disturbance or injury to livestock. All personnel operating vehicles have completed site-specific inductions, including driver awareness training. Transport trucks are restricted to daylight hours where practicable. Vehicle movements are monitored for compliance with designated routes and speed limits, with corrective actions documented and implemented where non-compliance is identified. Relevant road authorities are consulted where activities may affect public roads or infrastructure. Stakeholder engagement and complaints reporting systems are in place to ensure land use concerns are captured and addressed.

Environmental Impact Report

Impact ID	LU4
Potential Impact Event	<i>Access to contaminants (e.g. spills and leaks) and waste by stock</i>
Source/s	Presence of hazards (e.g. activities, equipment, vehicles, machinery, flammable or toxic substances).
Pathway/s	The potential for stock to access contaminants and waste.
Receptor/s	- Existing land uses. - Livestock.
Confirmation of Source – Pathway- Receptor	Yes - livestock presence in the area which could be impacted if contaminants and waste are accessed. Impact would only occur from an unplanned event.
Uncertainties and Assumptions	- Uncertain activity locations. - Assumption that livestock can access contaminants.
Sensitivity to Change	- Consequence will be greater in closer proximity to sensitive receptors. - Impact will vary depending the type of chemicals, fuels and wastes stored on site.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	- High certainty in effectiveness of controls. - Controls have been used effectively on other projects within the Impact Assessment Area.
Substitution	-	
Physical Controls	- Access to areas that present risk (chemical storage or contaminated areas) by wildlife and stock are restricted (e.g. use of existing paddock fencing). - For further control measures refer to PHS2 (Table 5-6).	
Procedural Controls	Refer to PHS2 (Table 5-6).	

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Controls to prevent stock access and manage fuels, chemicals and waste to avoid stock exposure to contaminants.	Low (Table 5-3)

Environmental Impact Report

Significance Assessment

Frequency	Low - unplanned event. Hazardous substances will only be present during periods of active operation and will therefore occur intermittently. With proposed controls, access by stock is not expected to occur, and if it does, it will be infrequent.
Extent	Localised - impact confined to site boundary.
Duration	Short-term - contaminants and waste may be present for weeks to months. Impacts to livestock expected to be reversible as most hazards and equipment pose a relatively low risk (comparable to agricultural machinery).
Severity	Low to high - in the unlikely event that access by stock to contaminants occurred, severity would greatly be depending on exposure of livestock to contaminants. Most hazards and equipment are considered comparable to agricultural machinery, and therefore, risk to livestock is relatively low. Explosive components will be stored and managed to prevent exposure to livestock if access occurs. Controls in place to prevent access by stock and to reduce presence of hazards.
Cumulative Impact Assessment	Possible - land uses may be impacted by other activities or sources.
Sensitivity of Receptor/s	Moderate (Table 5-2) - variable sensitivity. Depends on the existing land use, agricultural land occurs in the region which may be sensitive to impacts.
Likely Residual Significance	The predicted significance level is Low (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where access to contaminants (e.g. spills and leaks) and waste by stock, the worst-case consequence is Minor . The likelihood of the worst-case consequence is Highly Unlikely , with the implementation of controls, resulting in a Low risk to land use that is considered ALARP.

SEO

Environmental Objective	Disturbance to existing land users and infrastructure associated with geophysical operations is kept to as low as reasonably practicable.
Assessment Criteria	No unreasonable disturbance to existing land uses (including livestock activities) outside agreed disturbance or compensation areas as a result of project activities. Any accidental or unforeseen impacts to existing land uses (including livestock activities) are reported and managed to the reasonable satisfaction of the landholder.

SEO	Any reasonable landholder or stakeholder complaints regarding land use impacts are documented and resolved.
Leading Performance Criteria	Activities are planned and conducted to avoid unreasonable disturbance to livestock and other land uses. Waste, chemicals and contaminants are stored, handled and contained to prevent livestock access and land contamination. Site inspections are undertaken to verify that land-use and livestock protection measures where appropriate are in place and effective. Landholders are consulted regarding the location, timing and management of activities to minimise disturbance to land use and livestock. Stakeholder engagement and complaints reporting systems are in place to ensure land use concerns are captured and addressed.

Environmental Impact Report

Impact ID	LUS
Potential Impact Event	<i>Risk of weed introduction.</i>
Source/s	Weed / pathogen introduction and spread.
Pathway/s	Movement of vehicles and equipment (particularly earthmoving and vegetation slashing / mulching equipment).
Receptor/s	- Existing land uses. - Livestock.
Confirmation of Source – Pathway- Receptor	Yes - livestock presence in the area which could be impacted if weeds and pathogens are introduced/spread.
Uncertainties and Assumptions	- Uncertain activity locations. - Assumption that weeds are present and that attracted weeds will impact land use through competition for resources or habitat.
Sensitivity to Change	- Consequence will be greater in closer proximity to sensitive receptors. - Consequences depend on the level of weed or pathogen introduction and spread. - Uncertain consequence - impact is unplanned.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	- High certainty in effectiveness of controls. - Controls have been used effectively on other projects within the Impact Assessment Area.
Substitution	-	
Physical Controls	- Vehicles and equipment to be appropriately cleaned prior to arriving in the survey or work area. Implementation of specific hygiene measures within the survey or work area will be agreed based on specific requirements of landholders and relevant land managers. - Imported paving materials (gravel) will be sourced from licensed quarries that are free of weeds. - Any new weed species / infestations as a result of activities are treated as necessary in accordance with requirements of the landholder, and if appropriate the Limestone Coast Landscape Board.	

Environmental Impact Report

Control Measures

Procedural Controls	• Appropriate consultation regarding weeds or pathogens carried out with landholders and Limestone Coast Landscape Board officers. • All records of vehicle or equipment inspections and cleaning will be kept for auditing. • Records of detection, monitoring or eradication of weeds or pathogens introduced by activities are kept and available for review.
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Significance Assessment

<i>Consideration</i>	<i>Description</i>	<i>Overall magnitude</i>
Avoidance	Controls in place to minimise/avoid introduction and spread of weeds, pests and plant pathogens.	Low (Table 5-3)
Frequency	Low - unplanned event. Vehicle and equipment movement will be intermittent. Frequency of introduction and spread depends on the location of the site and potential pathways for spread of weeds, pests and plant pathogens. With implementation of controls, spread of weeds and pathogens is not anticipated to occur.	
Extent	Localised to moderate - impact of weeds, pests and plant pathogens may extend beyond site boundary in scenario of successful introduction and spread. However, this is not expected to occur with the implementation of controls which will manage spread of weeds and pathogens between sites.	
Duration	Short to long-term - vehicle and equipment movements will be short term. However, the impact can be long-term if weed, pest or plant pathogen is not eradicated.	
Severity	Low to moderate - dependent on the species of weed, pest or plant pathogen. If established, eradication may be challenging and significantly disrupt land use (e.g. agricultural activities). With control measures in place, spread and introduction of weeds and pathogens will be reduced.	
Cumulative Impact Assessment	Possible - other activities associated with agricultural activities could also result in introduction and spread of weeds, pests or plant pathogens.	
Sensitivity of Receptor/s	Moderate (Table 5-2) - variable sensitivity. Depends on the existing land use, agricultural land occurs in the region which may be sensitive to impacts.	
Likely Residual Significance	The predicted significance level is Low (Table 5-4).	

Environmental Impact Report

Significance Assessment

This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where risk of weed introduction, the worst-case consequence is **Minor**. The likelihood of the worst-case consequence is **Highly Unlikely**, with the implementation of controls, resulting in a **Low** risk to land use that is considered ALARP.

SEO

Environmental Objective Disturbance to existing land users and infrastructure associated with geophysical operations is kept to as low as reasonably practicable.

Assessment Criteria The presence or extent of weeds or plant pathogens at project sites is consistent with or better than pre-disturbance conditions and adjacent land. Where this is not the case, appropriate management actions are implemented promptly.
Declared plants occurring as a result of project activities are reported and managed in accordance with the *Landscape South Australia Act 2019* (SA) and relevant Landscape Board plans.

Leading Performance Criteria Records of weed management actions, detection and monitoring efforts, vehicle/equipment inspections are maintained.
Vehicle/equipment hygiene measures are implemented based on agreed requirements of landholders and relevant land manager.
Consultation is undertaken with landholders and Landscape Board to identify weed or pathogen risks and any specific management requirements.
Local earthmoving contractors and locally sourced materials (e.g., quarry products) are used where practicable to reduce the risk of introducing weeds or pathogens.
Sites, access tracks and disturbed areas are monitored for new weed infestations, with treatment undertaken in accordance with landholder requirements and relevant Landscape Board plans.

Environmental Impact Report

Impact ID	LU6
Potential Impact Event	<i>Fire (resulting from activities) impacts land use (e.g. via damage to pasture, forestry, crops, buildings and other infrastructure)</i>
Source/s	Sparks from vehicles or equipment.
Pathway/s	Spread of fire which damages pasture, forestry, crops, buildings and other infrastructure.
Receptor/s	- Existing land uses. - Livestock.
Confirmation of Source – Pathway- Receptor	Yes – presence of flammable substances on site. Impact would only occur from an unplanned event.
Uncertainties and Assumptions	- Uncertainty in siting and location of activities (i.e. proximity to livestock, third party infrastructure). - Assumption that the fire started due to failure to comply with control measures surrounding vehicles, machinery and weather.
Sensitivity to Change	- Exposure and potential spread of fire may be more or less likely across different sites (i.e. proximity to livestock, third-party infrastructure). - Uncertain consequence - impact is unplanned.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	- High certainty in effectiveness of controls. - Controls have been used effectively on other projects within the Impact Assessment Area.
Substitution	-	
Physical Controls	Refer to PHS4 (Table 5-6).	
Procedural Controls	Refer to PHS4 (Table 5-6).	

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Proposed controls are in place to minimise the likelihood of a fire occurring and spreading (e.g. confinement of flammable sources, restriction of vehicles to tracks, seismic lines and cleared areas, maintenance of suitable fire-fighting equipment on site and liaison with the CFS).	Moderate (Table 5-3)

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Significance Assessment

Frequency	Low - unplanned event. With proposed controls, spread of fire is not expected to occur. If it does, it will be infrequent.
Extent	Moderate - non-confined. Fire can extend beyond site boundaries and endanger infrastructure and stock external to site boundaries. With implementation of controls, fire expected to be controlled to minimise spread.
Duration	Medium to long-term - depending on severity of fire.
Severity	Moderate to high - fire can damage third-party infrastructure or disturb/injury/kill livestock. Proposed controls will reduce this risk by preventing initiation of fire and quickly managing spread of fire.
Cumulative Impact Assessment	Low potential - it is unlikely that multiple fires will occur in the region, or that the same infrastructure would be impacted if they do.
Sensitivity of Receptor/s	Moderate (Table 5-2) - variable sensitivity. Depends on the existing land use, agricultural land occurs in the region which may be sensitive to impacts.
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event where fire (resulting from activities) impacts land use (e.g. via damage to pasture, forestry, crops, buildings and other infrastructure), the worst-case consequence is Serious . The likelihood of the worst-case consequence is Highly Unlikely , with the implementation of controls, resulting in a Medium risk to land use that is considered ALARP.

SEO

Environmental Objective	Disturbance to existing land users and infrastructure associated with geophysical operations is kept to as low as reasonably practicable.
Assessment Criteria	No uncontrolled fires reported as a result of project activities.
Leading Performance Criteria	Engagement with local Emergency Service Providers is completed prior to commencement of activities, and any recommendations are documented and incorporated into site fire management planning. Pre-start audits confirm fire prevention controls are in place and effective. Fire prevention and firefighting equipment are inspected and maintained according to a documented schedule, with records demonstrating equipment is present, certified and serviceable.

SEO	
	Emergency Response Plan is in place and reviewed following exercises, drills or incidents to incorporate lessons learned, and updated in line with regulatory requirements.
	Site personnel are inducted to fire prevention requirements including ignition source controls and emergency response procedures.

5.2.8 Native Fauna

5.2.8.1 Setting the Context

Table 5-19 summarises the view of affected parties, government legislation and non-legislated standards and key environmental receptors relevant to native fauna.

Table 5-19: Native Fauna Views of Affected Parties, Legislation, Standards and Receptors

Environmental Element	Views of Affected Parties	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
Native fauna	- Habitat of red-tailed black cockatoos. - Native and honeybees. - Noise and vibration impacts to fauna. - Injury or disturbance to wildlife. - Adequacy of fauna avoidance measures. - Stakeholder interest in observing and reviewing monitoring plans.	<i>National Parks and Wildlife Act 1972 (SA).</i> <i>Environmental Protection and Biodiversity Conservation Act 1999 (Cth).</i> <i>Landscape South Australia Act 2019 (SA).</i> <i>Fire and Emergency Services Act 2005 (SA).</i> <i>Planning, Development and Infrastructure Act 2016 (SA).</i>	AS 1940-2017: The storage and handling of flammable and combustible liquids.	- Native fauna. - Fauna habitat.

5.2.8.2 Potential Impact Events

The potential impacts events for native fauna include:

- disturbance to fauna from site activities (e.g. light, noise, vibration, presence of machinery, camp sites and personnel)
- disturbance, injury or death to fauna from use of roads and movement of heavy vehicles and machinery
- disturbance, injury or death to fauna from access to contaminants and waste
- disturbance, injury or death of fauna from fire (resulting from activities).

5.2.8.3 Environmental Impact Significance Assessment

The results of the impact assessment for each impact event are presented in Table 5-20.

Environmental Impact Report

Table 5-20: Native Fauna Impact Assessment

Impact ID	NF1
Potential Impact Event	<i>Disturbance to fauna from site activities (e.g. light, noise, vibration, presence of machinery, camp sites and personnel)</i>
Source/s	Geophysical survey activities, transport moves and presence of machinery, camp sites and personnel.
Pathway/s	- Disturbance to native fauna from light, noise and vibration emissions. - Disturbance to native fauna from the physical presence of machinery, camp sites and personnel.
Receptor/s	Native fauna.
Confirmation of Source – Pathway- Receptor	Yes - noise, light emissions and physical presence of infrastructure and machinery will occur which could disturb native fauna.
Uncertainties and Assumptions	- Uncertain activity locations - uncertain presence of native fauna. - Uncertain timing of activities.
Sensitivity to Change	- Consequence will be greater in closer proximity to sensitive receptors. - Consequence will be greater if light and noise emissions occur during hours of darkness. - Changes to impact severity are possible if species classifications change.

Control Measures

Type	Description	Effectiveness of controls
Elimination	Activities within parks or reserves established under the NPW Act will be avoided, where practicable. Geophysical activities will only be undertaken in parks or reserves established under the NPW Act when expressly authorised under that Act and all other relevant legislation	- High certainty in effectiveness of controls. - Industry standard control measures that are well understood and that have been successfully implemented.
Substitution	-	
Physical Controls	- No unauthorised off-road or off-line driving or creation of shortcuts. - All drill holes are immediately covered, capped and backfilled on completion of survey activities to prevent injury or death to wildlife and stock in accordance with relevant industry standards and guidelines (e.g. SA Earth Resources Information Sheet M21 -	

Environmental Impact Report

Control Measures

	Mineral Exploration Drillholes — General specifications for construction and backfilling). • Feeding of wildlife is not permitted. • No domestic pets allowed at camps or operational sites. • Lighting (expected from campsites only, if these are required) will be positioned to minimise light emanating from sites during operations. • Refer to LU2 (Table 5-18).
Procedural Controls	• The environmental assessment undertaken during the planning process will identify whether there are specific issues within a particular survey area which could trigger requirement changes to the survey design, and / or mitigation measures to avoid potential impacts. • Fauna mortality (if it occurs) to be captured by incident reporting system and advice from an ecologist if required. • If geophysical activities are proposed to occur within a park or reserve established under the NPW Act, consultation will be undertaken with DEW to determine appropriate mitigation measures and approval requirements. • Refer to LU2 (Table 5-18).

Significance Assessment

<i>Consideration</i>	<i>Description</i>	<i>Overall magnitude</i>
Avoidance	Light emissions, noise emissions and physical presence of machinery and infrastructure cannot be avoided. Controls in place to avoid impacts to native fauna if possible (e.g. ecological surveys and seeking specialist advice if threatened species are identified). The presence of site personnel and the typically short period of excavations / voids on site will generally preclude impacts to medium to larger species, with some minor short-term risk posed to smaller species.	Low (Table 5-3)
Frequency	Moderate - noise and light emissions will be intermittent during five-year period. Presence of excavations or voids on site that would be accessible to stock will be infrequent.	
Extent	Localised - generally confined to areas surrounding project site and access roads.	

Environmental Impact Report

Significance Assessment

Duration	Short term - short term (weeks to months). No long-term impacts anticipated. Geophysical surveys are progressive, rather than repeatedly disturbing the same location.
Severity	Low - short term and localised increases in noise and light emissions are not anticipated to significantly native fauna - recoverable impact. Controls in place to minimise disturbance (e.g. noise limitations will be included as part of induction procedures, with a focus on noise minimisation during early morning and evening activities). Adaptive management measures in place to reduce disturbance - the environmental assessment undertaken during the planning process will identify whether there are specific issues within a particular survey area, and changes to the survey design, and / or mitigation measures, would be made / developed to avoid potential impacts.
Cumulative Impact Assessment	Possible - native fauna may be impacted by other activities or sources.
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - State or Nationally listed species. Site-specific ecological assessments will further define the sensitivity for siting of activities, as part of approvals process.
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). The implementation of control measures ensures this impact is reduced to ALARP.

SEO

Environmental Objective	Impacts to native fauna associated with geophysical operations are avoided as far as reasonably practicable, and no disturbance requiring approval occurs without relevant authorisation.
Assessment Criteria	No reasonably preventable native fauna injuries or deaths attributable to site activities. Any accidental or unforeseen impacts to native fauna are reported and managed in accordance with regulatory requirements. Any reasonable landholder or stakeholder complaints regarding fauna impacts are documented and resolved.
Leading Performance Criteria	Any injury or mortality of native fauna is recorded and reported in accordance with regulatory requirements. Inductions include noise limitation training covering use of horns, reversing machinery and noise production in the early morning and evening. Personnel are trained through inductions and toolbox talks in importance of minimising dust generation. Records of dust suppression activities and any dust-related incidents or complaints are maintained. Disturbed areas are stabilised progressively to minimise dust generation. Vehicles and equipment are operated in a manner that minimises dust generation, including adherence to site speed limits.

SEO	High noise emitting activities, seismic activities and transport trucks are restricted to daylight hours where practicable. Lighting is designed and positioned to minimise light spill beyond the operational area, including the use of directional, shielded or downward-facing fixtures where practicable. Site inspections are undertaken to verify that dust control measures are in place and functioning effectively. Inspections verify that lighting controls (e.g. shielding, direction, height, intensity) are implemented and effective, and noise-generating equipment is operated and maintained in accordance with manufacturer specifications and site procedures to minimise unnecessary noise.
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Impact ID	NF2
Potential Impact Event	<i>Disturbance, injury or death to fauna from use of roads and movement of heavy vehicles and machinery</i>
Source/s	Increased use of roads, movement of vehicles and heavy machinery by project vehicles and traffic.
Pathway/s	Potential to impact wildlife, principally through collisions.
Receptor/s	Native fauna.
Confirmation of Source – Pathway- Receptor	Yes - native fauna may be present in the area which could be impacted by the project vehicles and traffic.
Uncertainties and Assumptions	- Uncertain activity locations - uncertain presence of native fauna. - Uncertain timing of activities.
Sensitivity to Change	- Consequence will be greater in closer proximity to sensitive receptors. - Likelihood of interactions with native fauna higher during hours darkness. - Changes to impact severity are possible if species classifications change.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	- Moderate certainty on the effectiveness of controls. - Vehicle strike cannot be eliminated despite implementation of controls. However, controls will reduce likelihood and severity of impact.
Substitution	-	
Physical Controls	Refer to PHS1 (Table 5-6).	
Procedural Controls	Refer to PHS1 (Table 5-6).	

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Use of roads is unavoidable.	Low (Table 5-3)
Frequency	Low - Vehicle movements will be intermittent. Mobilisation and demobilisation of equipment and personnel will be staged (i.e. survey crew will arrive on site with staged mobilisation/demobilisation of equipment over several weeks), minimising volume of	

Environmental Impact Report

Significance Assessment

	project-related traffic at any one time. Controls in place to avoid interactions with native fauna (e.g. speed restrictions, limitations of movements at night).
Extent	Localised - impact confined to site boundary and surrounding roads.
Duration	Short-term - increases in traffic would be short-term. Peak traffic movements would occur during initial and final mobilisation.
Severity	Low to moderate - controls in place to reduce severity of impact to native fauna (e.g. speed restrictions, limitation of movements at night). If the impact does occur, only small number of individuals would be impacted, with no impacts on community / populations predicted. Vehicle strike will be instantaneous and unlikely to have significant impacts to the wider population, unless a listed species is involved.
Cumulative Impact Assessment	Possible - there could be increased use of shared roads from nearby activities (such as harvesting). This is factored into control measures (e.g. mobilisation and demobilisation to detour around town centres where possible).
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - State or Nationally listed species. Site-specific ecological assessments will further define the sensitivity for siting of activities, as part of approvals process.
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event disturbance, injury or death to fauna from use of roads and movement of heavy vehicles and machinery, the worst-case consequence is Minor . The likelihood of the worst-case consequence is Unlikely , with the implementation of controls, resulting in a Low risk to native fauna that is considered ALARP.

SEO

Environmental Objective	Impacts to native fauna associated with geophysical operations are avoided as far as reasonably practicable
Assessment Criteria	No reasonably preventable native fauna injuries or deaths from vehicle or machinery movement attributable to project activities. Any accidental or unforeseen impacts to native fauna are reported and managed in accordance with regulatory requirements. Any reasonable landholder or stakeholder complaints regarding fauna impacts are documented and resolved.
Leading Performance Criteria	Speed limits, traffic management measures and driver awareness protocols are implemented to minimise fauna vehicle strike. Inductions include driver awareness training covering fauna behaviour, speed management and night driving restrictions.

SEO	
	Any injury or mortality of native fauna is recorded and reported in accordance with regulatory requirements.
	Site inspections are undertaken to verify that traffic management and fauna protection measures are in place and effective.

Environmental Impact Report

Impact ID	NF3
Potential Impact Event	<i>Disturbance, injury or death to fauna from access to contaminants and waste</i>
Source/s	Presence of hazards (e.g. activities, equipment, vehicles, machinery, flammable or toxic substances).
Pathway/s	The potential for native fauna to access contaminants and waste.
Receptor/s	Native fauna.
Confirmation of Source – Pathway- Receptor	Yes - native fauna presence in the area which could be impacted if contaminants and waste are accessed. Impact would only occur from an unplanned event.
Uncertainties and Assumptions	- Uncertain activity locations. - Assumption that livestock can access contaminants and is injured or killed.
Sensitivity to Change	- Consequence will be greater in closer proximity to sensitive receptors. - Impact will vary depending the type of chemicals, fuels and wastes stored on site. - Changes to impact severity are possible if species classifications change.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	High certainty that proposed control measures will be effective, which have been developed in line with standard industry practice and relevant environmental standards and policies.
Substitution	-	
Physical Controls	- Access to areas that present risk (chemical storage or contaminated areas) by wildlife are restricted (e.g. use of existing paddock fencing). - Refer to S2 and S3 (Table 5-10).	
Procedural Controls	Refer to S2 and S3 (Table 5-10).	

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Controls to prevent native fauna access to site and for management of fuels, chemicals and waste will prevent native fauna exposure to contaminants.	Low (Table 5-3)

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Significance Assessment

Frequency	Low - unplanned event. Hazardous substances will only be present during periods of active operation and will therefore occur intermittently. With proposed controls, access by native fauna is not expected to occur, and if it does, it will be infrequent.
Extent	Localised - impact confined to site boundary.
Duration	Short-term - contaminants and waste may be present for weeks to months. Impacts to fauna expected to be reversible as most hazards and equipment pose a relatively low risk (comparable to agricultural machinery).
Severity	Low to high - impact severity may be low or high depending on the type of substance accessed, the volume ingested or contacted, and the type of fauna involved. Controls in place to prevent access by native fauna and to reduce presence of hazards.
Cumulative Impact Assessment	Possible - fauna can be affected by other impacts such as spread of pests and weeds, vehicle strike, noise and light disturbance and fire simultaneously to contaminant exposure - highly unlikely.
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - State or Nationally listed species. Site-specific ecological assessments will further define the sensitivity for siting of activities, as part of approvals process.
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event disturbance, injury or death to fauna from access to contaminants and waste, the worst-case consequence is Minor . The likelihood of the worst-case consequence is Highly Unlikely , with the implementation of controls, resulting in a Low risk to native fauna that is considered ALARP.

SEO

Environmental Objective	Impacts to native fauna associated with geophysical operations are avoided as far as reasonably practicable
Assessment Criteria	No reasonably preventable native fauna injuries or deaths from exposure to contaminants or waste from a spill or leak attributable to project activities. Audit and inspection records demonstrate that spills or leaks of fuel, oil or chemicals that could affect native fauna are immediately contained, cleaned up and remediated in accordance regulatory requirements. Any accidental or unforeseen impacts to native fauna are reported and managed in accordance with regulatory requirements. Audit and inspection records demonstrate appropriate storage and handling of fuel, oil and chemicals.

SEO	
	Any reasonable landholder or stakeholder complaints regarding fauna impacts are documented and resolved.
Leading Performance Criteria	Waste, chemicals and hydrocarbons are stored, handled and contained to prevent fauna access. Domestic waste is managed to avoid attracting fauna (e.g. scavenger proof lids, regular offsite disposal, no stockpiling). Site personnel monitor excavations, waste storage areas and containment systems for trapped fauna and undertake rescue/relocation where safe and appropriate. Spill response procedures include measures to prevent fauna exposure to contaminants. Any injury or mortality of native fauna is recorded and reported in accordance with regulatory requirements. Site inspections are undertaken to verify that fauna protection measures associated with containment systems are in place and effective.

Environmental Impact Report

Impact ID	NF4
Potential Impact Event	<i>Disturbance, injury or death of fauna from fire (resulting from activities)</i>
Source/s	Sparks from vehicles or equipment.
Pathway/s	Spread of fire which injures or kills fauna or damages native fauna habitat.
Receptor/s	Native fauna.
Confirmation of Source – Pathway- Receptor	Yes – presence of flammable substances on site. Impact would only occur from an unplanned event.
Uncertainties and Assumptions	• Uncertainty in siting and location of activities - uncertain presence of native fauna. • Assumption that the fire started due to failure to comply with control measures surrounding vehicles, machinery and weather.
Sensitivity to Change	• Exposure and potential spread of fire may be more or less likely across different sites (i.e. proximity to native fauna, presence of flammable sources). • Uncertain consequence - impact is unplanned. • Changes to impact severity are possible if species classifications change.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	
Substitution	-	
Physical Controls	Refer to PHS4 (Table 5-6).	
Procedural Controls	Refer to PHS4 (Table 5-6).	

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Proposed controls are in place to minimise the likelihood of a fire occurring and spreading (e.g. confinement of flammable sources, restriction of vehicles to tracks, seismic lines and	Moderate (Table 5-3)

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Significance Assessment

	cleared areas, maintenance of suitable fire-fighting equipment on site and liaison with the CFS).
Frequency	Low - unplanned event. With proposed controls, spread of fire is not expected to occur. If it does, it will be infrequent.
Extent	Moderate - non-confined. Fire can extend beyond site boundaries and endanger native fauna external to site boundaries. With implementation of controls, fire will be controlled to minimise spread.
Duration	Medium to long-term - depending on severity of fire.
Severity	Moderate to high - if fire spreads rapidly and impacts large areas, fauna deaths could be severe. Proposed controls to prevent initiation of fire and quickly manage spread of fire will either prevent this impact from occurring or reduce the impacts to native fauna in the unplanned event that the impact does occur.
Cumulative Impact Assessment	Possible - fauna can be affected by other impacts such as spread of pests and weeds, vehicle strike, or noise and light disturbance simultaneously to fire. Cumulative impacts may also occur from follow-on effects of fires, for example a scarcity of food or habitat for impacted fauna.
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - State or Nationally listed species. Site-specific ecological assessments will further define the sensitivity for siting of activities, as part of approvals process.
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event disturbance, injury or death of fauna from fire (resulting from activities), the worst-case consequence is Serious . The likelihood of the worst-case consequence is Remote , with the implementation of controls, resulting in a Low risk to native fauna that is considered ALARP.

SEO

Environmental Objective	Impacts to native fauna associated with geophysical operations are avoided as far as reasonably practicable
Assessment Criteria	No uncontrolled fires attributable to geophysical operations. No significant adverse impacts to native fauna or fauna habitat as a result of fire initiated by project activities.

SEO	
Leading Performance Criteria	Fire prevention measures are implemented to minimise fire risk to fauna and fauna habitat. Pre-start checks verify that fire management controls are in place prior to project activities. Fire prevention and firefighting equipment are inspected and maintained according to a documented schedule, with records demonstrating equipment is present, certified and serviceable. Any injury or mortality of native fauna is recorded and reported in accordance with regulatory requirements. Emergency Response Plan is in place and reviewed following exercises, drills or incidents to incorporate lessons learned, and updated in line with regulatory requirements. Site personnel are inducted to fire prevention requirements including ignition source controls and emergency response procedures. Ongoing engagement with CFS is undertaken regarding fire risk and mitigation measures.

5.2.9 Native Vegetation

5.2.9.1 Setting the Context

Table 5-21 summarises the view of affected parties, government legislation and non-legislated standards and key environmental receptors relevant to native vegetation.

Table 5-21: Native Vegetation Views of Affected Parties, Legislation, Standards and Receptors

Environmental Element	Views of Affected Parties	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
Native vegetation	- Removal or trimming of large, old or hollow-bearing trees. - Habitat of red-tailed black cockatoos. - Disturbance to remnant and high-quality native vegetation. - Rehabilitation effectiveness and long-term outcomes. - Stakeholder interest in observing and reviewing monitoring plans.	<i>Native Vegetation Act 1991 (SA).</i> <i>National Parks and Wildlife Act 1972 (SA).</i> <i>Environmental Protection and Biodiversity Conservation Act 1999 (Cth).</i> <i>Landscape (South Australia) Act 2019 (SA).</i> <i>Fire and Emergency Services Act 2005 (SA).</i> <i>Planning, Development and Infrastructure Act 2016 (SA).</i>	AS 1940-2017: The storage and handling of flammable and combustible liquids.	- Native vegetation. - Habitat areas.

5.2.9.2 Potential Impact Events

The potential impacts events for native vegetation include:

- direct disturbance or loss of vegetation from surface disturbing activities and vegetation clearing
- spills, leaks and waste cause damage to native vegetation.
- damage or loss of native vegetation from fire (resulting from activities)
- loss of native vegetation and habitat from the introduction or spread of weeds, pests and plant pathogens.

5.2.9.3 Environmental Impact Significance Assessment

The results of the impact assessment for each impact event are presented in Table 5-22.

Table 5-22: Native Vegetation Impact Assessment

Impact ID	NV1
Potential Impact Event	<i>Direct disturbance or loss of vegetation from surface disturbing activities and vegetation clearing</i> <i>Note: clearance of native vegetation can generally be avoided by locating survey / work areas in previously cleared or disturbed areas. If avoidance is not possible, clearance of native vegetation may be required in line with relevant approvals. Therefore, impact event is categorised as planned but will be avoided where possible. Any accidental clearance of native vegetation would be unplanned.</i>
Source/s	• Earthworks and vegetation clearing activities during site preparation, construction, and rehabilitation / restoration activities. • Minor surface disturbance associated with seismic survey and drilling activities.
Pathway/s	Disturbance to vegetation within the footprint of the activity (e.g. incidental clearance of native vegetation).
Receptor/s	• Native vegetation. • Habitat areas.
Confirmation of Source – Pathway- Receptor	Yes - native vegetation presence in the area which could be impacted by activities.
Uncertainties and Assumptions	• Uncertainty in siting and location of activities - uncertain presence of native vegetation. • Uncertainty in the type and/or size of earthworks required, for example, paving of access tracks and campsites (existing roads and access tracks expected to be used).
Sensitivity to Change	• Consequence will be greater if threatened and/or rare native flora is present in project footprint. • Changes to impact severity are possible if species classifications change.
Control Measures	
<i>Type</i>	<i>Description</i>
Elimination	Activities within parks or reserves established under the NPW Act will be avoided, where practicable. Geophysical activities will only be undertaken in parks or reserves established under the NPW Act when expressly authorised under that Act and all other relevant legislation.
Substitution	-
	<i>Effectiveness of controls</i>
	• High certainty in effectiveness of controls.

Control Measures

Physical Controls	• Low impact seismic survey methods used to minimise impacts to vegetation wherever practicable e.g. walk-in methods, use of vegetation slashing / mulching equipment. • Prioritise location of geophysical survey activities and infrastructure in areas of existing disturbed land wherever practicable. • Native vegetation clearance avoided or minimised by locating and orientating geophysical surveys and associated infrastructure appropriately. • Vegetation is trimmed (e.g. using a chainsaw) rather than removed where possible. • Vegetation, ground cover and root stock are retained on seismic lines as far as practicable. • Removal of large trees (including dead trees with hollows) is avoided. • Significant disturbance to areas of high quality or significant remnant vegetation or Heritage Agreement Areas are avoided. • Significant disturbance to areas of lower-quality native vegetation is avoided unless there are no viable alternatives (e.g. adjacent cleared areas). • Seismic lines are weaved through vegetation if the plant density is sparse enough to allow it.
Procedural Controls	• Areas of native vegetation disturbed by proposed activities are rehabilitated in consultation with DEM, DEW and other relevant stakeholders. • The environmental assessment undertaken during the planning process will identify whether there are specific issues within a particular survey area which could trigger requirement changes to the survey design, and / or mitigation measures to avoid potential impacts. • Where avoidance of native vegetation is not possible, native vegetation clearance would require approval and implementation of a 'significant environmental benefit', in accordance with the <i>Native Vegetation Act</i> and Native Vegetation Council guidelines. As part of this process, the requirement for ecological assessments (desktop ecological assessments or ecological surveys) will be proportionate to the sensitivity in the area (e.g. presence of listed species or communities).

Significance Assessment

Consideration	Description	Overall magnitude
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Environmental Impact Report

Significance Assessment

Avoidance	Impacts to native vegetation can be avoided by use of pre-disturbed areas where possible. Low (Table 5-3) If avoidance is not possible, clearance will be conducted in line with relevant approvals.
Frequency	Low – clearance of native vegetation will be avoided where possible - impact is expected to be infrequent.
Extent	Localised - confined to defined disturbance areas within project footprint. If clearance of vegetation occurs - it will be highly localised to discrete locations.
Duration	Short to long-term - variable - some damage or clearance of native vegetation can be rehabilitated successfully within short periods, some may take decades to recover depending on the species and ecosystems impacted.
Severity	Low to high - severity depends on the species of native vegetation present and the extent of the clearance. Site-specific environmental sensitivities such as remnant native vegetation, presence of listed species or habitat and significant wetland areas are identified early during the planning process and appropriate modifications are made to ensure activities are located to minimise disturbance to sensitive areas and maximise use of pre-disturbed areas. Where avoidance of native vegetation is not possible, native vegetation clearance would require approval and implementation of a 'significant environmental benefit', in accordance with the <i>Native Vegetation Act</i> and Native Vegetation Council guidelines. Therefore, significant loss of native vegetation or wildlife habitat is not expected.
Cumulative Impact Assessment	Possible - other impacts possible from the project may affect native vegetation simultaneously to earthworks damage, such as fire, spread of weeds and pests, and spills and leaks.
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - State or Nationally listed species / habitats. Site-specific ecological assessments will further define the sensitivity for siting of works, as part of approvals process.
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event direct disturbance or loss of vegetation from surface disturbing activities and vegetation clearing, the worst-case consequence is Moderate . The likelihood of the worst-case consequence is Highly Unlikely , with the implementation of controls, resulting in a Low risk to native vegetation that is considered ALARP.

Environmental Impact Report

SEO

Environmental Objective	Impacts to native vegetation associated with geophysical operations are avoided or minimised as far as reasonably practicable, and no clearance or significant disturbance occurs without relevant authorisation.
Assessment Criteria	No unauthorised clearing or significant damage to native vegetation attributable to project activities. Sites of listed or threatened flora, vegetation communities or high-value habitat are avoided unless required approvals are obtained. No listed or threatened flora or high-value vegetation is removed without relevant authorisation and satisfaction of any Significant Environmental Benefit requirements. Inspections and audits verify that native vegetation clearing has not occurred outside approved areas.
Leading Performance Criteria	Pre disturbance vegetation assessments are undertaken by suitably trained and experienced personnel to identify native vegetation, listed or threatened flora, significant trees and sensitive communities (including wetlands). Activity sites are preferentially located in previously cleared or disturbed areas to avoid native vegetation. Listed or threatened flora and vegetation and other sensitive areas are clearly flagged or marked on site prior to activities. Vegetation is trimmed rather than cleared where practicable. Site inspections are undertaken to verify that clearing boundaries, flagging and avoidance measures are in place and effective during construction. Any unavoidable native vegetation clearance is undertaken only after obtaining relevant approval and implementing required Significant Environmental Benefit obligations.

Environmental Impact Report

Impact ID	NV2
Potential Impact Event	<i>Spills, leaks and waste cause damage to native vegetation</i>
Source/s	Improper transportation, storage and handling of fuel, oil and chemicals. Vehicles, drilling equipment and seismic survey equipment (e.g. oil leak or hydraulic hose failure). Inappropriately managed waste.
Pathway/s	Localised contamination of native vegetation from spills, leaks and uncontrolled releases of waste.
Receptor/s	- Native vegetation. - Habitat areas.
Confirmation of Source – Pathway- Receptor	Yes - native vegetation presence in the area which could be impacted in the unplanned event of spill, leak or uncontrolled release of waste.
Uncertainties and Assumptions	- Uncertainty in siting and location of activities - uncertain presence of native vegetation. - Uncertain extent and nature of impact (e.g. spill, leak or waste release volume). - Assumption that this contamination will impact native vegetation - impact is uncertain.
Sensitivity to Change	- Consequence will be greater if threatened and/or rare native flora is present in project footprint. - It is possible spills and leaks will not impact native vegetation. - Changes to impact severity are possible if species classifications change.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	- High certainty that proposed control measures will be effective. - Controls have been used at numerous well sites and proven to be effective.
Substitution	-	
Physical Controls	Refer to S2 and S3 (Table 5-10).	
Procedural Controls	Refer to S2 and S3 (Table 5-10).	

Significance Assessment

Consideration	Description	Overall magnitude
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Environmental Impact Report

Significance Assessment

Avoidance	Controls to prevent contamination from leaks, spills and accidental incidents will be implemented.	Low (Table 5-3)
Frequency	Low - minor spills and leaks are known to occur - most can be avoided by application of controls. Impacts to native vegetation expected to be infrequent with application of controls (e.g. prioritise use of pre-disturbed areas).	
Extent	Short to medium-term - depends on volume and type of contamination and ability for that vegetation type to recover. With the implementation of controls, minor spills are anticipated to be cleaned up, and larger spills will be remediated, with no long-term impacts.	
Duration	Localised - the spill or leak will impact the soil at a localised location, the size of which will depend on the nature of the incident.	
Severity	Low to moderate - depending on the size and type of contaminant involved in the spill or leak. Most common leaks and spills (e.g. hydraulic leaks) have a low impact, are localised and immediately cleaned up. Major spills are avoided through controls (e.g. bunded tanks) and not expected to occur. If they do occur, they will be appropriately remediated. Therefore, no significant degradation of native vegetation or wildlife habitat is predicted.	
Cumulative Impact Assessment	Possible - other impacts possible from the project may affect native vegetation simultaneously to earthworks damage, such as fire and spread of weeds and pests	
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - State or Nationally listed species / habitats. Site-specific ecological assessments will further define the sensitivity for siting of works, as part of approvals process.	
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event of spills, leaks and waste cause damage to native vegetation. the worst-case consequence is Moderate . The likelihood of the worst-case consequence is Remote , with the implementation of controls, resulting in a Low risk to native vegetation that is considered ALARP.	

SEO

Environmental Objective	Impacts to native vegetation associated with geophysical operations are avoided or minimised as far as reasonably practicable, and no clearance or significant disturbance occurs without relevant authorisation.
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SEO	
Assessment Criteria	No reasonably preventable damage to native vegetation or vegetation communities as a result of spills or leaks. Audit and inspection records demonstrate appropriate storage and handling of fuel, oil and chemicals. Audit and inspection records demonstrate that spills or leaks of fuel, oil or chemicals that could affect native vegetation are immediately contained, cleaned up and remediated in accordance regulatory requirements.
Leading Performance Criteria	Fuel, chemical and waste storage areas are designed and managed to prevent spills, leaks or runoff from reaching native vegetation. Spill response equipment is available on site and personnel are trained in procedures to prevent vegetation impacts. Site inspections are undertaken to verify that spill prevention and containment measures are in place and functioning effectively. Drainage and surface water management measures are implemented to prevent contaminated runoff from entering native vegetation or wetland communities.

Environmental Impact Report

Impact ID	NV3
Potential Impact Event	<i>Damage or loss of native vegetation from fire (resulting from activities)</i>
Source/s	Sparks from vehicles or equipment.
Pathway/s	Spread of fire which injures or kills fauna or damages native fauna habitat.
Receptor/s	- Native vegetation. - Habitat areas.
Confirmation of Source – Pathway- Receptor	Yes - native vegetation presence in the area which could be impacted in the unplanned event of fire.
Uncertainties and Assumptions	- Uncertainty in siting and location of activities - uncertain presence of native vegetation. - Assumption that the fire started due to failure to comply with control measures surrounding vehicles, machinery and weather.
Sensitivity to Change	- Exposure and potential spread of fire may be more or less likely across different sites (i.e. proximity to native vegetation, presence of flammable sources). - Uncertain consequence - impact is unplanned. - Changes to impact severity are possible if species classifications change.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	High certainty in the effectiveness of controls.
Substitution	-	
Physical Controls	Refer to PHS4 (Table 5-6).	
Procedural Controls	Refer to PHS4 (Table 5-6).	

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Proposed controls are in place to minimise the likelihood of a fire occurring and spreading (e.g. confinement of flammable sources, restriction of vehicles to tracks, seismic lines and	Moderate (Table 5-3).

Environmental Impact Report

Significance Assessment

	cleared areas, maintenance of suitable fire-fighting equipment on site and liaison with the CFS).
Frequency	Low - unplanned event. With proposed controls, spread of fire is not expected to occur. If it does, it will be infrequent.
Extent	Moderate - non-confined. Fire can extend beyond site boundaries and endanger native fauna external to site boundaries. With implementation of controls, fire will be controlled to minimise spread.
Duration	Medium to long-term - depending on severity of fire, vegetation impacted and potential recovery.
Severity	Moderate to high - if fire spreads rapidly and impacts large areas, damage or loss of native vegetation could be severe. Proposed controls to prevent initiation of fire and quickly manage spread of fire will either prevent this impact from occurring or reduce the impacts to native vegetation in the unplanned event that the impact does occur.
Cumulative Impact Assessment	Possible - other impacts possible from the project may affect native vegetation simultaneously to earthworks damage, such as contamination and spread of weeds and pests.
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - State or Nationally listed species / habitats. Site-specific ecological assessments will further define the sensitivity for siting of works, as part of approvals process.
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event of damage or loss of native vegetation from fire (resulting from activities), the worst-case consequence is Serious . The likelihood of the worst-case consequence is Remote , with the implementation of controls, resulting in a Low risk to native vegetation that is considered ALARP.

SEO

Environmental Objective	Impacts to native vegetation associated with geophysical operations are avoided or minimised as far as reasonably practicable, and no clearance or significant disturbance occurs without relevant authorisation.
Assessment Criteria	No uncontrolled fires as a result of project activities.
Leading Performance Criteria	Fire prevention measures are implemented to minimise fire risk to native vegetation.

SEO	Pre-start checks verify that fire management controls are in place prior to project activities. Fire prevention and firefighting equipment are inspected and maintained according to a documented schedule, with records demonstrating equipment is present, certified and serviceable. Site personnel are inducted to fire prevention requirements including ignition source controls and emergency response procedures. Emergency Response Plan is in place and reviewed following exercises, drills or incidents to incorporate lessons learned, and updated in line with regulatory requirements. Ongoing engagement with the CFS is undertaken regarding fire risk and mitigation measures. Any fire-related damage to native vegetation is recorded, investigated and managed in accordance with regulatory requirements.
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Environmental Impact Report

Impact ID	NV4
Potential Impact Event	<i>Loss of native vegetation and habitat from the introduction or spread of weeds, pests and plant pathogens</i>
Source/s	Weed / pathogen introduction and spread.
Pathway/s	Movement of vehicles and equipment (particularly earthmoving and vegetation slashing / mulching equipment).
Receptor/s	Native vegetation.
Confirmation of Source – Pathway- Receptor	Yes - native vegetation presence in the area which could be impacted if weeds and pathogens are introduced/spread.
Uncertainties and Assumptions	- Uncertain activity locations - uncertain presence of native vegetation. - Assumption that weeds are present and that introduced weeds will impact native vegetation through competition for resources or habitat.
Sensitivity to Change	- Consequence will be greater in closer proximity to sensitive receptors. - Consequences depend on the level of weed or pathogen introduction and spread. - Uncertain consequence - impact is unplanned.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	High certainty in effectiveness of controls.
Substitution	-	
Physical Controls	Refer to LU5 (Table 5-18).	
Procedural Controls	Refer to LU5 (Table 5-18).	

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Controls in place to minimise/avoid introduction and spread of weeds, pests and plant pathogens.	Moderate (Table 5-3).
Frequency	Low - vehicle and equipment movement will be intermittent. Frequency of introduction and spread depends on the location of the site and potential pathways for spread of weeds,	

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Significance Assessment

	pests and plant pathogens. With implementation of controls, spread of weeds and pathogens is not anticipated to occur.
Extent	Localised to moderate - impact of weeds, pests and plant pathogens may extend beyond clearance area in scenario of successful introduction and spread. However, this is not expected to occur with the implementation of controls which will manage spread of weeds and pathogens between sites.
Duration	Short to long-term - vehicle and equipment movements will be short term. However, the impact can be long-term if weed, pest or plant pathogen is not eradicated.
Severity	Low to moderate - dependent on the species of weed, pest or plant pathogen and native vegetation communities affected (e.g. recovery potential). With control measures in place, spread and introduction of weeds and pathogens will be reduced - no significant loss or damage to native vegetation communities anticipated.
Cumulative Impact Assessment	Possible - other activities associated with agricultural activities could also result in introduction and spread of weeds, pests or plant pathogens. Other impacts possible from the project may affect native vegetation simultaneously, such as contamination and fire.
Sensitivity of Receptor/s	Moderate to high (Table 5-2) - State or Nationally listed species / habitats. Site-specific ecological assessments will further define the sensitivity for siting of works, as part of approvals process.
Likely Residual Significance	The predicted significance level is Moderate (Table 5-4). This impact event is unplanned and therefore a risk assessment has been conducted to assess if the risk is acceptable and ALARP, per the Beach Risk Matrix (Section 5.1.6, Appendix D). In the unplanned event of loss of native vegetation and habitat from the introduction or spread of weeds, pests and plant pathogens, the worst-case consequence is Serious. The likelihood of the worst-case consequence is Highly Unlikely, with the implementation of controls, resulting in a Low risk to native vegetation that is considered ALARP.

SEO

Environmental Objective	No introduction or spread of weeds, plant pathogens or diseases as a result of geophysical operations.
Assessment Criteria	The presence or extent of weeds or plant pathogens at project sites is consistent with or better than pre-disturbance conditions and adjacent land. Where this is not the case, appropriate management actions are implemented promptly. Declared plants occurring as a result of project activities are reported and managed in accordance with the <i>Landscape South Australia Act 2019</i> and relevant Landscape Board plans.

SEO

Leading Performance Criteria	Records of weed management actions, detection and monitoring efforts, vehicle/equipment inspections are maintained. Vehicle/equipment hygiene measures are implemented based on agreed requirements of landholders and relevant land manager. Consultation is undertaken with landholders and Landscape Board to identify weed or pathogen risks and any specific management requirements. Local earthmoving contractors and locally sourced materials (e.g., quarry products) are used where practicable to reduce the risk of introducing weeds or pathogens. Sites, access tracks and disturbed areas are monitored for new weed infestations, with treatment undertaken in accordance with landholder requirements and relevant Landscape Board plans.
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5.2.10 General Amenity

5.2.10.1 Setting the Context

Table 5-23 summarises the view of affected parties, government legislation and non-legislated standards and key environmental receptors relevant to general amenity.

Table 5-23: General Amenity Views of Affected Parties, Legislation, Standards and Receptors

Environmental Element	Views of Affected Parties	Applicable Government Legislation	Applicable Non-Legislated Standards	Environmental Receptor
General amenity	No significant stakeholder concerns have been identified.	<i>Planning, Development and Infrastructure Act 2016 (SA).</i> <i>Local Nuisance and Litter Control Act 2016 (SA).</i>	AS 4282-1997 Control of the obtrusive effects of outdoor lighting.	- Local community. - Landholders and users.

5.2.10.2 Potential Impact Events

The potential impacts events for general amenity include:

- visual impacts from earthworks and minor surface disturbance from seismic survey and drilling activities
- disturbance from site activities (e.g. presence of seismic survey activities, equipment and machinery, camp sites and personnel) and generation of noise, light, dust and vibration
- noise disturbance to local community from use of roads and movement of heavy vehicles and machinery.

5.2.10.3 Environmental Impact Significance Assessment

The results of the impact assessment for each impact event are presented in Table 5-24.

Table 5-24: General Amenity Impact Assessment

Impact ID	GA1
Potential Impact Event	Visual impacts from earthworks and minor surface disturbance from seismic survey and drilling activities
Source/s	- Earthworks and vegetation clearing activities during site preparation and construction. - Minor surface disturbance associated with seismic survey and drilling activities. - Presence of machinery, campsites and laydown areas.
Pathway/s	- Surface disturbance and vegetation clearing. - Seismic lines. - Visual obstruction from physical presence of machinery, campsites (if required) and laydown areas.
Receptor/s	Local community.
Confirmation of Source – Pathway- Receptor	Yes - sources and pathways for visual impacts will occur which could disturb local community if visible to receptors.
Uncertainties and Assumptions	- Uncertain activity locations - uncertain visibility from public roads or private property. - Uncertainty in the type and/or size of earthworks required, for example, paving of access tracks and campsites (existing roads and access tracks expected to be used).
Sensitivity to Change	Proximity of receptors will greatly change the visual impact of project activities.

Control Measures		
Type	Description	Effectiveness of controls
Elimination	-	Medium certainty on effectiveness of controls.
Substitution	-	
Physical Controls	- Seismic lines are kept to a maximum width of approximately 4 m. - Required remediation work carried out as soon as possible after completion of all activities. - Machinery, equipment and camps will be promptly removed from site following the completion of operations, particularly in visible locations. - Implementation of adequate buffer distances to residences (typically 500 m).	

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Control Measures

Procedural Controls	- Landholders to be consulted about earthworks required, and location of survey infrastructure to minimise surface damage and facilitate rehabilitation / restoration. - Survey infrastructure sites to be rehabilitated following completion of activities, or handed over to the landholder under a deed of transfer or similar where appropriate. - Restoration / rehabilitation of disturbances to be approved by the landholder, or undertaken in accordance with landholder's wishes, should retention of specific areas of parts of infrastructure be requested (e.g. part of an access track). - Planning has been undertaken to minimise impacts of activities, and records are available for audit. - Systems in place for logging stakeholder complaints to ensure that issues are addressed as appropriate.
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Significance Assessment

<i>Consideration</i>	<i>Description</i>	<i>Overall magnitude</i>
Avoidance	Avoidance of visual impacts may be possible, depending on location of receptors. Adequate buffer distances will be maintained between activities and residences.	Low (Table 5-3)
Frequency	Moderate - some visual impacts are likely to occur and may be ongoing/continuous during operations (intermittent for five-year period). The impact will be constrained to when the receptors are in the vicinity, which may change.	
Extent	Localised – impact is confined to the locations that the project activity is observable from. Impacts confined to localised area at any one time - geophysical surveys are progressive, rather than repeatedly disturbing the same location.	
Duration	Short-term – visual impacts may occur over weeks to months. The impacts will cease upon activity completion - areas will be rehabilitated, campsites and laydown areas will be removed. geophysical surveys are progressive, rather than repeatedly disturbing the same location.	
Severity	Low - control measures in place for landowner consultation prior to commencing activities to minimise impacts to amenity. This is a recoverable impact and rehabilitation of land will be conducted.	

Environmental Impact Report

Significance Assessment

Cumulative Impact Assessment	Possible - other visual impacts external to the project may be present in the area and visible to receptors.
Sensitivity of Receptor/s	Low to moderate (Table 5-2) - depending on proximity of sensitive receptor. Receptors are capable of tolerating localised and temporary visual impacts.
Likely Residual Significance	The predicted significance level is Low (Table 5-4).

SEO

Environmental Objective	Amenity impacts to landholders and the general public associated with geophysical operations are avoided or minimised as far as reasonably practicable.
Assessment Criteria	Records verify that activity sites, access tracks and camp areas are maintained in a clean and tidy condition. Audit and inspection demonstrate no evidence of significant soil disturbance attributable to the geophysical operations which results in significant long term visual impacts, or where this does occur, records demonstrate that rehabilitation measures are undertaken at the earliest practicable opportunity, including reinstatement of soil profiles and surface contours to be consistent with surrounding land and replacement of topsoil to support successful rehabilitation, where required. Records demonstrate that any reasonable landholder or stakeholder complaint regarding visual amenity are documented and resolved.
Leading Performance Criteria	Consultation with landholders is undertaken during planning and operations to identify and manage potential visual amenity concerns. Stakeholder engagement and complaints reporting systems are in place to ensure amenity concerns are captured and addressed. Inspections are undertaken to verify that the activity sites, access tracks and camp areas are maintained in a clean and tidy condition. Activities are confined to approved operational areas to minimise unnecessary visual disturbance. Camps and associated infrastructure are removed in accordance with approved project schedules following completion of activities. Rehabilitation is initiated as soon as practicable after operations cease in accordance with approved rehabilitation plans and landholder requirements.

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Impact ID	GA2
Potential Impact Event	<i>Disturbance from site activities (e.g. presence of seismic survey activities, equipment and machinery, camp sites and personnel) and generation of noise, light, dust and vibration</i>
Source/s	Geophysical survey activities, transport moves and presence of machinery, camp sites and personnel.
Pathway/s	Disturbance to local community from light, noise, vibration and physical presence of machinery, camp sites and personnel.
Receptor/s	Local community.
Confirmation of Source – Pathway- Receptor	Yes - noise, light emissions and physical presence of infrastructure and machinery will occur which could disturb local community.
Uncertainties and Assumptions	- Uncertain activity locations. - Uncertain timing of activities.
Sensitivity to Change	- Consequence will be greater in closer proximity to sensitive receptors. - Consequence will be greater if light and noise emissions occur during hours of darkness.

Control Measures

Type	Description	Effectiveness of controls
Elimination	Refer to LU2 (Table 5-18)	- High certainty in effectiveness of controls. - Controls have been used effectively on other projects within the Impact Assessment Area.
Substitution	Refer to LU2 (Table 5-18)	
Physical Controls	Refer to LU2 (Table 5-18)	
Procedural Controls	Refer to LU2 (Table 5-18)	

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Light emissions, noise emissions and physical presence of machinery and infrastructure cannot be avoided. Controls in place to avoid impacts to local community (e.g. consultation with landowners regarding location, management and timing of activities).	Low (Table 5-3)
Frequency	Moderate - noise and light emissions will occur intermittently.	

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Significance Assessment

Extent	Localised - generally confined to areas surrounding project site and access roads. Impacts confined to localised area at any one time - geophysical surveys are progressive, rather than repeatedly disturbing the same location.
Duration	Short term - short term (weeks to months). However, impact to public at any location expected to be days to weeks - geophysical surveys are progressive, rather than repeatedly disturbing the same location.
Severity	Low - short term and localised increases in noise and light emissions are not anticipated to significantly disturb local community, impact is recoverable. Controls in place to minimise disturbance, in particular for noise (e.g. noise limitations will be included as part of induction procedures, with a focus on noise minimisation during early morning and evening activities (e.g. unnecessary use of horns, reversing of machinery).
Cumulative Impact Assessment	Possible - disturbance from other activities in the region may occur.
Sensitivity of Receptor/s	Low to moderate (Table 5-2) - depending on proximity of sensitive receptor. Receptors are capable of tolerating localised and temporary visual impacts.
Likely Residual Significance	The predicted significance level is Low (Table 5-4).

SEO

Environmental Objective	Amenity impacts to landholders and the general public associated with geophysical operations are avoided or minimised as far as reasonably practicable.
Assessment Criteria	Any reasonable landholder or stakeholder complaint regarding noise, light or vibration are documented and resolved.
Leading Performance Criteria	Consultation with landholders is undertaken during planning and operations to identify and manage potential noise, light or vibration concerns. Stakeholder engagement and complaints reporting systems are in place to ensure noise, light and vibration concerns are captured and addressed. Sensitive receptors (e.g. dwellings) are identified during planning, and site layout and activity timing are designed to minimise impacts from noise, light, dust and vibration. High noise emitting activities are scheduled to occur during daylight hours where practicable.

SEO	Lighting in campsites is designed and positioned to minimise light spill beyond the operational area, including the use of directional, shielded or downward-facing fixtures where practicable. Inspections verify that lighting controls (e.g. shielding, direction, height, intensity) are implemented and effective, and noise-generating equipment is operated and maintained in accordance with manufacturer specifications and site procedures to minimise unnecessary noise. Camps and associated infrastructure are removed in accordance with approved project schedules following completion of activities.
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Impact ID	GA3
Potential Impact Event	<i>Noise disturbance to local community from use of roads and movement of heavy vehicles and machinery</i>
Source/s	Increased use of roads, movement of vehicles and heavy machinery by project vehicles and traffic.
Pathway/s	Noise disturbance.
Receptor/s	Local community.
Confirmation of Source – Pathway- Receptor	Yes - local community receptors present which may be impacted by noise disturbance from project-related traffic.
Uncertainties and Assumptions	• Uncertain activity locations. • Uncertain timing of activities.
Sensitivity to Change	• Consequence will be greater in closer proximity to sensitive receptors. • Consequence will be greater if noise emissions occur during hours of darkness.

Control Measures

Type	Description	Effectiveness of controls
Elimination	-	• Medium certainty in effectiveness of controls.
Substitution	-	
Physical Controls	• Transport trucks to be restricted to daylight hours as far as possible. • Noise limitation (particularly during early morning) to be included as part of induction procedures (e.g. unnecessary use of horns, reversing of machinery). • Noise limitations will be included as part of induction procedures, with a focus on noise minimisation during early morning and evening activities (e.g. unnecessary use of horns, reversing of machinery). • For further controls measures for noise disturbance to local community from the use of roads and movement of heavy vehicles and machinery, refer to PHS1 (Table 5-6).	
Procedural Controls	• Landholders and relevant stakeholders (e.g. local council, industry associations) consulted regarding location of proposed activities where appropriate. • Systems in place for logging stakeholder complaints to ensure that issues are addressed as appropriate.	

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Control Measures

- For further controls measures for noise disturbance to local community from the use of roads and movement of heavy vehicles and machinery, refer to **PHS1** (Table 5-6).

Significance Assessment

Consideration	Description	Overall magnitude
Avoidance	Noise emissions from vehicles and equipment cannot be avoided.	Low (Table 5-3)
Frequency	Low - vehicle and equipment movement will be intermittent. Mobilisation and demobilisation of equipment and personnel will be staged (i.e. survey crew will arrive on site with staged mobilisation/demobilisation of equipment over several weeks), minimising volume of project-related traffic at any one time. Controls in place to minimise disturbance to local community (e.g. speed restrictions, limitations of movements at night).	
Extent	Localised - impact confined to site boundary and surrounding roads.	
Duration	Short term – increases in traffic would be short-term. Peak traffic movements would occur during initial and final mobilisation.	
Severity	Low - short term and localised increases in noise emissions are not anticipated to significantly disturb local community, impact is recoverable.	
Cumulative Impact Assessment	Possible - disturbance from other activities in the region may occur.	
Sensitivity of Receptor/s	Low to moderate (Table 5-2) - depending on proximity of sensitive receptor. Receptors are capable of tolerating localised and temporary visual impacts.	
Likely Residual Significance	The predicted significance level is Low (Table 5-4).	

SEO

Environmental Objective	Amenity impacts to landholders and the general public associated with geophysical operations are avoided or minimised as far as reasonably practicable.
Assessment Criteria	Any reasonable landholder or stakeholder complaint regarding noise is documented and resolved.
Leading Performance Criteria	Consultation with landholders is undertaken during planning and operations to identify and manage potential noise concerns.

SEO	Stakeholder engagement and complaints reporting systems are in place to ensure noise are captured and addressed. Transport trucks are restricted to daylight hours where practicable. Inductions include noise limitation training covering use of horns, reversing machinery and noise production in the early morning and evening.
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6 Environmental Management Framework

Geophysical operations will be undertaken in accordance with Beach's Operations Excellence Management System (OEMS).

The OEMS is a key tool in the management of Beach and associated contractors' environmental responsibilities, issues and risks. The OEMS also provides a framework for the coordinated and consistent management of environmental issues by ensuring the:

- establishment of an environmental policy (see <http://www.beachenergy.com.au/>)
- identification of environmental risks and legal and other requirements relevant to the operations
- setting of appropriate environmental objectives and targets
- delineation of responsibilities
- establishment of a structure and program to implement environmental policy and achieve objectives and targets, including the development of procedures or guidelines for specific activities and education and induction programs
- facilitation of planning, control monitoring, corrective action, auditing and review of activities to ensure that the requirements and aspirations of the environmental policy are achieved.

The Beach OEMS (Figure 6-1) is an integrated health, safety and environment (HSE) management system and includes all HSE management plans and procedures. The OEMS provides guidance on how Beach will meet the requirements of its Environment Policy) and has been developed using the principles of the IOGP Report 510.

The OEMS consists of 5 Management Standards (refer to Table 6-1) that detail specific performance requirements to ensure the effective management of HSE risks and impacts and are applied to each activity as required⁸. The Management Standards are complemented by asset and activity specific environmental management procedures and plans, including this EIR and accompanying SEO. Standards are applied to each activity as appropriate.

Key components of the OEMS are discussed in the following sections.

⁸ Not all OEMS management standards are relevant to all Beach activities. For instance Standard 2.1 Well lifecycle management may not be applicable to Beach's geophysical operations.

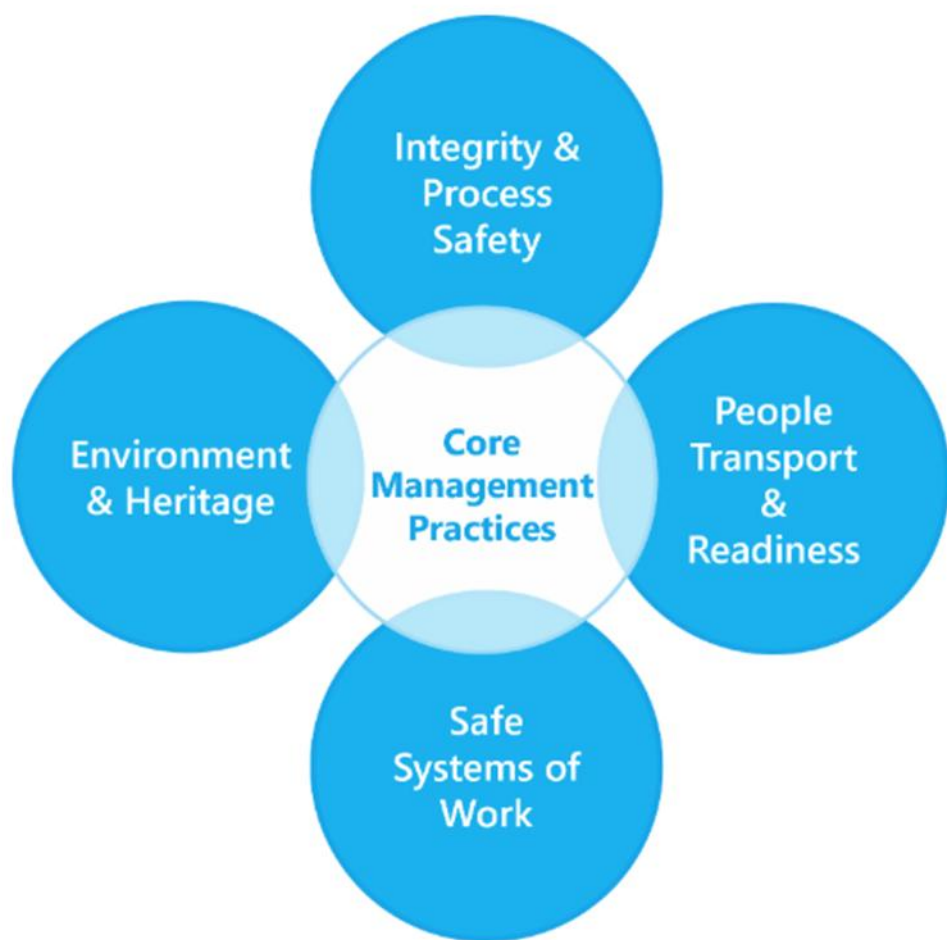


Figure 6-1: Beach OEMS Structure

Table 6-1: Beach OEMS Standards

OEMS Management Standards	
Standard 1: Core management practices	1.1 OEMS leadership
	1.2 Asset risk management
	1.3 Management of change
	1.4 Incident management
	1.5 Emergency management
	1.6 Assurance and improvement
Standard 2: Integrity and process safety	2.1 Well lifecycle management
	2.2 Plant and pipeline lifecycle management

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OEMS Management Standards

	2.3 Safety critical elements
	2.4 Pre-startup safety review (PSSR)
	2.5 Safe operating envelope
	2.6 Asset information
Standard 3: People, transport and readiness	3.1 Induction, training and competency
	3.2 Fitness for work
	3.3 Driving
	3.4 Aviation
Standard 4: Safe systems of work	4.1 Permit to work
	4.2 Hot work
	4.3 Energy isolation
	4.4 Confined space
	4.5 Working at height
	4.6 Lifting and load safety
	4.7 Electrical safety
	4.8 Excavation
	4.9 Occupational exposure
Standard 5: Environment and heritage	5.1 Environment permissions documents
	5.2 Cultural heritage
	5.3 Emissions monitoring and reporting

6.1 Environmental Objectives

Environmental objectives have been developed based on the information and issues identified in this document. These objectives have been designed to provide a clear guide for the management of environmental issues and are detailed in the accompanying SEO.

6.2 Responsibilities

Beach aims to ensure that the organisation is equipped, structured, and supported to ensure a healthy, efficient, and successful company. Communications with internal and external bodies, including joint venture partners, is essential to delivering successful projects and operations. The leadership styles and actions demonstrated within Beach will influence the performance of all staff and contractors. Clear levels of authority are necessary to remove organisational ambiguity and to support effective decision making.

Beach's Executive Vice President – Onshore and Offshore Assets has the ultimate responsibility for ensuring that Beach has the appropriate organisation in place to comply with the commitments within the accompanying SEO. However, the Beach Exploration Manager has the responsibility and delegated authority to ensure that adequate and appropriate resources are allocated to comply with OEMS and the SEO.

Table 6-2: Roles and responsibilities for key roles for implementation of the EIR

Role	Responsibilities
Beach Executive Management	• Licence holders. • Hold overall responsibility for Beach activities and environmental management.
Beach Exploration Manager	• Responsible for coordinating the management of the activities, including all environmental aspects. • Responsible for overall implementation of HSE. • Responsible for the overseeing and fulfilling of commitments contained in EIR and SEO. • Overall responsibility for reporting on environmental performance and due diligence. • Coordinates environmental incident internal reporting and investigation. • Incident notification to Authorities.
Beach Health, Safety and Environment Personnel	• Oversee implementation of EIR and SEO. • Monitor the activities of geophysical survey contractors and assesses compliance with the SEO. • Coordinates the monitoring and audit program. • Environmental internal reporting and incident investigation.
Beach Landholder Liaison	• Landholder liaison. • Monitors seismic survey activities and rehabilitation / restoration.
Survey Manager "Bird Dog" (contractor)	• Responsible for ensuring that works meet regulatory requirements and all environmental objectives contained in the SEO. • Directly responsible for the overseeing and fulfilling of commitments contained in relevant approvals, EIR and SEO. • Responsible for ensuring adequate resources are provided for constructing and maintaining environmental controls. • Inspection of work areas / survey area to ensure appropriate environmental management. • Environmental internal reporting and incident investigation. • Reports to Beach Exploration Manager or alternative Beach company representative.
Beach Health, Safety and Environment Personnel	• Oversee implementation of EIR and SEO . • Monitor the activities of geophysical survey contractors and assesses compliance with the SEO. • Coordinates the monitoring and audit program. • Environmental internal reporting and incident investigation.

6.3 Environmental Management Procedure

All Beach employees and contractors are responsible for ensuring compliance with the Beach environmental permissioning documents (i.e. the SEO) which are embedded within the integrated OEMS along with any

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underlying procedures. The SEO and any procedures have been developed to set minimum operating standards to ensure Beach and its contractors comply with the relevant environmental legislation.

Beach conducts periodic environmental audits to assess the appropriateness of the HSE procedures to monitor performance to verify Beach is meeting its policies, legislative requirements and environmental objective commitments and whether procedures have been properly implemented and maintained.

6.4 Job Safety Analysis and Permit to Work

Job Safety Analysis (JSA) is a process used to identify hazards associated with a job, by assessing the risks and implementing control measures to ensure the job can be conducted in a safe manner. Beach conducts JSAs for tasks where a work procedure does not exist, where the task has not previously been conducted by the personnel assigned to the task, or where additional hazards are present.

Beach operates a single use, multi-purpose Permit to Work (PTW) system covering all areas of operations. The purpose of this PTW procedure is to summarise the Beach safety control mechanism designed to identify hazards, assess risks and to prevent accidents associated with task specific activities requiring a Permit prior to the work commencing.

6.5 Induction and Training

Prior to the start of field operations all field personnel will be required to undertake an environmental induction to ensure they understand their role in protecting the environment. This induction will be part of a general induction process which also includes safety procedures. Site specific environmental requirements will be documented in the work program or work instruction.

A record of induction and attendees will be maintained.

6.6 Emergency Response and Contingency Planning

In the course of normal operations, there is always the potential for environmental incidents and accidents to occur. To manage these incidents, emergency response plans will be developed to guide actions to be taken to minimise the impacts of accidents and incidents. Emergency response plans will be reviewed and updated on a regular basis to incorporate new information arising from any incidents, near misses and hazards and emergency response simulation training sessions. These plans will also include the facilitation of fire danger season restrictions and requirements.

Emergency response drills will also be undertaken at regular intervals to ensure that personnel are familiar with the plans and the types of emergencies to which they apply, and that there will be a rapid and effective response in the event of a real emergency occurring.

6.7 Environmental Monitoring and Audits

Monitoring and auditing of geophysical operations will be undertaken to determine whether significant environmental risks are being managed, minimised and where reasonably possible, eliminated.

Monitoring and auditing undertaken will assess aspects such as:

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- compliance with regulatory requirements (particularly the SEO)
- visual impact of the operations
- impact upon land use
- cultural heritage management
- impact on flora and fauna
- integrity of bunding and containment systems
- site contamination
- site revegetation following program completion and any restoration
- contractor performance.

6.8 Incident Management, Recording and Corrective Actions

Beach and its contractors have a system in place to record environmental incidents, near misses and hazards, track the implementation and close out of corrective actions, and allow analysis of such incidents to identify areas requiring improvement. The system also provides a mechanism for recording 'reportable' incidents, as defined under the ER Act and associated regulations (refer to Section 3 of the SEO).

6.9 Reporting

Internal and external reporting procedures will be implemented to ensure that environmental issues and / or incidents are appropriately responded to. A key component of the internal reporting will be contractors' progress and incident reports to Beach.

External reporting (e.g. incidents, annual reports) will be carried out in accordance with ER Act and other relevant regulatory requirements as detailed in Section 3 of the SEO. Annual reports are available for public viewing on the DEM website.

7 Stakeholder Consultation

The South East region of South Australia is comprised of exceptionally fertile land accounting for three-quarters of the State's forests and one-third of its pastures. The high levels of employment within the agriculture, forestry and fishing industry reflects the economic importance of agricultural production within the region.

It is a requirement under the Petroleum and Geothermal Energy Regulations that information on consultation with relevant landholders, Aboriginal groups or representatives, government departments or agencies, or any other interested person or parties is outlined in an EIR.

Stakeholders in the Otway Basin region include landholders and the local community, native title groups, regulatory agencies, local councils, industry groups and environmental organisations.

Beach's long-term sustainability is contingent upon maintaining strong and meaningful relationships with the communities in which Beach operates. This ensures that Beach creates a lasting legacy as an environmentally and socially responsible organisation across the regions in which it operates. Beach maintains ongoing engagement with a wide range of stakeholders in the region.

7.1 Ongoing Consultation

Beach has engaged with stakeholders in the South East since inception of operations. The methods of engagement include formal notification, direct discussions regarding specific activities and ongoing engagement regarding safe work practices near pipelines, general operational and land management matters.

Notwithstanding the mothballing of the Katnook Gas Production Facility, Beach maintains ongoing contact with key stakeholders in the region to gain an understanding of the issues of importance to the community and to ensure concerns are identified and appropriately addressed.

Regular and ongoing engagement with key stakeholders including local councils and landholders is an important element of our operations in the region through:

- Beach corporate website
- Engage Beach, Beach's online engagement platform
- regular community and stakeholder information updates
- meetings with landholders and key stakeholders
- Community partnerships and investments
- Public notices in the local print press.

7.2 ER Act EIR and SEO 5 Year Review Consultation

The previous revisions of the EIR and SEO were formally submitted to DEM after being updated to address the comments raised during stakeholder consultation in 2021. DEM, through concurrence with EPA and DEW, classified the regulated activities as low impact in May 2021. Government agencies were subsequently formally consulted by DEM under the *Petroleum and Geothermal Energy Act* (SA) process in February and March 2021 (as described in the Environmental Impact Classification available on DEMs website⁹).

Beach will consult on the EIR and SEO in accordance with the Consultation Plan, developed to meet the requirements of the *ER Act*, ER Regulations and the DEM (2025) Consultation Plan Preparation Guidelines. The Consultation Plan is designed to ensure that stakeholders are provided with sufficient information and reasonable time to allow them to make an informed assessment of the potential impacts and risks of activities.

The methods for consultation are outlined in the Consultation Plan and include various formats such as:

- emails
- information sheets,
- online engagement platform (Engage Beach),
- public notice advertisements
- social media
- meetings
- direct phone calls.

Copies of engagement materials utilised during the consultation will be provided in Appendix E for the versions of the EIR and SEO formally submitted to DEM.

Through all platforms, stakeholders will be advised of the purpose of consultation and provided details of the activities covered by the EIR and SEO, the consultation timelines and Beach contact details for further information, or queries. Stakeholders will be encouraged to make formal submission either through the Engage Beach online platform or to reach out via phone or email.

7.3 Consultation Summary and Outcomes

In accordance with Regulation 10 and 11 of the ER Regulations, the outcomes of consultation will be reported as part of the Consultation Plan process and recorded within the EIR. Beach will consider all comments received during consultation and update the EIR and SEO accordingly for formal submission to

⁹ Environmental Impact Classification for is available here: [PGER 00326 Beach, geophysical operations in the Otway Basin, South Australia - environmental impact classification, May 2021](#)

DEM. The formal submissions to DEM will include a summary of any comments received during the consultation period, and where appropriate, Beach responses (refer to Appendix F).

7.4 Further Consultation

Once the EIR and SEO is formally submitted to DEM, and additional public consultation will be undertaken by DEM for a minimum of 30 business days. The EIR and SEO will be amended, as required, based on comments received during DEM's public consultation and the EIR and SEO to be resubmitted to DEM will include a summary of any comments received during DEM's public consultation and where appropriate Beach responses (refer to Appendix G). Further rounds of public consultation may be required if significant changes are made to the EIR and SEO during the public consultation process.

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9 Abbreviations and Glossary

Abbreviation	Definition
AAR	Aboriginal Affairs and Reconciliation, Department of Premier and Cabinet (South Australia)
ABS	Australian Bureau of Statistics
ALARP	As Low as Reasonably Practicable
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
ASX	Australian Securities Exchange
AUS	Australia
BDSA	Biological Databases of South Australia
BJD	Bovine Johne's Disease
BOM	Bureau of Meteorology
CE	Critically Endangered
CFS	Country Fire Service
DAS	Distributed Acoustic Sensing
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEM	Department for Energy and Mining
DEW	Department of Environment and Water (South Australia)
DIT	Department for Infrastructure and Transport (formerly DPTI)
EIR	Environmental Impact Report prepared in accordance with Section 97 of the South Australian ER Act 2000 and Regulation 10
EMP	Emergency Management Plan
EPA	Environmental Protection Authority
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
ER	<i>Energy Resources Act 2000</i>
GHG	Greenhouse Gas
GIS	Geographical Information System
GL	Gigaliter
GPS	Global Positioning System
GSP	Gross State Product
HSE	Health, Safety and Environment
IBRA	Interim Biogeographical Regionalisation for Australia
ID	Internal Diameter
IMT	Incident Management Team

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Abbreviation	Definition
IOGP	International association of Oil and Gas Producers
JSA	Job Safety Analysis
LLC	Lower Limestone Coast
LSA	Life-Saving Appliances
ML	megalitre (10 ⁶ litres)
MNES	Matters of National Environmental Significance
NEPM	National Environment Protection Measure
NGER	National Greenhouse and Energy Reporting
NPI	National Pollution Inventory
NPW	<i>National Parks and Wildlife Act</i>
NRM	Natural Resource Management
OEMS	Operations Excellence Management System
OJD	Ovine Johne's Disease
PDI	Planning, Development and Infrastructure Act 2016
PEL	Petroleum Exploration Licences
PETN	Pentaerythritol tetranitrate
PIRSA	Department of Primary Industries and Regions South Australia
PMST	EPBC Act Protected Matters Search Tool
PPL	Petroleum Production Licences
PRL	Production Retention Licences
PSSR	Pre-startup Safety Review
PTW	Permit to Work
PVC	Polyvinyl chloride
PWA	Prescribed Wells Area
RDX	Cyclonite
SA	South Australia
SAHPD	South Australian Heritages Places Database
SANTS	The South Australian Native Title Services
SAPOL	SA Police
SARIG	South Australian Resource Information Gateway
SE	South-East
SEA	Strategic Environmental Assessment
SEO	Statement of Environmental Objectives

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Abbreviation	Definition
SESA	South East South Australia
SPC	State Planning Commission
SPRAT	Species profile and threats database
TCSA	Tertiary Confined Sand Aquifer
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
TLA	Tertiary Limestone Aquifer
TNT	Trinitrotoluene

Appendix A Historic Seismic Survey Activity in the Impact Assessment Area

Table A-1: Historic seismic survey activity in the Impact Assessment Area

Year	Survey Name	Company	Energy Source
2D Seismic Surveys			
1961	Gambier Sunklands Seismic Survey	Beach Petroleum	Buried source
1962	Millicent-Beachport Seismograph Reflection Seismic Survey	Beach Petroleum	Buried source
1964	Gambier Basin Study Seismic Survey	SADME	Buried source
1964	Otway Basin Experimental Vibroseis Seismic Survey	BMR	Buried source
1965	Kalangadoo-Lucindale Seismic Survey	Alliance Oil Development (Aust)	Buried source
1965	Otway Basin Experimental Seismic Survey	BMR	Buried source
1966	Caroline-Killanoola Seismic and Gravity Survey	Alliance Oil Development (Aust)	Buried source
1969	Mayurra-Panhandle Gravity and Seismic Survey	Beach Petroleum	Buried source
1969	O69A Land Seismic Survey	Esso Exploration & Production (Aust)	Buried source
1970	Gambier Trough Seismic Survey	Alliance Oil Development (Aust)	Thumper
1971	O71A Land Seismic Survey	Esso Exploration & Production (Aust)	Thumper
1974	Tartwaup Seismic Survey	Alliance Oil Development (Aust)	Vibroseis
1980	Rendelsham Seismic Survey	Australian Aquitaine Petroleum	Vibroseis
1981	LSA-81 Seismic Survey	Australian Aquitaine Petroleum	Vibroseis
1981	OTSA-81 Seismic Survey (Millicent)	Australian Aquitaine Petroleum	Vibroseis
1984	Tantanoola Seismic Survey	Beach Petroleum	Vibroseis
1985	Burrungule Seismic Survey	Beach Petroleum	Vibroseis
1985	Kalangadoo Seismic Survey	Ultramar Australia	Vibroseis
1985	Konetta North Seismic Survey	Hartogen Energy	Vibroseis
1986	Burrungule Detail Seismic Survey	Beach Petroleum	Vibroseis
1986	Lake Eliza Seismic Survey	Hartogen Energy	Vibroseis
1986	Lucindale Seismic Survey	Hartogen Energy	Vibroseis
1986	Riddoch Seismic Survey	Ultramar Australia	Vibroseis

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Year	Survey Name	Company	Energy Source
1987	Baker Range Seismic Survey	Ultramar Australia	Vibroseis
1987	Orana Seismic Survey	Beach Petroleum	Vibroseis
1988	Bool Lagoon Seismic Survey	Hartogen Energy	Vibroseis
1988	Gambier Seismic Survey	Beach Petroleum	Vibroseis
1988	Penola Seismic Survey	Ultramar Australia	Vibroseis
1990	Coonawarra Seismic Survey	Ultramar Australia	Vibroseis
1990	Hatherleigh Seismic Survey	Sagasco Resources	Vibroseis
1990	Killanoola Seismic Survey	Oil Company Of Australia	Vibroseis
1990	St. Clair Seismic Survey	Gas & Fuel Exploration	Vibroseis
1991	Mt. Bruce Seismic Survey	IW Partnership	Vibroseis
1991	Mt. Hope Seismic Survey	Sagasco Resources	Vibroseis & Dynamite
1991	Oakwood Seismic Survey	Oil Company Of Australia	Vibroseis
1991	Rouge Homme Seismic Survey	Ultramar Australia	Vibroseis
1992	Beachport Seismic Survey	Gas & Fuel Exploration	Vibroseis & Dynamite
1992	Biscuit Flat Seismic Survey	Sagasco Resources	Vibroseis
1992	BMR Otway Basin Profiles Seismic Survey	BMR	Dynamite
1992	Sawpit Seismic Survey	Oil Company Of Australia	Vibroseis
1993	Mt. Elephant Seismic Survey	Sagasco Resources	Vibroseis
1993	Reynella Seismic Survey	Sagasco Resources	Vibroseis
1994	East Avenue Seismic Survey	GFE Resources	Vibroseis
1994	Lindsay Seismic Survey	Santos Ltd	Vibroseis
1995	Cadara Seismic Survey	Oil Company Of Australia	Vibroseis
1995	Redman 2D Seismic Survey	Sagasco Resources	Vibroseis
1996	East Avenue Detail Seismic Survey	GFE Resources	Vibroseis
1996	Kanawinka Seismic Survey	Santos Ltd	Vibroseis
1996	Viewbank Seismic Survey	Oil Company Of Australia	Vibroseis
1997	Bald Hill Seismic Survey	Boral Energy Resources	Vibroseis
1998	Mt. Burr A Seismic Survey	Boral Energy Resources	Vibroseis
1998	Mt. Burr B Seismic Survey	Boral Energy Resources	Vibroseis
1998	Mt. Burr C Seismic Survey	Boral Energy Resources	Vibroseis
1999	Mt. McIntyre A Seismic Survey	Boral Energy Resources	Vibroseis
1999	Mt. McIntyre C Seismic Survey	Boral Energy Resources	Vibroseis

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Year	Survey Name	Company	Energy Source
1999	Mt. McIntyre D Seismic Survey	Boral Energy Resources	Vibroseis
2000	Mt. Lyon Seismic Survey	Origin Energy Resources	Vibroseis
2001	Nampara Seismic Survey	Origin Energy Resources	Vibroseis
2002	Honan's Scrub Seismic Survey	Origin Energy Resources	Vibroseis
2002	Western Casterton 2D Seismic Survey	Santos Ltd	Vibroseis
2010	Weatherall 2D Seismic Survey	Adelaide Energy	Vibroseis and Buried Source (10 - 28 m deep)
3D Seismic Surveys			
1993	Tilbooroo	Oil Company Of Australia	Vibroseis
1995	Haselgrove	Sagasco Resources	Vibroseis
2000	Balnaves	Origin Energy Resources	Vibroseis
2001	St George	Origin Energy Resources	Vibroseis
2008	Jacaranda Ridge	Adelaide Energy	Vibroseis
2008	Nangwarry	Rawson Resources	Vibroseis
2022	Dombey	Beach Energy	Vibroseis
2022	Lodwick	Red Sky Energy	Vibroseis

Source: DEM, 2025

Appendix B Land Systems and Associated Soils in the Impact Assessment Area

Table B-1: Land systems and Associated Soils in the Impact Assessment Area

Land System	Landscape Description	Main Soils Description	Impact Assessment Area (%)
Nangwarry	Gently undulating plain with deep sandy soils, mostly well drained with only occasional dunes and swamps in swales. Occasional limestone (calcareenite) rises occur with shallow red soils.	I2 Wet highly leached sand G3 Thick sand over clay I1 Highly leached sand	9.4
Atlantic Heath	Poorly drained plains near Wattle Range with sand over clay soils mostly, occasionally with calcrete in the subsoils. Deep sands on the plains are often waterlogged. Low beach ridge remnants divide the plains in places.	G3 Thick sand over clay B7 Shallow sand over clay on calcrete I2 Wet highly leached sand	9.3
Krongart	Plains with mainly dark coloured, medium to fine textured soils. Small swamps are common	G3 Thick sand over clay N3 Wet soil (non to moderately saline) M4 Deep hard gradational sandy loam F2 Loam over poorly structured brown or dark clay E3 Brown or grey cracking clay	8.9
Kalangadoo	Gently undulating plain with low rises. Small swamps are common. Occasional higher dunes and calcreted rises also occur. Relief is only a few metres.	G3 Thick sand over clay G5 Sand over acidic clay	8.2
Young	A poorly drained sand plain lying between Forest Ridge Land System ridges and similar land west of Lake Leake. There are extensive swamps with peats or organic clays and sand over clay soils on elevated parts of plain.	I2 Wet highly leached sand G3 Thick sand over clay	7.8
Mount Burr	High range with extensive sand spreads and calcarenite slopes. There are some exposures of basaltic volcanic materials upon which the range has accreted.	B3 Shallow sandy loam on calcrete B6 Shallow loam over red-brown clay on calcrete	6.3
Millicent	Broad dune corridor plains formed mostly on lagoonal clays, extending northwest from near Tantanoola, past Millicent, to east of Hatherleigh with mainly dark coloured, clay loam to clay soils. Swamps are common in places.	A7 Calcareous clay loam on marl (Marly Calcarosol) B5 Shallow dark clay loam on limestone (Petrocalcic Black-Grey Dermosol) N1 Peaty soil (Organosol)	5.6

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		N3 Wet soil (non to moderately saline) (Sodosolic-Calcarosolic-Dermosolic Hydrosol) C5 Gradational dark clay loam (Calcic-Hypercalcic Brown-Grey-Black Dermosol-Calcarosol)	
Monbulla	Corridor plains southwest of Bool Lagoon, with sandy rises and low dunes and swampy flats	G3 Thick sand over clay N3 Wet soil (non to moderately saline) B7 Shallow sand over clay on calcrete G4 Sand over poorly structured clay	4.7
George	Wet sub-coastal plain with salt lakes, swamps, low sandy rises and samphire flats. It includes Lakes George, St. Claire and Eliza, between Beachport and Robe	WW Water N2 Saline soil (Salic-Hypersalic Hydrosol) B3 Shallow sandy loam on calcrete (Petrocalcic Red Tenosol-Kandosol-Rudosol) N3 Wet soil (non to moderately saline) (Sodosolic-Calcarosolic-Dermosolic Hydrosol)	3.0
Derrymore	Moderately well drained flat to gently undulating plains south west of Kalangadoo, with areas of swamp. This area is at the southern end of more clayey environments of the inter-dune corridor plains of the South East. The sand spreads to the east and the clay plains inter-tongue in the Derrymore Land System.	G3 Thick sand over clay (sandy Brown-Red Chromosol-Sodosol) I2 Wet highly leached sand (Aquic or Semi-Aquic Podosol)	2.9
Short	Plains south west of Penola and a corridor plain east of Lucindale, with mainly sand over clay soils with some parallel dunes, calcarenite rises and swamps.	G3 Thick sand over clay G4 Sand over poorly structured clay	2.8
Furner	Dune corridor, stony plains and swamps extending from Furner to east of Kingston, with mainly dark coloured, fine textured soils. Occasional stony banks.	B5 Shallow dark clay loam on limestone B2 Shallow calcareous loam on calcrete C5 Gradational dark clay loam	2.8
Glen Roy	Flat plains west and north of the Penola land system, with stony rises and swampy flats. Relief is less than 2 m.	B5 Shallow dark clay loam on limestone E3 Brown or grey cracking clay B2 Shallow calcareous loam on calcrete C5 Gradational dark clay loam	2.4

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Wylie	Coastal swamps and sub-coastal lagoonal deposits in the lower South East. The swamps are alkaline and many peats contain shell fragments as well as fibrous plant debris.	C5 Gradational dark clay loam (Calcic-Hypercalcic Brown-Grey-Black Dermosol/Calcarosol on marl) N1 Peaty soil (Organosol) A6 Gradational calcareous clay loam (grey clay-loamy pedal Hypercalcic-Lithocalcic Calcarosol with clayey subsoil on marl) N3 Wet soil (non to moderately saline) (Sodosolic-Calcarosolic-Dermosolic Hydrosol)	2.3
Woakwine	Old coastal dunes capped with alcarenite and wind blown sand.	B3 Shallow sandy loam on calcrete (Petrocalcic Red Tenosol-Kandosol-Rudosol) RR Rock or exposed calcrete.	2.0
Kennion	Complex of calcarenite ranges and corridor plains on Reedy Creek and West Avenue Ranges between Furner and Kingston. The ranges are low, narrow ridges often with exposed calcarenite, but also with deep sands. Flats are stony, sandy and swampy.	B3 Shallow sandy loam on calcrete (Petrocalcic Red Tenosol-Kandosol-Rudosol) H3 Bleached siliceous sand (sandy Bleached Tenosol) B7 (Shallow sand over clay on calcrete (sandy Petrocalcic Sodosol-Chromosol) B8 Shallow sand on calcrete (sandy Petrocalcic Rudosol-Tenosol)	1.6
Maoope	The Maoope Land System is a plain with minor lunettes, swamps and lagoons such as Bool Lagoon, Hacks Lagoon, Moyhall Swamp and Cockatoo Lake. The plains are imperfectly to poorly drained. The groundwater table may be at the surface for some time in the year.	Variable, typically clay loamy/clayey surfaces and calcrete within 50 cm of the surface. Shallow dark clays with smaller areas of deep dark clays.	1.6
Mingbool	Mostly a low lying, poorly drained plain with a chain of wet swamps, which includes the Dismal Swamp. Low dunes occupy 12% of the area.	I2 Wet highly leached sand (Aquic or Semi-Aquic Podosol) N3 Wet soil (non to moderately saline) (Sodosolic-Calcarosolic-Dermosolic Hydrosol) G3 Thick sand over clay (sandy Brown-Red Chromosol-Sodosol)	1.6
Cave Range	Disjunct linear dune ranges and low ridges south east of Lucindale, including the southern parts of Cave Range, Stewarts Range and Bakers Range.	H3 Bleached siliceous sand B6 Shallow loam over red-brown clay on calcrete G3 Thick sand over clay	1.5
Kongorong	Stranded beach ridge land system extending north-west from near Kongorong to west of Millicent.	B3 Shallow sandy loam on calcrete (Petrocalcic Red Tenosol-Kandosol-Rudosol)	9.4

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		B6 Shallow loam over red-brown clay on calcrete (Petrocalcic Red ChromosolKandosol)	
Biscuit Range	Poorly drained dune corridor plains on the landward side of the Woakwine Range, north west of Hatherleigh. Calcarenite rises are intermingled with the plains.	N3 Wet soil (non to moderately saline) (Sodosolic-Calcarosolic-Dermosolic-Hydrosol) C5 (Gradational dark clay loam (Calcic-Hypercalcic Brown-Grey-Black Dermosol-Calcarosol) B7 Shallow sand over clay on calcrete (sandy Petrocalcic Sodosol-Chromosol) B2 Shallow calcareous loam on calcrete (Petrocalcic Calcarosol-Rudosol) A7 Calcareous clay loam on marl (Marly Calcarosol)	1.3
East Avenue	Dune range of low rises with swampy flats between the Kennion and Lucindale ranges, with some salinity in the northern end.	H3 Bleached siliceous sand B7 Shallow sand over clay on calcrete I1 Highly leached sand B6 Shallow loam over red-brown clay on calcrete	1.3
Tartwaup	Gently undulating plains with low rises on calcarenite. Mostly shallow soils with some volcanic ash influence in surface horizons in the south east where it adjoins the Gambier land system.	B6 Shallow loam over red-brown clay on calcrete (Petrocalcic Red ChromosolKandosol) B3 Shallow sandy loam on calcrete (Petrocalcic Red Tenosol-Kandosol-Rudosol)	1.0
Hatherleigh	Rocky calcarenite dune range with very shallow soils, near Hatherleigh.	B3 Shallow sandy loam on calcrete (Petrocalcic Red Tenosol-Kandosol-Rudosol) RR Bare calcrete B2 Shallow calcareous loam on calcrete (Petrocalcic Calcarosol-Rudosol) B6 Shallow loam over red-brown clay on calcrete (Petrocalcic Red Chromosol-Kandosol)	1.0
Rivoli	The Rivoli Land System is named after Rivoli Bay, near Beachport. It consists of a series of parallel, narrow, low nconsolidated coastal sand ridges and depressions or swales. The land system occurs in three disjunct areas; i.e. adjacent to Rivoli Bay, and to Guichen Bay near Robe.	H1 Carbonate sand (Shelly-Supravescent Calcarosol-Rudosol) H2 Calcareous siliceous sand (sandy Calcarosol-Tenosol)	1.0

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Burrungule	Complex of calcarenite ranges and corridor plains south and west of Mt. Gambier. This land system is divided by the Gambier land system into south-east & north-west portions.	B3 Shallow sandy loam on calcrete (Petrocalcic Red Tenosol-Kandosol-Rudosol)	1.0
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Source: DEW, 2026b, 2026c (accessed via NatureMaps, 2026). Note: Land systems representing <1% of the Impact Assessment Area (these include Penola, Glencoe, Forest Ridge, Caroline, Coola, Edward, Lucindale, Peweenaa, Beachport, Spence, Naracoorte, Symon, Conmurra, Baker Range and Canunda) have been excluded from this table.

Appendix C Flora and Fauna Information

This appendix provides additional detail on the vegetation communities, threatened and migratory species and weeds that are summarised in Section 4.5 of the EIR. The information in this appendix updates the information in a draft report prepared for Beach by Coffey Environments in 2012.

C. 1. Vegetation communities

Floristic communities mapped in areas of remnant native vegetation (based on Native Vegetation Floristic Areas (NVIS) dataset on NatureMaps, 2026) within Beach's Impact Assessment Area included in Table C-1.

Table C-1: Floristic Communities Mapped in Areas of Remnant Native Vegetation

Vegetation description	Count within Impact Assessment Area
Eucalyptus camaldulensis var. camaldulensis mid woodland over Leptospermum continentale shrubs over Hypochaeris radicata, Hydrocotyle laxiflora, Ranunculus robertsonii, Schoenus apogon forbs	430
Eucalyptus arenacea/baxteri mid woodland over Leptospermum myrsinoides, Banksia marginata, Xanthorrhoea caespitosa shrubs over Pteridium esculentum, Astroloma conostephioides ferns	374
Cyperaceae sp., Gramineae sp. mid sedgeland	208
Melaleuca brevifolia, Leptospermum continentale mid shrubland over Apodasmia brownii, Baumea juncea sedges	97
emergent Eucalyptus obliqua trees over Xanthorrhoea caespitosa, Leptospermum continentale mid open shrubland over Leucopogon virgatus var. virgatus, Astroloma conostephioides, Isopogon ceratophyllus, Hypolaena fastigiata, Epacris impressa, Tetratheca ciliata	94
Eucalyptus obliqua mid woodland over Acacia melanoxylon shrubs over Pteridium esculentum, Leucopogon parviflorus, Hypochaeris radicata, Hydrocotyle laxiflora ferns	76
Eucalyptus fasciculosa low woodland over Acacia longifolia ssp. sophorae, Banksia marginata shrubs over Xanthorrhoea caespitosa	76
Emergent Eucalyptus ovata var. trees over Melaleuca squarrosa tall shrubland over Leptospermum continentale over Lepidosperma viscidum, Pteridium esculentum, Gonocarpus tetragynus, Schoenus carsei sedges	62
Eucalyptus ovata var., Eucalyptus viminalis ssp. mid woodland	59
Emergent Pinus radiata, Eucalyptus arenacea/baxteri, Eucalyptus viminalis ssp. cygnetensis, Eucalyptus camaldulensis var. camaldulensis, Eucalyptus ovata var. trees over Leptospermum continentale mid shrubland over Hibbertia fasciculata, Epacris impressa shrubs	52

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Vegetation description	Count within Impact Assessment Area
Leptospermum lanigerum, Ozothamnus ferrugineus, +/-Leucopogon parviflorus tall shrubland over Epilobium billardierianum ssp. billardierianum, Acaena novae-zelandiae forbs	33
Leucopogon parviflorus, Acacia longifolia ssp. sophorae, Olearia axillaris, Myoporum insulare tall shrubland over Lepidosperma gladiatum, Pimelea serpyllifolia ssp. serpyllifolia, Isolepis nodosa sedges over Carpobrotus rossii, Clematis microphylla var. microphylla	31
Melaleuca halmaturorum tall shrubland over Gahnia filum sedges over Comesperma volubile, Samolus repens	27
emergent Eucalyptus sp. trees over Pteridium esculentum mid closed fernland	18
Eucalyptus leucoxylon ssp. mid open woodland over Acacia pycnantha shrubs over Astroloma humifusum, Hibbertia australis, Kunzea pomifera, Danthonia sp. shrubs	15
Sarcocornia sp., Tecticornia sp., Suaeda australis low shrubland over Frankenia pauciflora var., Samolus repens, Distichlis distichophylla	13
Emergent Eucalyptus incrassata mallee trees over Banksia ornata, Leptospermum myrsinoides, Babingtonia behrii, Allocasuarina pusilla, Leptospermum coriaceum mid shrubland over Astroloma conostephioides, Hibbertia australis, Calytrix tetragona over Lepidosperma carphoides, Hypolaena fastigiata, Schoenus breviculmis sedges	12
Emergent Melaleuca halmaturorum shrubs over Gahnia filum, Juncus kraussii tall sedgeland over Samolus repens, Tetragonia implexicoma, Selliera radicans, Acaena novae-zelandiae	10
Melaleuca lanceolata low woodland	8
Baumea juncea, Gahnia trifida mid sedgeland	6
Eucalyptus leucoxylon ssp. low woodland over Acacia spinescens shrubs over Lepidosperma carphoides, Pteridium esculentum sedges	6
Typha domingensis tall closed sedgeland over Samolus repens	6
Eucalyptus diversifolia ssp. diversifolia mid open mallee forest over Xanthorrhoea caespitosa, Allocasuarina muelleriana ssp. muelleriana shrubs over Hibbertia australis, Lepidosperma carphoides, Astroloma humifusum, Correa reflexa var. scabridula, Acacia spinescens shrubs	4
Gramineae sp. mid tussock grassland	4
Acacia leiophylla mid shrubland	3
Allocasuarina verticillata low woodland over Bursaria spinosa ssp. spinosa shrubs over Xanthorrhoea caespitosa shrubs	3

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Vegetation description	Count within Impact Assessment Area
Spinifex sericeus (NC), Ozothamnus turbinatus, Isolepis nodosa, Olearia axillaris mid grassland over Leucophyta brownii, Apium prostratum var., Cakile maritima ssp. maritima	2
Themeda triandra, Pimelea glauca, Acrotriche affinis, Pultenaea hispidula mid open tussock grassland over Schoenus apogon, Asperula conferta	2
Eucalyptus camaldulensis var. camaldulensis, Eucalyptus fasciculosa, Eucalyptus leucoxylon ssp., Eucalyptus arenacea/baxteri mid woodland	1

Source: [Native Vegetation Floristic Areas \(NVIS\) dataset on NatureMaps, 2026.](#)

C. 2. Protected Matters Search Tool (PMST) Report

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C. 3. Biological Databases of South Australia Outputs

Table C-2: Threatened Flora Species identified on BDSA Database

Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Acacia dodonaeifolia</i>	Hop-bush Wattle	-	R	1
<i>Acacia mitchellii</i>	Mitchell's Wattle	-	R	29
<i>Acacia stricta</i>	Hop Wattle	-	R	40
<i>Acacia suaveolens</i>	Sweet Wattle	-	V	22
<i>Acacia trineura</i>	Three-nerve Wattle	-	E	1
<i>Allittia cardiocarpa</i>	Swamp Daisy	-	R	20
<i>Allittia uliginosa</i>	Wet-heath Daisy	-	R	15
<i>Amphibromus archeri</i>	Pointed Swamp Wallaby-grass	-	R	15
<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass	V	-	2
<i>Amphibromus macrorhinus</i>	Long-nosed Swamp Wallaby-grass	-	R	9
<i>Amphibromus recurvatus</i>	Dark Swamp Wallaby-grass	-	R	53
<i>Anogramma leptophylla</i>	Annual Fern	-	R	3
<i>Arthropodium milleflorum</i>	Pale Vanilla-lily	-	V	28
<i>Asperula subsimplex</i>	Water Woodruff	-	R	64
<i>Asplenium trichomanes</i>	Common Spleenwort	-	R	2
<i>Baloskion tetraphyllum</i> ssp. <i>tetraphyllum</i>	Tassel Cord-rush	-	V	61

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Billardiera scandens</i> var. <i>scandens</i>	Eastern Apple-berry	-	R	42
<i>Blechnum wattsii</i>	Hard Water-fern	-	R	12
<i>Boronia nana</i> var. <i>pubescens</i>	Dwarf Boronia	-	R	3
<i>Boronia parviflora</i>	Swamp Boronia	-	R	21
<i>Boronia pilosa</i> ssp. <i>torquata</i>	Hairy Boronia	-	R	63
<i>Brachycome parvula</i> var. <i>parvula</i> (NC)	Coast Daisy	-	R	2
<i>Brachyscome graminea</i>	Grass Daisy	-	R	13
<i>Brachyscome paludicola</i>	Swamp Daisy	-	R*	1
<i>Brachyscome parvula</i>	Coast Daisy	-	R	17
<i>Brachyscome readeri</i>	Reader's Daisy	-	R	1
<i>Caesia parviflora</i> var. <i>minor</i>	Pale Grass-lily	-	R	23
<i>Caladenia audasii</i>	Audas' Spider-orchid	E	-	1
<i>Caladenia behrii</i>	Pink-lip Spider-orchid	E	E	1
<i>Caladenia bicalliata</i> ssp. <i>bicalliata</i> (NC)	Western Daddy-long-legs	-	R	1
<i>Caladenia brumalis</i>	Winter Spider-orchid	V	V	1
<i>Caladenia calcicola</i>	Limestone Spider-orchid	V	E	3
<i>Caladenia clavigera</i>	Plain-lip Spider-orchid	-	E	3
<i>Caladenia concolor</i>	Crimson Spider-orchid	V	-	2

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Caladenia congesta</i>	Black-tongue Caladenia	-	E	40
<i>Caladenia cruciformis</i>	Bordertown Spider-orchid	-	E*	1
<i>Caladenia cucullata</i>	Hooded Caladenia	-	R	1
<i>Caladenia dilatata</i>	Late Spider-orchid	-	E	105
<i>Caladenia formosa</i>	Elegant Spider Orchid	V	V	4
<i>Caladenia fragrantissima</i>	Scented Spider-orchid	-	V	2
<i>Caladenia fulva</i>	Tawny Spider-orchid	E	E	1
<i>Caladenia hastata</i>	Mellblom's Spider-orchid	E	-	1
<i>Caladenia moschata</i>	Musky Caladenia	-	E*	6
<i>Caladenia necrophylla</i>	Late Spider-orchid	-	R	15
<i>Caladenia ornata</i>	Ornate Pink Fingers	V	E	5
<i>Caladenia parva</i>	Small Green-comb Spider-orchid	-	R	63
<i>Caladenia pusilla</i>	Pigmy Caladenia	-	R	79
<i>Caladenia reticulata</i>	Veined Spider-orchid	-	R	1
<i>Caladenia sanguinea</i>	Crimson Daddy-long-legs	-	R	1
<i>Caladenia venusta</i>	Large White Spider-orchid	-	V	30
<i>Caladenia versicolor</i>	Grampians Spider-orchid	V	E*	1
<i>Caladenia vulgaris</i>	Plain Caladenia	-	R	29
<i>Caleana major</i>	Large Duck-orchid	-	V	3

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Calectasia intermedia</i>	Eastern Blue Tinsel-lily	-	V	25
<i>Callitriche umbonata</i>	Water Starwort	-	V	2
<i>Calocephalus lacteus</i>	Milky Beauty-heads	-	E	6
<i>Calochilus campestris (NC)</i>	Plains Beard-orchid	-	R	1
<i>Calochilus herbaceus</i>	Swamp Bearded Orchid	-	R	1
<i>Calochilus paludosus</i>	Red Beard-orchid	-	V	39
<i>Cardamine gunnii</i>	Spade-leaf Bitter-cress	-	V	9
<i>Cardamine paucijuga</i>	Annual Bitter-cress	-	R	2
<i>Cardamine paucijuga (NC)</i>	Annual Bitter-cress	-	R	1
<i>Cardamine tenuifolia</i>	Slender Bitter-cress	-	R	33
<i>Carex gunniana</i>	Mountain Sedge	-	R	8
<i>Centrolepis glabra</i>	Smooth Centrolepis	-	R	11
<i>Chiloglottis cornuta</i>	Green Bird-orchid	-	E	15
<i>Chiloglottis trapeziformis</i>	Dainty Bird-orchid	-	E	4
<i>Choretrum chrysanthum</i>	Yellow Sour-bush	-	R	1
<i>Chorizandra australis</i>	Bristle-rush	-	E	26
<i>Cladium procerum</i>	Leafy Twig-rush	-	R	8
<i>Clematis aristata</i>	Mountain Clematis	-	V	5
<i>Coronidium gunnianum</i>	Pale Everlasting	-	E	1

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Correa alba</i> var. <i>pannosa</i>	White Correa	-	R	1
<i>Corybas fordhamii</i>	Swamp Helmet-orchid	-	E	1
<i>Corybas unguiculatus</i>	Small Helmet-orchid	-	R	58
<i>Corybas X dentatus</i>	Finniss Helmet-orchid	V	E	5
<i>Craspedia paludicola</i>	Swamp Buttons	-	V	6
<i>Crassula peduncularis</i>	Purple Crassula	-	R	3
<i>Cryptostylis subulata</i>	Moose Orchid	-	V	108
<i>Cullen microcephalum</i>	Mountain Scurf-pea	-	E	11
<i>Cuscuta tasmanica</i>	Tasmanian Dodder	-	V	6
<i>Cycnogeton alcockiae</i>	Alcock's Water-ribbons	-	R	18
<i>Cyperus lhotskyanus</i>	-	-	R	2
<i>Deyeuxia densa</i>	Heath Bent-grass	-	R	9
<i>Deyeuxia minor</i>	Small Bent-grass	-	V	3
<i>Dianella callicarpa</i>	Swamp Flax-lily	-	E	7
<i>Dianella longifolia</i> var. <i>grandis</i>	Pale Flax-lily	-	R	3
<i>Dillwynia cinerascens</i>	Grey Parrot-pea	-	E	24
<i>Dipodium campanulatum</i>	Bell-flower Hyacinth Orchid	E	V	5
<i>Dipodium pardalinum</i>	Leopard Hyacinth-orchid	-	V	6
<i>Diuris behrii</i>	Behr's Cowslip Orchid	-	V	1

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Diuris chryseopsis</i>	Cowslip Orchid	-	E	29
<i>Diuris sulphurea</i>	Tiger Orchid	-	R	44
<i>Dodonaea procumbens</i>	Trailing Hop-bush	V	V	3
<i>Drosera binata</i>	Forked Sundew	-	R	9
<i>Elatine gratioloides</i>	Waterwort	-	R	7
<i>Eleocharis atricha</i>	Tuber Spike-rush	-	V	13
<i>Eryngium ovinum</i>	Blue Devil	-	V	1
<i>Eryngium vesiculosum</i>	Prostrate Blue Devil	-	R	17
<i>Eucalyptus fasciculosa</i>	Pink Gum	-	R	189
<i>Eucalyptus leucoxylon ssp. megalocarpa</i>	Large-fruit Blue Gum	-	R	13
<i>Eucalyptus viminalis ssp. viminalis</i>	Manna Gum	-	R	1
<i>Euphrasia collina ssp. collina</i>	Purple Eyebright	-	V	1
<i>Eurychorda complanata</i>	Flat Cord-rush	-	V	3
<i>Gahnia clarkei</i>	Tall Saw-sedge	-	R	118
<i>Gahnia radula</i>	Thatch Saw-sedge	-	R	65
<i>Galium curvihirtum</i>	Tight Bedstraw	-	R	37
<i>Gastrodia sesamoides</i>	Potato Orchid	-	R	27
<i>Gastrodia vescula</i>	Lesser Potato Orchid	-	V	6

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Genoplesium ciliatum</i>	Swamp Midge-orchid	-	E	21
<i>Genoplesium despectans</i>	Sharp Midge-orchid	-	V	10
<i>Gentianella clelandii</i>	-	-	E*	1
<i>Gleichenia microphylla</i>	Coral Fern	-	R	25
<i>Glycine latrobeana</i>	Clover Glycine	V	V	15
<i>Glycine tabacina</i>	Variable Glycine	-	V	1
<i>Gonocarpus humilis</i>	Shade Raspwort	-	R	61
<i>Gonocarpus micranthus ssp. micranthus</i>	Creeping Raspwort	-	R	31
<i>Goodenia heteromera</i>	Spreading Goodenia	-	R	2
<i>Gratiola pedunculata</i>	Stalked Brooklime	-	R	1
<i>Gratiola pubescens</i>	Glandular Brooklime	-	R	22
<i>Gratiola pumilo</i>	Dwarf Brooklime	-	R	13
<i>Grevillea aquifolium</i>	Prickly Grevillea	-	R	2
<i>Gymnoschoenus sphaerocephalus</i>	Button Grass	-	E	15
<i>Haloragis eichleri</i>	Eichler's Raspwort	-	R	1
<i>Haloragis myriocarpa</i>	-	-	R	3
<i>Hibbertia glaberrima</i>	Central Australian Guinea-flower	-	R	1
<i>Hibbertia sessiliflora</i>	-	-	E	1

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Histiopteris incisa</i>	Bat's-wing Fern	-	E	2
<i>Hovea heterophylla</i>	Common Hovea	-	V	2
<i>Hypericum japonicum</i>	Matted St John's Wort	-	R	22
<i>Hypolepis rugosula ssp. rugosula</i>	Ruddy Ground-fern	-	R	5
<i>Isoetes drummondii ssp. drummondii</i>	Plain Quillwort	-	R	9
<i>Isolepis producta</i>	Nutty Club-rush	-	V	4
<i>Isotoma fluviatilis ssp. australis</i>	Swamp Isotome	-	R	26
<i>Juncus amabilis</i>	-	-	V	10
<i>Juncus australis</i>	Austral Rush	-	R	4
<i>Juncus procerus</i>	Tall Rush	-	R	118
<i>Lachnagrostis robusta</i>	Tall Blown-grass	-	R	4
<i>Lachnagrostis rudis ssp. rudis</i>	Ruddy Bent	-	V	2
<i>Lachnagrostis semibarbata var. semibarbata</i>	-	-	R*	3
<i>Lagenophora sublyrata</i>	Slender Bottle-daisy	-	V*	6
<i>Lastreopsis acuminata</i>	Shiny Shield-fern	-	E	3
<i>Lepidosperma neesii</i>	Stiff Raper-sedge	-	V	20
<i>Leptinella reptans</i>	Creeping Cotula	-	R	9
<i>Leptorhynchos scaber</i>	Annual Buttons	-	R	1

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Leptorhynchos tenuifolius</i>	Wiry Buttons	-	R	14
<i>Leptostigma reptans</i>	Dwarf Nertera	-	R	15
<i>Levenhookia sonderi</i>	Slender Stylewort	-	V	3
<i>Lobelia beaugleholei</i>	Showy Lobelia	-	V	8
<i>Lobelia pedunculata</i>	White-flower Matted Pratia	-	V	2
<i>Lobelia pratioides</i>	Poison Lobelia	-	R	22
<i>Lomandra filiformis ssp. coriacea</i>	Wattle Mat-rush	-	R	33
<i>Lomandra multiflora ssp. multiflora</i>	Many-flower Mat-rush	-	E	2
<i>Luzula flaccida</i>	Pale Wood-rush	-	V	10
<i>Luzula ovata</i>	Clustered Wood-rush	-	R	4
<i>Lycopodiella lateralis</i>	Slender Clubmoss	-	R	1
<i>Lythrum salicaria</i>	Purple Loosestrife	-	R	7
<i>Machaerina acuta</i>	Pale Twig-rush	-	R	19
<i>Machaerina laxa</i>	Lax Twig-rush	-	R	1
<i>Mazus pumilio</i>	Swamp Mazus	-	V	64
<i>Meionectes brownii</i>	Swamp Raspwort	-	R*	3
<i>Melaleuca squamea</i>	Swamp Honey-myrtle	-	R	65
<i>Melaleuca squarrosa</i>	Bottlebrush Tea-tree	-	R	152
<i>Mentha atrolilacina</i>	Slender Mint	-	R*	18

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Mentha diemenica</i>	Slender Mint	-	R	40
<i>Mentha diemenica (NC)</i>	Slender Mint	-	R	12
<i>Microtis atrata</i>	Yellow Onion-orchid	-	R	12
<i>Microtis orbicularis</i>	Swamp Onion-orchid	-	V	11
<i>Microtis rara</i>	Sweet Onion-orchid	-	R	1
<i>Microtis rara (NC)</i>	Sweet Onion-orchid	-	R	6
<i>Mitrasacme pilosa var. pilosa</i>	Hairy Mitrewort	-	V	14
<i>Montia australasica</i>	White Purslane	-	R	65
<i>Myriophyllum crispatum</i>	Upright Milfoil	-	V	1
<i>Myriophyllum glomeratum</i>	Clustered Milfoil	-	E	1
<i>Myriophyllum integrifolium</i>	Tiny Milfoil	-	R	11
<i>Myriophyllum variifolium</i>	Varied Milfoil	-	R	14
<i>Nertera granadensis</i>	Matted Nertera	-	E	2
<i>Olearia erubescens</i>	Moth Daisy-bush	-	E	15
<i>Olearia glandulosa</i>	Swamp Daisy-bush	-	V	20
<i>Olearia glutinosa</i>	Sticky Daisy-bush	-	E	1
<i>Olearia pannosa ssp. pannosa</i>	Silver Daisy-bush	V	V	8
<i>Olearia suffruticosa</i>	Clustered Daisy-bush	-	E	11

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Ornduffia umbricola</i> var. <i>beaugleholei</i>	Beauglehole's Marsh-flower	-	V	1
<i>Paracaleana minor</i>	Small Duck-orchid	-	V	119
<i>Pentapogon quadrifidus</i> var. <i>quadrifidus</i>	Five-awn Spear-grass	-	R	23
<i>Phebalium calcicola</i>	Limestone Phebalium	-	E*	1
<i>Phyllangium distylis</i>	Tiny Mitrewort	-	R	9
<i>Phylloglossum drummondii</i>	Pigmy Clubmoss	-	R	3
<i>Pilularia novae-hollandiae</i>	Austral Pillwort	-	R	1
<i>Plagiobothrys orthostatus</i>	-	-	V	2
<i>Poa fax</i>	Scaly Poa	-	R	1
<i>Poa meionectes</i>	Fine-leaf Tussock-grass	-	V	37
<i>Poa morrisii</i>	Soft Tussock-grass	-	R	43
<i>Poa rodwayi</i>	Velvet Tussock-grass	-	R	50
<i>Poa sieberiana</i> var. <i>sieberiana</i>	-	-	R	13
<i>Podolepis decipiens</i>	-	-	R*	6
<i>Podolepis jaceoides</i>	Showy Copper-wire Daisy	-	R	8
<i>Podolepis jaceoides</i> (NC)	Showy Copper-wire Daisy	-	R	2
<i>Podolepis linearifolia</i>	Narrow-leaf Copper-wire Daisy	-	R*	1

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Pomaderris halmaturina ssp. continentis</i>	Glenelg Pomaderris	-	V	3
<i>Pomaderris halmaturina ssp. halmaturina</i>	Kangaroo Island Pomaderris	V	V	6
<i>Potamogeton australiensis</i>	Thin Pondweed	-	V	4
<i>Potamogeton ochreatus</i>	Blunt Pondweed	-	R	3
<i>Prasophyllum australe</i>	Austral Leek-orchid	-	R	3
<i>Pteris tremula</i>	Tender Brake	-	R	2
<i>Pterostylis chlorogramma</i>	-	V	E	56
<i>Pterostylis concinna</i>	Trim Greenhood	-	E	45
<i>Pterostylis corpulenta</i>	Tiny Greenhood	-	V	182
<i>Pterostylis curta</i>	Blunt Greenhood	-	R	5
<i>Pterostylis falcata</i>	Forked Greenhood	-	E	7
<i>Pterostylis ferruginea</i>	Bangham Rustyhood	-	E*	1
<i>Pterostylis foliata</i>	Slender Greenhood	-	R	9
<i>Pterostylis lustra</i>	Forked Greenhood	-	E	1
<i>Pterostylis melagramma</i>	Tall Greenhood	-	E	242
<i>Pterostylis striata</i>	Tall Shell-orchid	-	R	7
<i>Pterostylis tasmanica</i>	-	-	V	1
<i>Pterostylis tenuissima</i>	Swamp Greenhood	V	V	1

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Pultenaea dentata</i>	Clustered Bush-pea	-	V	18
<i>Pultenaea villifera</i> var. <i>glabrescens</i>	Splendid Bush-pea	V	V	1
<i>Pycnosorus chrysanthes</i>	Yellow Drumsticks	-	E	3
<i>Ranunculus glabrifolius</i>	Shining Buttercup	-	V	19
<i>Ranunculus inundatus</i>	River Buttercup	-	R	46
<i>Ranunculus papulentus</i>	Large River Buttercup	-	V	2
<i>Ranunculus pumilio</i> var. <i>politus</i>	Smooth-fruit Ferny Buttercup	-	V	1
<i>Ranunculus robertsonii</i>	Slender Buttercup	-	R	20
<i>Rorippa laciniata</i>	Jagged Bitter-cress	-	R	1
<i>Rumex dumosus</i>	Wiry Dock	-	R	3
<i>Rytidosperma tenuius</i>	Short-awn Wallaby-grass	-	R	2
<i>Scaevola calendulacea</i>	Dune Fanflower	-	V	1
<i>Scaevola hookeri</i>	Creeping Fanflower	-	E	5
<i>Schizaea bifida</i>	Forked Comb-fern	-	V	9
<i>Schizaea fistulosa</i>	Narrow Comb-fern	-	V	1
<i>Schoenus discifer</i>	Tiny Bog-rush	-	R	1
<i>Schoenus laevigatus</i>	-	-	R	4
<i>Schoenus latelaminatus</i>	Medusa Bog-rush	-	V	8

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Schoenus lepidosperma</i> ssp. <i>lepidosperma</i>	Slender Bog-rush	-	R	34
<i>Schoenus sculptus</i>	Gimlet Bog-rush	-	R	2
<i>Schoenus tesquorum</i>	Grassy Bog-rush	-	R	35
<i>Senecio pinnatifolius</i> var. <i>pinnatifolius</i>	-	-	R	2
<i>Senecio psilocarpus</i>	-	V	V	32
<i>Sphaerolobium minus</i>	Leafless Globe-pea	-	R	30
<i>Spiranthes australis</i>	Austral Lady's Tresses	-	R	165
<i>Spiranthes australis</i> (NC)	Austral Lady's Tresses	-	R	5
<i>Sprengelia incarnata</i>	Pink Swamp-heath	-	R	12
<i>Stellaria angustifolia</i> ssp. <i>tenella</i>	Swamp Starwort	-	R	2
<i>Stellaria caespitosa</i> (NC)	Starwort	-	V	1
<i>Stellaria multiflora</i> (NC)	Rayless Starwort	-	R	4
<i>Stellaria multiflora</i> ssp. <i>nebulosa</i>	Rayless Starwort	-	R	1
<i>Stellaria pungens</i>	Prickly Starwort	-	R	50
<i>Stylidium beaugleholei</i>	Beauglehole's Trigger-plant	-	R	9
<i>Stylidium ecorne</i>	-	-	R	2
<i>Styphelia clelandii</i>	Cleland's Beard-heath	-	R	17
<i>Tetrarrhena distichophylla</i>	Hairy Rice-grass	-	V	9

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Thelionema caespitosum</i>	Tufted Lily	-	V	18
<i>Thelymitra aristata</i>	Great Sun-orchid	-	E*	28
<i>Thelymitra carnea</i>	Small Pink Sun-orchid	-	R	2
<i>Thelymitra crenulata</i>	-	-	V	45
<i>Thelymitra cyanapicata</i>	-	CE	E	1
<i>Thelymitra epipactoides</i>	Metallic Sun-orchid	E	E	3
<i>Thelymitra flexuosa</i>	Twisted Sun-orchid	-	R	149
<i>Thelymitra holmesii</i>	Blue Star Sun-orchid	-	V	107
<i>Thelymitra holmesii</i> (NC)	Blue Star Sun-orchid	-	V	3
<i>Thelymitra hygrophila</i>	Blue Star Sun-orchid	CE	E	1
<i>Thelymitra ixioides</i>	Spotted Sun-orchid	-	E*	60
<i>Thelymitra latifolia</i>	Blue Star Sun-orchid	-	V	41
<i>Thelymitra malvina</i>	Mauve-tufted Sun-orchid	-	E	5
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	E	E	36
<i>Thelymitra mucida</i> (NC)	Plum Sun-orchid	-	R	2
<i>Thelymitra orientalis</i>	Plum Sun-orchid	CE	R	3
<i>Thelymitra peniculata</i>	Blue Star Sun-orchid	-	V	37
<i>Thelymitra X merraniae</i>	-	-	E	1
<i>Thysanotus tuberosus</i> ssp.	Tuber Fringe-lily	-	V	4

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Thysanotus tuberosus ssp. parviflorus</i>	Tuber Fringe-lily	-	V*	12
<i>Thysanotus tuberosus ssp. tuberosus</i>	Tuber Fringe-lily	-	V	4
<i>Tricostularia pauciflora</i>	Needle Bog-rush	-	E	4
<i>Utricularia australis</i>	Yellow Bladderwort	-	R	6
<i>Utricularia beaugleholei</i>	Beauglehole's Bladderwort	-	V	2
<i>Utricularia lateriflora</i>	Small Bladderwort	-	V	8
<i>Utricularia violacea</i>	Violet Bladderwort	-	R	19
<i>Veronica derwentiana ssp. derwentiana</i>	Derwent Speedwell	-	E	2
<i>Veronica gracilis</i>	Slender Speedwell	-	V	10
<i>Veronica subtilis</i>	Slender Speedwell	-	V	9
<i>Viminaria juncea</i>	Native Broom	-	R	32
<i>Viola betonicifolia ssp. betonicifolia</i>	Showy Violet	-	E	4
<i>Wahlenbergia gymnoclada</i>	Naked Bluebell	-	V	20
<i>Wurmbea dioica ssp. lacunaria</i>	Lagoon Nancy	-	E	3
<i>Wurmbea latifolia ssp. vanessae</i>	Broad-leaf Nancy	-	R	1
<i>Wurmbea uniflora</i>	One-flower Nancy	-	E	1
<i>Xanthorrhoea minor ssp. lutea</i>	Little Yacca	-	E	9
<i>Xyris operculata</i>	Tall Yellow-eye	-	R	19

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Zieria veronicea ssp. veronicea</i>	Pink Zieria	-	R	1
<i>Zoysia macrantha ssp. walshii</i>	Manila Grass	-	R	3

Source: NatureMaps (2026). Status: V: Vulnerable; R: Rare; E: Endangered; CE: Critically Endangered.

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Table C-3: Threatened Fauna Species identified on BDSA Database

Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Acanthiza lineata</i>	Striated Thornbill	ssp	-	28
<i>Accipiter novaehollandiae</i>	Grey Goshawk	-	E	5
<i>Acrobates pygmaeus</i>	Narrow-toed Feather-tailed Glider	-	E	1
<i>Actitis hypoleucos</i>	Common Sandpiper	-	R	3
<i>Amphibolurus muricatus</i>	Jacky Lizard	-	R	3
<i>Anepischetosia maccoyi</i>	Salamander Skink	-	E	5
<i>Anhinga novaehollandiae</i> <i>novaehollandiae</i>	Australasian Darter	-	R	3
<i>Anseranas semipalmata</i>	Magpie Goose	-	E	5
<i>Antechinus flavipes</i>	Yellow-footed Antechinus	-	V	825
<i>Antechinus minimus maritimus</i>	Swamp Antechinus (mainland)	V	E	15
<i>Anthochaera chrysoptera</i>	Little Wattlebird	ssp	-	11
<i>Antigone rubicunda</i>	Brolga	-	V	86
<i>Aphelocephala leucopsis leucopsis</i>	Southern Whiteface	V	-	1
<i>Aprasia aurita</i>	Eared Worm-lizard	E	E	50
<i>Ardea intermedia plumifera</i>	Plumed Egret	-	R	4
<i>Ardenna carneipes</i>	Flesh-footed Shearwater	-	R	1
<i>Ardenna grisea</i>	Sooty Shearwater	V	-	1

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Arenaria interpres interpres</i>	Ruddy Turnstone	V	R	20
<i>Bidyanus bidyanus</i>	Silver Perch	E	-	1
<i>Biziura lobata menziesi</i>	Musk Duck	-	R	28
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	595
<i>Bubulcus ibis coromandus</i>	Eastern Cattle Egret	-	R	9
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	V	-	21
<i>Calidris alba alba</i>	Sanderling	-	R	13
<i>Calidris canutus rogersi</i>	Red Knot (ssp. rogersi)	V	E	10
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE	E	22
<i>Calidris melanotos</i>	Pectoral Sandpiper	-	R	7
<i>Calidris subminuta</i>	Long-toed Stint	-	R	1
<i>Calidris tenuirostris</i>	Great Knot	V	E	3
<i>Calyptorhynchus banksii graptogyne</i>	Red-tailed Black Cockatoo (south-east)	E	E	114
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	-	V	3
<i>Cereopsis novaehollandiae novaehollandiae</i>	Cape Barren Goose	-	R	1
<i>Charadrius leschenaultii leschenaultii</i>	Greater Sand Plover	V	R	3
<i>Charadrius mongolus mongolus</i>	Lesser Sand Plover	E	E	2
<i>Cladorhynchus leucocephalus</i>	Banded Stilt	-	V	14

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Coracina papuensis robusta</i>	White-bellied Cuckooshrike	-	R	41
<i>Corcorax melanorhamphos</i>	White-winged Chough	-	R	42
<i>Coturnix ypsilophora australis</i>	Brown Quail	-	V	5
<i>Dasyornis broadbenti (NC)</i>	Rufous Bristlebird	-	R	19
<i>Dasyornis broadbenti broadbenti</i>	Rufous Bristlebird	-	R	3
<i>Diomedea exulans complex</i>	Wandering Albatross (complex)	ssp	ssp	4
<i>Dromaius novaehollandiae</i>	Emu	ssp	ssp	33
<i>Drysdalia coronoides</i>	White-lipped Snake	-	R	5
<i>Egretta garzetta nigripes</i>	Little Egret	-	R	2
<i>Egretta sacra sacra</i>	Pacific Reef Heron	-	R	5
<i>Elanus scriptus</i>	Letter-winged Kite	-	V	2
<i>Entomyzon cyanotis cyanotis</i>	Blue-faced Honeyeater	-	R	9
<i>Eulamprus tympanum</i>	Southern Water Skink	-	R	5
<i>Falco peregrinus macropus</i>	Peregrine Falcon	-	R	20
<i>Falco subniger</i>	Black Falcon	-	R	1
<i>Falcunculus frontatus frontatus</i>	Eastern Shrike-tit	-	R	49
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle (Tasmanian Falsistrelle)	-	E	18
<i>Gallinago hardwickii</i>	Latham's Snipe	V	R	87

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Geocrinia laevis</i>	Tasmanian Smooth Froglet	-	R	107
<i>Gerygone olivacea olivacea</i>	White-throated Gerygone	-	R	1
<i>Haematopus fuliginosus fuliginosus</i>	Sooty Oystercatcher	-	R	5
<i>Haematopus longirostris</i>	Pied Oystercatcher	-	R	21
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	-	E	1
<i>Halobaena caerulea</i>	Blue Petrel	V	-	1
<i>Hieraaetus morphnoides</i>	Little Eagle	-	V	4
<i>Hirundapus caudacutus caudacutus</i>	White-throated Needletail	V	V	32
<i>Hylacola pyrrhopygia</i>	Chestnut-rumped Heathwren	ssp	ssp	17
<i>Isoodon obesulus</i>	Southern Brown Bandicoot	ssp	ssp	483
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (SA mainland and KI)	E	V	814
<i>Larus dominicanus dominicanus</i>	Kelp Gull	-	R	1
<i>Lathamus discolor</i>	Swift Parrot	CE	E	5
<i>Lewinia pectoralis pectoralis</i>	Lewin's Rail	-	V	25
<i>Limosa lapponica</i>	Bar-tailed Godwit	ssp	ssp	2
<i>Limosa limosa melanuroides</i>	Black-tailed Godwit	E	R	1
<i>Lissolepis coventryi</i>	Swamp Skink	E	E	11
<i>Lophoictinia isura</i>	Square-tailed Kite	-	E	2

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Macronectes giganteus</i>	Southern Giant Petrel	E	V	3
<i>Macronectes halli</i>	Northern Giant Petrel	V	-	1
<i>Melanodryas cucullata</i>	Hooded Robin	ssp	ssp	9
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (YP, MN, AP, MLR, MM, SE)	E	R	1
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	ssp	-	41
<i>Melithreptus gularis</i>	Black-chinned Honeyeater	-	ssp	14
<i>Microeca fascinans</i>	Jacky Winter	-	ssp	25
<i>Miniopterus orianae bassanii</i>	Southern Bent-winged Bat	CE	E	133
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	-	E	36
<i>Myiagra inquieta</i>	Restless Flycatcher	-	R	29
<i>Nannoperca australis</i>	Southern Pygmy Perch	V	-	69
<i>Nannoperca obscura</i>	Yarra Pygmy Perch	E	-	15
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	CE	E	2
<i>Neophema chrysostoma</i>	Blue-winged Parrot	V	V	105
<i>Neophema elegans elegans</i>	Elegant Parrot	-	R	4
<i>Neophema petrophila zietzi</i>	Rock Parrot	-	R	4
<i>Nesoptilotis leucotis</i>	White-eared Honeyeater	ssp	-	31
<i>Ninox connivens connivens</i>	Barking Owl	-	R	7

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Ninox strenua</i>	Powerful Owl	-	E	37
<i>Notechis scutatus</i>	Tiger Snake	ssp	-	34
<i>Numenius madagascariensis</i>	Far Eastern Curlew	CE	E	2
<i>Numenius phaeopus variegatus</i>	Whimbrel	-	R	3
<i>Nyctophilus gouldi</i>	Gould's Long-eared Bat	-	E	23
<i>Oriolus sagittatus sagittatus</i>	Olive-backed Oriole	-	R	4
<i>Oxyura australis</i>	Blue-billed Duck	-	R	15
<i>Pachycephala olivacea hesperus</i>	Olive Whistler	-	E	6
<i>Parvipsitta pusilla</i>	Little Lorikeet	-	E	1
<i>Petaurus norfolcensis</i>	Squirrel Glider	-	E	6
<i>Petaurus notatus</i>	Kreff's Glider	-	R	60
<i>Petroica boodang boodang</i>	Scarlet Robin	-	R	50
<i>Petroica phoenicea</i>	Flame Robin	-	V	13
<i>Platycercus elegans</i>	Crimson Rosella	ssp	-	81
<i>Plegadis falcinellus</i>	Glossy Ibis	-	R	6
<i>Pluvialis fulva</i>	Pacific Golden Plover	-	R	2
<i>Pluvialis squatarola squatarola</i>	Grey Plover	V	-	3
<i>Podiceps cristatus australis</i>	Great Crested Grebe	-	R	13
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (South East)	-	E	1

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Pseudemoia pagenstecheri</i>	Tussock Skink	-	R	1
<i>Pseudemoia rawlinsoni</i>	Glossy Grass Skink	V	V	6
<i>Pseudophryne bibronii</i>	Brown Broodfrog	-	R	2
<i>Pseudophryne semimarmorata</i>	Southern Broodfrog	-	V	6
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	R	224
<i>Ranoidea raniformis</i>	Southern Bell Frog	V	V	4
<i>Ranoidea raniformis major</i>	Southern Bell Frog (SE)	V	V	24
<i>Rattus lutreolus</i>	Swamp Rat	-	R	324
<i>Rostratula australis</i>	Australian Painted-snipe	E	E	2
<i>Spatula rhynchotis</i>	Australasian Shoveler	-	R	20
<i>Stagonopleura bella</i>	Beautiful Firetail	-	R	8
<i>Stagonopleura bella interposita</i>	Beautiful Firetail (SE)	-	R	9
<i>Stagonopleura guttata</i>	Diamond Firetail	V	V	1
<i>Stercorarius antarcticus lonnbergi</i>	Brown Skua	-	V	3
<i>Sterna hirundo longipennis</i>	Common Tern	-	R	5
<i>Sternula nereis nereis</i>	Fairy Tern	V	E	13
<i>Stictonetta naevosa</i>	Freckled Duck	-	V	5
<i>Stipiturus malachurus polionotum</i>	Southern Emuwren (South East)	-	R	38
<i>Strepera graculina</i>	Pied Currawong	-	ssp	18

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Strepera graculina ashbyi</i>	Pied Currawong	-	E	1
<i>Strepera versicolor</i>	Grey Currawong	-	ssp	29
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	ssp	ssp	35
<i>Thalassarche carteri</i>	Indian Yellow-nosed Albatross	V	E	2
<i>Thalassarche cauta cauta</i>	Shy Albatross	V	V	3
<i>Thalassarche chrysostoma</i>	Grey-headed Albatross	E	V	8
<i>Thalassarche melanophris</i>	Black-browed Albatross	V	-	4
<i>Thinornis cucullatus cucullatus</i>	Hooded Plover	V	V	19
<i>Trichosurus vulpecula</i>	Common Brushtail Possum	-	R	84
<i>Tringa brevipes</i>	Grey-tailed Tattler	-	R	2
<i>Tringa glareola</i>	Wood Sandpiper	-	R	10
<i>Tringa nebularia</i>	Common Greenshank	E	-	23
<i>Turnix varius varius</i>	Painted Buttonquail	-	R	19
<i>Varanus rosenbergi</i>	Heath Goanna	-	V	3
<i>Varanus varius</i>	Lace Monitor	-	R	3
<i>Vombatus ursinus</i>	Common Wombat	-	R	27
<i>Xenus cinereus</i>	Terek Sandpiper	V	R	1
<i>Zanda funerea whiteae</i>	Yellow-tailed Black Cockatoo	-	V	62

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Species Name	Common Name	Conservation Status		Number of Records
		EPBC Act	SA	
<i>Zoothera lunulata</i>	Bassian Thrush	ssp	R	46

Source: NatureMaps (2026). Status: V: Vulnerable; R: Rare; E: Endangered; CE: Critically Endangered, ssp= subspecies listed as threatened.

C. 4. Introduced Species

Table C-4: Priority Pest Weeds and Alert Weeds Identified by the Limestone Coast Landscape Board (2022)

Common name	Scientific name	LSA Act status: Limestone Coast Landscape Board Management Action
Bridal veil	<i>Asparagus declinatus</i>	Declared: eradicate from region
Golden dodder	<i>Cuscuta campestris</i>	Declared: eradicate from region
Mexican feathergrass	<i>Nassella tenuissima</i>	Declared: eradicate from region
Blackberry	<i>Rubus fruticosus</i>	Declared: destroy infestations
Western Cape bridal creeper	<i>Asparagus asparagoides</i>	Declared: destroy infestations
Buffel grass	<i>Cenchrus ciliaris</i>	Declared: destroy infestations
Fountain grass	<i>Cenchrus setaceus</i>	Declared: destroy infestations
Innocent weed	<i>Cenchrus incertus</i> / <i>C. longispinus</i>	Declared: destroy infestations
Khaki weed	<i>Alternanthera pungens</i>	Declared: destroy infestations
Pampas grass	<i>Cortaderia spp</i>	Declared: destroy infestations
Silverleaf nightshade	<i>Solanum elaeagnifolium</i>	Declared: destroy infestations
Texas needlegrass	<i>Nassella leucotricha</i>	Declared: destroy infestations
White weeping broom	<i>Retama raetam</i>	Declared: destroy infestations
Asparagus fern	<i>Asparagus scandens</i>	Declared: destroy infestations
African boxthorn	<i>Lycium ferocissimum</i>	Declared: contain the spread
African feathergrass	<i>Pennisetum macrourum</i>	Declared: contain the spread
African lovegrass	<i>Eragrostis curvula</i>	Declared: contain the spread
Aleppo pine	<i>Pinus halepensis</i>	Declared: contain the spread
Bathurst burr	<i>Xanthium spinosum</i>	Declared: contain the spread
Bluebell creeper	<i>Sollya heterophylla</i>	Declared: contain the spread
Boneseed ssp. <i>monilifera</i>	<i>Chrysanthemoides monilifera</i>	Declared: contain the spread
Caltrop	<i>Tribulus sp.</i>	Declared: contain the spread
Cape tulip	<i>Homeria sp.</i>	Declared: contain the spread
Creeping knapweed	<i>Rhaponticum repens</i>	Declared: contain the spread
Berry Heath (<i>Erica baccans</i>)	<i>Erica baccans</i>	Declared: contain the spread
Gorse	<i>Ulex europaeus</i>	Declared: contain the spread
Hoary cress	<i>Lepidium appelianum</i>	Declared: contain the spread

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Common name	Scientific name	LSA Act status: Limestone Coast Landscape Board Management Action
Madeira vine	<i>Anredera cordifolia</i>	Declared: contain the spread
Prickly pear	<i>Opuntia spp.</i>	Declared: contain the spread
Salvation jane	<i>Echium plantagineum</i>	Declared: contain the spread
Three corner jack	<i>Emex australis</i>	Declared: contain the spread
Three horned bedstraw	<i>Galium tricornutum</i>	Declared: contain the spread
Variegated thistle	<i>Silybum marianum</i>	Declared: contain the spread
Apple of Sodom	<i>Solanum linnaeanum</i>	Declared: protect (i.e. prevent spread)
Arum Lily	<i>Zantedeschia aethiopica</i>	Declared: protect (i.e. prevent spread)
Bladder campion	<i>Silene vulgaris</i>	Declared: protect (i.e. prevent spread)
Coastal tea tree	<i>Leptospermum laevigatum</i>	Declared: protect (i.e. prevent spread)
Cape broom	<i>Genista monspessulana</i>	Declared: protect (i.e. prevent spread)
Cutleaf mignonette	<i>Reseda lutea</i>	Declared: protect (i.e. prevent spread)
Dolichos pea	<i>Dipogon lignosus</i>	Declared: protect (i.e. prevent spread)
English broom	<i>Cytisus scoparius</i>	Declared: protect (i.e. prevent spread)
False caper	<i>Euphorbia terracina</i>	Declared: protect (i.e. prevent spread)
Field bindweed	<i>Convolvulus arvensis</i>	Declared: protect (i.e. prevent spread)
Gazania	<i>Gazania rigens</i>	Declared: protect (i.e. prevent spread)
Horehound	<i>Marrubium vulgare</i>	Declared: protect (i.e. prevent spread)
Italian buckthorn	<i>Rhamnus alaternus</i>	Declared: protect (i.e. prevent spread)
Lincoln weed	<i>Diploaxis tenuifolia</i>	Declared: protect (i.e. prevent spread)
Mirror bush	<i>Coprosma repens</i>	Declared: protect (i.e. prevent spread)
Muskweed	<i>Dittrichia graveolens</i>	Declared: protect (i.e. prevent spread)
Noogoora burr	<i>Xanthium strumarium</i>	Declared: protect (i.e. prevent spread)
Olive	<i>Olea europaea</i>	Declared: protect (i.e. prevent spread)
Polygala	<i>Polygala myrtifolia</i>	Declared: protect (i.e. prevent spread)
Spiny Rush	<i>Juncus acutus</i>	Declared: protect (i.e. prevent spread)
Swamp Oak	<i>Casuarina glauca</i>	Declared: protect (i.e. prevent spread)
Willow spp.	<i>Salix spp.</i>	Declared: protect (i.e. prevent spread)
Bridal creeper	<i>Asparagus asparagoides</i>	Declared: manage pest
Desert ash	<i>Fraxinus angustifolia subsp. oxycarpa</i>	Declared: manage pest
Yellow burweed	<i>Amsinckia calycina</i>	Declared: manage pest

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Common name	Scientific name	LSA Act status: Limestone Coast Landscape Board Management Action
Dog rose	<i>Rosa canina</i>	Declared: manage site
Skeleton weed	<i>Chondrilla juncea</i>	Declared: manage site
Sweet briar	<i>Rosa rubiginosa</i>	Declared: manage site
Sweet pittosporum	<i>Pittosporum undulatum</i>	Declared: manage site
Athel pine	<i>Tamarix aphylla</i>	Declared: monitor
Chilean dodder	<i>Cuscuta chilensis</i>	Declared: monitor
Red dodder	<i>Cuscuta planiflora</i>	Declared: monitor
Hawthorn / May / Azzarola	<i>Crataegus monogyna</i>	Declared: monitor
Wild artichoke	<i>Cynara cardunculus</i>	Declared: monitor
Bulbil watsonia	<i>Watsonia meriana</i> var. <i>bulbillifera</i>	Declared: limited action
Alisma	<i>Alisma lanceolatum</i>	Declared: alert weed
Alkali sida	<i>Sida spinosa</i>	Declared: alert weed
Alligator weed	<i>Alternanthera philoxeroides</i>	Declared: alert weed
Arrowhead	<i>Sagittaria montevidensis</i>	Declared: alert weed
Blue mustard	<i>Chorispora tenella</i>	Declared: alert weed
Broadkernel espartillo	<i>Amelichloa brachychaeta</i>	Declared: alert weed
Broomrape	<i>Orobanche ramosa</i>	Declared: alert weed
Cabomba	<i>Cabomba caroliniana</i>	Declared: alert weed
Calomba daisy	<i>Oncosiphon suffruticosum</i>	Declared: alert weed
Cane needlegrass	<i>Nassella hyalina</i>	Declared: alert weed
Distichlis	<i>Distichlis spicata</i>	Declared: alert weed
Dune onion weed	<i>Asphodelus fistulosus</i>	Declared: alert weed
Elodea	<i>Elodea canadensis</i>	Declared: alert weed
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>	Declared: alert weed
Horsetail	<i>Equisetum hyemale</i>	Declared: alert weed
Hydrocotyle	<i>Hydrocotyle ranunculoides</i>	Declared: alert weed
Lagarosiphon	<i>Lagarosiphon major</i>	Declared: alert weed
Lantana	<i>Lantana camara</i>	Declared: alert weed
Leafy elodea	<i>Egeria densa</i>	Declared: alert weed
Nightstock	<i>Matthiola longipetala</i>	Declared: alert weed
Pheasant's eye	<i>Adonis microcarpa</i>	Declared: alert weed

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Common name	Scientific name	LSA Act status: Limestone Coast Landscape Board Management Action
Perennial thistle	<i>Cirsium arvense</i>	Declared: alert weed
Plumerillo	<i>Jarava plumosa</i>	Declared: alert weed
Poison buttercup	<i>Ranunculus sceleratus</i>	Declared: alert weed
Poison ivy	<i>Toxicodendron radicans</i>	Declared: alert weed
Primrose willow	<i>Ludwigia peruviana</i>	Declared: alert weed
Ragwort	<i>Senecio jacobaea</i>	Declared: alert weed
Rhus tree	<i>Toxicodendron succedaneum</i>	Declared: alert weed
Sagittaria	<i>Sagittaria graminea</i>	Declared: alert weed
Salvinia	<i>Salvinia molesta</i>	Declared: alert weed
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	Declared: alert weed
Serrated tussock	<i>Nassella trichotoma</i>	Declared: alert weed
Tree heath	<i>Erica arborea</i>	Declared: alert weed
Water caltrop	<i>Trapa natans</i>	Declared: alert weed
Water dropwort	<i>Oenanthe pimpinelloides</i>	Declared: alert weed
Water hyacinth	<i>Eichhornia crassipes</i>	Declared: alert weed

Table C-5: Priority Pest Fauna Identified by the Limestone Coast Landscape Board (2022)

Common name	Scientific name	LSA Act status: Limestone Coast Landscape Board Management Action
Wild dog	<i>Canis lupus</i>	Declared: eradicate
Feral pig		Declared: eradicate
Goat	<i>Capra hircus</i>	Declared: eradicate
Chital deer	<i>Axis axis</i>	Declared: eradicate
Rusa deer	<i>Cervus timorensis</i>	Declared: eradicate
Sambar deer	<i>Cervus unicolour</i>	Declared: eradicate
Red deer	<i>Cervus elaphus</i>	Declared: eradicate
Hog deer	<i>Axis porcinus</i>	Declared: eradicate
Wapiti deer	<i>Cervus canadensis</i>	Declared: eradicate
Fallow deer	<i>Dama dam</i>	Declared: eradicate
Brown rat	<i>Rattus norvegicus</i>	Declared: contain spread
Rabbit	<i>Oryctolagus cuniculus</i>	Declared: contain spread
Black rat	<i>Rattus rattus</i>	Declared: protect (i.e. prevent spread)

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Feral cat	<i>Felis catus</i>	Declared: manage pest
Fox	<i>Vulpes vulpes</i>	Declared: manage pest
House mouse	<i>Mus musculus</i>	Declared: manage pest
Starling	<i>Sturnus vulgaris</i>	Declared: manage pest
Eurasian blackbird	<i>Turdus merula</i>	Declared: manage pest
Domestic pigeon	<i>Columba livia</i>	Declared: manage pest
Hare	<i>Lepus europaeus</i>	Declared: manage pest
Asian black spined toad	<i>Duttaphrynus melanostictus</i>	Declared: alert pest
Cane toad	<i>Rhinella marina</i>	Declared: alert pest
Corn snake	<i>Pantherophis guttatus</i>	Declared: alert pest
Common (Indian) myna	<i>Acridotheres tristis</i>	Declared: alert pest
House crow	<i>Corvus splendens</i>	Declared: alert pest
Indian ringneck parakeet	<i>Psittacula krameri</i>	Declared: alert pest
Laughing dove	<i>Spilopelia senegalensis</i>	Declared: alert pest
Red-eared slider	<i>Trachemys scripta elegans</i>	Declared: alert pest
Red Whiskered bulbul	<i>Pycnonotus jocosus</i>	Declared: alert pest
Song thrush	<i>Turdus philomelos</i>	Declared: alert pest
Tree sparrow	<i>Passer montanus</i>	Not declared: alert pest
Water buffalo	<i>Bubalus bubalis</i>	Not declared: alert pest

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Appendix D Beach Risk Matrix

The risk assessment that is summarised in the impact assessment tables in Section 5 uses the Beach risk matrix definitions of likelihood and consequence.

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Risk Matrix	CONSEQUENCE CATEGORY					LIKELIHOOD					
	PEOPLE	ENVIRONMENT	REPUTATION	FINANCIAL ¹	LEGAL	A. Remote	B. Highly Unlikely	C. Unlikely	D. Possible	E. Likely	F. Almost Certain
	Impact to Beach or contracting personnel	Natural environment	Community safety, reputation/social licence, media, items of cultural significance.	Financial impact (e.g. due to loss of revenue, business interruption, asset loss etc.)	Breach of law, prosecution, civil action	<1% chance of occurring within the next year. Requires exceptional circumstances, unlikely event in the long-term future. Only occur as a 100-year event.	>1% chance of occurring within the next year. May occur but not for a while. Could occur within a few years to decades.	>5% chance of occurring within the next year. May occur but not for a while. Could occur within months to years.	>10% chance of occurring within the next year. May occur shortly but a distinct probability it won't. Could occur within weeks to months.	>50% chance of occurring within the next year. Balance of probability will occur. Could occur within days to weeks.	99% chance of occurring within the next year. Impact is occurring now. Could occur within days to weeks.
CONSEQUENCE	6 Catastrophic	Multiple fatalities >4 or severe irreversible disability to large group of people (>10)	Catastrophic offsite or onsite release or spill; long-term destruction of highly valued ecosystems; significant effects on endangered species or habitats; irreversible or very long-term impact	Multiple community fatalities; complete loss of social licence; prolonged negative national media; complete loss of items of cultural significance	>\$500m	Prolonged and complex civil and/or regulatory litigation; potential jail terms and/or very high fines and/or damages claim	HIGH	HIGH	VERY HIGH	VERY HIGH	VERY HIGH
	5 Critical	1-3 fatalities or serious irreversible disability (>30%) to multiple persons (<10)	Significant offsite or onsite release or spill; eradication or impairment of the ecosystem; significant impact on highly valued species or habitats; widespread long-term impact	Community fatality; significant loss of social licence; negative national media for 2 or more days; significant damage to items of cultural significance	\$100m-\$500m	Civil and/or regulatory litigation; potential significant fines and/or damages claim	MEDIUM	MEDIUM	HIGH	VERY HIGH	VERY HIGH
	4 Major	Serious permanent injury/illness or moderate irreversible disability (<30%) to one or more persons	Major offsite or onsite release or spill; very serious environmental effects, such as displacement of species and partial impairment of ecosystem; major impact on highly valued species or habitats; widespread medium and some long-term impact	Serious permanent injury to community member; major damage to social licence; negative national media; major damage to items of cultural significance	\$10m-\$100m	Civil and/or regulatory litigation; potential major fine and damages claim	MEDIUM	MEDIUM	HIGH	HIGH	VERY HIGH
	3 Serious	Serious reversible/ temporary injury/illness; Lost Time Injury >5 days or Alternate/Restricted Duties >1 month	Minor offsite or onsite release or spill; serious short-term effect to ecosystem functions; serious impact on valued species or habitats; moderate effects on biological or physical environment	Serious reversible injury to community member; serious damage to social licence; negative state media; serious damage to items of cultural significance	\$1m-\$10m	Serious potential breach of law; report and investigation by regulator; possible prosecution or regulatory notice (e.g. improvement notice or equivalent), or possible civil litigation and serious damages claim	LOW	MEDIUM	MEDIUM	HIGH	HIGH
	2 Moderate	Reversible temporary injury/illness requiring Medical Treatment; Lost Time Injury ≤5 days or Alternate/Restricted Duties for ≤1 month	Event contained within site; short-term effects but not affecting ecosystem functions; some impact on valued species or habitats; minor short-term damage to biological and/or physical environment	Moderate injury to community member; moderate impact to social licence; negative local media; moderate damage to items of cultural significance	\$100k-\$1m	Potential breach of law or non-compliance; inquiry by a regulator leading to Low-level legal issues; possible civil litigation and moderate damages claim	LOW	LOW	MEDIUM	MEDIUM	HIGH
	1 Minor	First Aid Injury/Illness	Spill limited to release location; minor effects but not affecting ecosystem functions; no impact on valued species or habitats; low-level impacts on biological and physical environment	Minor injury to community member; public concern restricted to local complaints; minor damage to items of cultural significance	≤\$100k	Minor potential breach of law; not reportable to a regulator; on the spot fine or technical non-compliance	LOW	LOW	LOW	MEDIUM	MEDIUM

Appendix E Consultation Materials

[To be completed following Beach consultation]

Appendix F Submissions and Responses Summary (Beach Consultation)

[To be completed following Beach consultation]

Appendix G Submissions and Responses Summary (DEM Consultation)

[To be completed following DEM Consultation]