Our ref: MER F2010/000471
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Government of South Australia
Department for Energy and Mining

26 May 2021

Environmental Impact Classification – Pursuant to Section 98 of the *Petroleum and Geothermal Energy Act 2000* – Otway Basin Geophysical Operations – Statement of Environmental Objectives, Beach Energy Ltd, April 2021.

Pursuant to Section 98 of the *Petroleum and Geothermal Energy Act 2000* (the Act) the Minister must classify the regulated activities covered by a prepared Environmental Impact Report (EIR) as either of low, medium or high environmental impact.

The classification must be made on the basis of:

- The prepared EIR;
- Criteria established for classifying the level of environmental impact of regulated activities, a copy of which is found on the Department for Energy and Mining - Energy Resource Divisions (DEM-ERD) web page:

  https://www.petroleum.sa.gov.au/regulation/environmental-register#EICcriteria; and
- Comment received from relevant Government departments in accordance with established administrative arrangements between these departments and DEM-ERD.

This document summarises the classification made by DEM-ERD on the *Otway Basin Geophysical Operations – Statement of Environmental Objectives, Beach Energy Ltd, April 2021.* This classification is based on information provided in the EIR prepared by Beach Energy Ltd.

ACTIVITY CLASSIFICATION SUMMARY

1. From an analysis of the potential environmental significance of the events and potential impacts associated with the proposed activities against the classification criteria referred to above (assessment provided as Attachment 1), these regulated activities have been classified as **low impact**.

2. Of 44 potential environmental events assessed, 44 were deemed to be of low potential environmental significance, none of medium potential environmental significance and none of high potential environmental significance. This is due to the fact that appropriate management measures will be implemented by Beach Energy Ltd to avoid or mitigate any potential environmental consequences.

CONSULTATION

1. For a low impact classification, DEM-ERD consults with the Department of Environment, Water (DEW) and the Environment Protection Authority (EPA) on the impact classification level in accordance with relevant administrative arrangement's dated 11 November 2005 and 25 June 2012 respectively.

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2. Concurrence was received from DEW and the EPA on 21 January and 1 February 2021 respectively agreed with the classification of **low impact.**

3. In accordance with Section 101 of the Act, activities classified as low impact require DEM-ERD to undertake consultation with relevant government agencies. This consultation period was for at least 20 business days. Consultation was initiated on 2 February 2021 and closed on 5 March 2021.

4. Comments received from this consultation are tabled in Appendix F of the EIR whereby all reasonable comments within scope need to be adequately addressed. DEM-ERD are satisfied that all comments raised during consultation have been adequately addressed.

   *The Environmental Register can be accessed via the webpage at - https://www.petroleum.sa.gov.au/regulation/environmental-register#SEO

Pursuant to delegated powers, I classify this regulated activity as **low impact.**

Nick Panagopolous
A/Executive Director
Energy Resources Division
Department for Energy and Mining
Delegate of the Minister for Energy and Mining

Activity:	**Environmental Impact Classification**																		
Company:	**Beach Energy Ltd**																		
Project:	**Otway Basin Petroleum Drilling Operations**																		
				PREDICTABILITY (L=Low, H=High)						**MANAGEABILITY**								
REF	**TYPE OF IMPACT**	**EVENT(S)**	**POTENTIAL CONSEQUENCES**	**SIZE**	**SCOPE**	**DURATION**	**FREQUENCY**	**STAKEHOLDERS**	**SIGNIFICANCE**	**AVOIDANCE**	**PROBABILITY**	**DURATION**	**SIZE AND SCOPE**	**CUMULATIVE EFFECTS**	**STAKEHOLDER CONCERNS**	**SIGNIFICANCE**	**ASSOCIATED INFORMATION**	**Environmental significance**
	Natural Environment Impacts																	
	Soil Impacts																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 5 km north of PEL 494) are black self-mulching cracking clays. Dunes are comprised of a mix of deep sands (with marine shell fragments) and interdunal flats characterised by either heavier clays, that overlie limestone or sands that overlie clay. In places, sands have been hardened to rock by percolating groundwater. 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). Soils in the licence area are dominated by thick acidic sands over clay with areas of wet leached sands, that can be susceptible to seasonal waterlogging (DEW 2019; 2019a).	
3.6.3; 5.1; Table 5-1		Earthworks associated with seismic line and drilling site preparation, access track, camp site, laydown and magazine construction and rehabilitation / restoration activities	Impacts to soil (e.g. erosion, inversion, compaction)	H	H	H	H	H	1	No	Medium	Short	Small / Confined	N/A	N/A	2	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). Earthworks for survey infrastructure construction and rehabilitation / restoration activities have the potential to cause localised impacts to soil through inversion, compaction or increased erosion risk. In order to minimise surface impacts and facilitate rehabilitation, landholders will be consulted regarding the earthworks required, the location of seismic lines, drilling sites, access tracks, camp sites, laydown yards, explosive storage magazines and other relevant issues. Topsoil is removed from areas planned to be paved with gravel (e.g. some camp sites, laydowns, magazines and access tracks will be paved) and stockpiled for use in rehabilitation / restoration. Paving material (gravel) is imported from a licensed quarry. The bulk of paving materials are usually removed during rehabilitation / restoration (unless the landholder requests they are retained) and stockpiled topsoil re-spread over the site. Disturbance to soil from site preparation, and construction activities, is relatively localised and restricted to a defined and agreed survey or work area. Rehabilitation / restoration will be undertaken in consultation with the landholder, with measures such as ripping of compacted soils, replacement of topsoil that has been removed, restoration of soil profiles and contours, and reseeding implemented to ensure rehabilitation success (refer to Section 3.6.7 for further detail).	**LOW**
3.6.3; 5.1; Table 5-1		Drilling activities	Impacts to soil (e.g. erosion, inversion, compaction, subsidence)	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	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 Following detonation of each shot hole, the detonation wiring is cut off a few centimetres below the surface level, and any subsidence in the hole is remediated 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. Localised disturbance at drilling sites will generally naturally rehabilitate within a short period of time following natural processes e.g. rainfall and regrowth vegetation. Backfilling and plugging of all drill holes will be undertaken 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). This specification outlines how drilling activities are to be undertaken when drill holes encounter unconfined and confined groundwater resources in South Australia.	**LOW**
3.6.6; 5.1; Table 5-1		Spills or leaks associated with: • storage of fuel, oil and chemicals • refuelling operations and high-pressure hydraulic systems	Contamination of soil	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	Improper transportation, storage and handling of fuel, oil and chemicals has the potential to result in localised contamination of soil and shallow groundwater. In order to minimise this risk, fuel, oil and chemicals stored on site are stored and handled in accordance with relevant standards and guidelines (e.g. AS 1940, EPA guideline 080/16 Bunding and Spill Management and the Australian Dangerous Goods Code), and Safety Data Sheets (SDS). Fuel, oil and chemicals will be stored in their product containers with appropriate secondary containment (e.g. lined, bunded areas or on selfbunded pallets). Bulk storage and handling of fuel and chemicals is restricted to designated areas i.e. typically paved laydown or camp areas. Vehicles, drilling equipment and associated seismic survey equipment have the potential to cause minor leaks of fuel and chemicals during the course of geophysical survey operations. All vehicles, drill equipment and associated equipment will be operated and maintained in accordance with specifications to minimise the potential for a spill or leak (e.g. oil leak or hydraulic hose failure). Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process in accordance with relevant Beach standards. Appropriate emergency / spill response procedures will be in place for any losses of containment, and spills will be immediately cleaned up and any contaminated material removed off-site for appropriate treatment or disposal at an EPA licensed facility. All losses of containment and spills, no matter how minor, will be immediately reported to the Beach Operations Supervisor. 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). Affected areas would be fenced if a threat is posed to people, stock or wildlife.	**LOW**
3.6.6; 5.1; Table 5-1		Storage, handling and disposal of waste	Localised contamination of soil	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	Inappropriately managed waste has the potential to result in localised disturbance or contamination of soil and shallow groundwater. Storage of waste and transport to licensed disposal or recycling facilities will be undertaken in accordance with relevant legislation and guidelines. Waste generation will be minimised where practicable, waste will be securely stored and licensed waste transport contractors will be used. As discussed in Section 3.6.6 , all wastewater will be stored and disposed of in accordance with the South Australian Public Health (Wastewater) Regulations 2013 or to the satisfaction of the Department of Health) and consistent with the Environment Protection (Water Quality) Policy 2015. Excess drill cuttings will be removed from site and disposed of at an appropriately licensed waste management facility unless otherwise agreed with the landowner. EPAs 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. 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.	**LOW**
3.6.6; 5.5; Table 5-1		Storage, handling and use of explosives	Localised contamination of soil	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	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 Explosives Act 1936 and Explosives Regulations 2011. 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. 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. 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.	**LOW**
	Surface Water and Groundwater Impacts																The South East 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 South East 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). Groundwater is the primary source of water for the South East 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 South East encompasses some of the largest groundwater systems in Australia (Brown et al. 2006). The resource is made up of two distinct systems, 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 (South East NRM Board 2010). 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 (South East NRM Board 2013).The unconfined TLA is utilised more extensively than theTCSA, 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.	
3.6.3; 5.2; Table 5-1		Earthworks associated with seismic line and drilling site preparation, access track, camp site, laydown and magazine construction and rehabilitation / restoration activities	Disturbance to natural drainage patterns; Sedimentation of surface waters	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	Earthworks for survey infrastructure construction and rehabilitation / restoration activities have the potential to alter natural drainage patterns or result in increased sedimentation of surface water features. This can potentially impact native vegetation and fauna (particularly wetland communities) as discussed in Section 5.3. Geophysical survey areas and associated infrastructure will be located, prepared and / or constructed to avoid significantly impacting surface drainage patterns or surface water features. Where necessary, temporary culverts will be installed to ensure natural surface drainage is maintained. Landholders are consulted regarding crossings of features such as drainage channels and appropriate measures (e.g. culverts) are installed where required. 'Water affecting activities (as defined by the LSA Act and Limestone Coast Landscape Plan) are not undertaken unless relevant permits have been obtained. Sites will be rehabilitated to restore natural surface profiles and original drainage patterns. 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.	**LOW**

REF	TYPE OF IMPACT	EVENT(S)	POTENTIAL CONSEQUENCES	SIZE	SCOPE	DURATION	FREQUENCY	STAKEHOLDERS	SIGNIFICANCE	AVOIDANCE	PROBABILITY	DURATION	SIZE AND SCOPE	CUMULATIVE EFFECTS	STAKEHOLDER CONCERNS	SIGNIFICANCE	ASSOCIATED INFORMATION	Environmental significance
3.6.3; 5.1; Table 5-1		Drilling activities	Contamination of aquifers or crossflow between aquifers	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	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. Drilling fluids in the down-hole environment have the potential to invade freshwater aquifers near the drill hole and cause localised contamination. Water based drilling muds will be used if mud drilling is undertaken to avoid contamination of the freshwater aquifers near the drill hole. Drilling, backfilling and plugging of all drill holes will be undertaken in accordance with relevant industry standards and guidelines to avoid aquifer contamination or crossflow, as discussed in Section 3.6.3. Any monitoring bores that are drilled (e.g. fibre optic monitoring bore holes) will also be constructed in accordance with relevant industry standards to ensure that crossflow between aquifers is prevented. Backfilling and plugging of all drill holes will be undertaken 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). This specification outlines how drilling activities are to be undertaken when drill holes encounter unconfined and confined groundwater resources in South Australia.	LOW
3.6.6; 5.1; Table 5-1		Spills or leaks associated with: • storage of fuel, oil and chemicals • refuelling operations and high-pressure hydraulic systems	Localised contamination of ground or surface water	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	Improper transportation, storage and handling of fuel, oil and chemicals has the potential to result in localised contamination of soil and shallow groundwater. In order to minimise this risk, fuel, oil and chemicals stored on site are stored and handled in accordance with relevant standards and guidelines (e.g. AS 1940, EPA guideline 080/16 Bunding and Spill Management and the Australian Dangerous Goods Code), and Safety Data Sheets (SDS). Fuel, oil and chemicals will be stored in their product containers with appropriate secondary containment (e.g. lined, bunded areas or on selfbunded pallets). Bulk storage and handling of fuel and chemicals is restricted to designated areas i.e. typically paved laydown or camp areas. Vehicles, drilling equipment and associated seismic survey equipment have the potential to cause minor leaks of fuel and chemicals during the course of geophysical survey operations. All vehicles, drill equipment and associated equipment will be operated and maintained in accordance with specifications to minimise the potential for a spill or leak (e.g. oil leak or hydraulic hose failure). Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process in accordance with relevant Beach standards. Appropriate emergency / spill response procedures will be in place for any losses of containment, and spills will be immediately cleaned up and any contaminated material removed off-site for appropriate treatment or disposal at an EPA licensed facility. All losses of containment and spills, no matter how minor, will be immediately reported to the Beach Operations Supervisor. 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). Affected areas would be fenced if a threat is posed to people, stock or wildlife.	LOW
3.6.6; 5.1; Table 5-1		Storage, handling and disposal of waste	Localised contamination of ground or surface water	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	Inappropriately managed waste has the potential to result in localised disturbance or contamination of soil and shallow groundwater. Storage of waste and transport to licensed disposal or recycling facilities will be undertaken in accordance with relevant legislation and guidelines. Waste generation will be minimised where practicable, waste will be securely stored and licensed waste transport contractors will be used. As discussed in Section 3.6.6 , all wastewater will be stored and disposed of in accordance with the South Australian Public Health (Wastewater) Regulations 2013 or to the satisfaction of the Department of Health) and consistent with the Environment Protection (Water Quality) Policy 2015. Excess drill cuttings will be removed from site and disposed of at an appropriately licensed waste management facility unless otherwise agreed with the landowner. EPAs 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. 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.	LOW
3.6.6; 5.1; Table 5-1		Storage, handling and use of explosives	Localised contamination of ground or surface water	H	L	H	H	L	1	No	Low	N/A	N/A	N/A	N/A	1	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. If buried explosive charges fail to detonate, there is potential for localised impact on aquifer water quality in the vicinity of the charge. Seismic charges are encased in sealed hard-plastic shells, which limits the potential for migration of watersoluble components such as TNT prior to detonation, however undetonated charges could release these components over time. Practices for installation and detonation (e.g. multiple detonators, appropriate waterproofing) minimise the chance of detonation failure, and failure rates are very low (e.g. significantly less than 1%). Seismic charges such as Geoprime dBX are also designed with micro-organisms incorporated directly into the charge to facilitate bioremediation of undetonated explosive when submerged in water.	LOW
3.6.6; 5.1; Table 5-1		Subsurface detonation of explosive charge	Crossflow between aquifers	H	L	L	H	L	2	No	Low	N/A	N/A	N/A	N/A	1	Physical impact of buried explosive charges on the surrounding formation is very limited, with detonation resulting in a small radius of rock around the charge to be fractured (typically less than 2 m) and with the implementation of adequate buffer distances this would not impact groundwater infrastructure, and would not affect aquifer transmissivity. Adequate buffer distances (vertical and horizontal) between buried seismic charges and groundwater wells will be incorporated into survey design. Additional monitoring or mitigation (e.g. sympathetic detonation) could be implemented for unexploded charges if required to manage any risks identified. Adequate buffer distances (vertical and horizontal) between buried seismic charges and groundwater wells incorporated into survey design. Buried seismic charges will not be placed near aquifer boundaries. Risk assessment for any unexploded charges to identify whether additional monitoring or mitigation measures are required (e.g. monitoring bore, sympathetic detonation). Note: Frequency of failure of charge detonation is very low – typically less than 0.5%	LOW
	Vegetation Impacts																There has been widespread vegetation clearance across the South East region. The proportion of native vegetation remaining ranges from approximately 2.5% remnant vegetation within the Hundred of Mount Muirhead (north of Millicent) to 19% in the Hundred of Waterhouse. The majority of areas average approximately 10% remnant vegetation. Remnant vegetation mapping in the licence areas indicates native vegetation cover ranging approximately from 8% to 14 % (NatureMaps 2018). Broad vegetation communities present include eucalypt woodland and forest, mallee, coastal shrublands, heath, shrublands, coastal tussock grasslands, sedgeland, and fernland (Croft et al. 1999). A list of floristic communities mapped in areas of remnant native vegetation within Beach's licence areas is provided in Appendix C.	
3.6.3; 5.4; Table 5-1		Earthworks associated with seismic line and drilling site preparation, access track, camp site, laydown and magazine construction and rehabilitation / restoration activities	Introduction and spread of weeds or pathogens	L	L	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	The introduction of weeds or pathogens by vehicles and equipment (particularly earthmoving and vegetation slashing / mulching equipment) poses a potentially significant impact to land use (and biodiversity). A range of measures will be undertaken to manage the potential for the introduction or spread of weeds or pathogens, including •consultation with landholders and Limestone Coast Landscape Board officers to identify any potential issues or specific management requirements •ensuring that vehicles and equipment arriving at the site are clean and free of soil and plant material •assessment of vehicles and equipment entering the region or moving between sites (especially from weed or pathogen infested areas into non-infested areas) for the risk of transporting weeds and pathogens and cleaning them down where appropriate •using local earthworks contractors where possible rather than bringing in equipment from outside the region •sourcing of any paving / drill hole backfilling materials from licensed quarries that are free of weeds •monitoring sites and access tracks for new weed infestations, with treatment undertaken as necessary in accordance with requirements of the landholder, and if appropriate the Limestone Coast Landscape Board.	LOW
3.6.3; 5.3; Table 5-1		Earthworks associated with seismic line and drilling site preparation, access track, camp site, laydown and magazine construction and rehabilitation / restoration activities	Damage to native vegetation and wildlife habitats	H	H	H	H	L	1	No	Medium	Medium	Small / Confined	N/A	N/A	2	Earthworks and vegetation clearing activities have the potential to damage native vegetation and wildlife habitats (including wetland communities) and disturb or injure fauna. In the onshore Otway Basin, a large proportion of the native vegetation has been cleared or heavily modified for agriculture and forestry. Consequently, the clearance of native vegetation for access tracks, camp sites, laydowns and magazines can generally be avoided by locating this survey infrastructure in previously cleared or disturbed areas As discussed in Section 5.1, there is generally significant spatial tolerance to locate geophysical survey designs and associated infrastructure to minimise surface disturbance, and prioritise use of pre-disturbed areas. Typically, environmental sensitivities such as remnant native vegetation, presence of listed species or habitat and significant wetland areas are identified early during the planning process (refer to Section 3.6.1), and appropriate modifications are made to ensure activities are located to minimise disturbance to sensitive areas and maximise use of pre-disturbed areas. Appropriately trained and experienced personnel have assessed or scouted proposed geophysical survey areas and infrastructure locations to identify and flag significant (or listed) species and communities (including wetland communities). 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. Prioritise location of geophysical survey activities and infrastructure in areas of existing disturbed land wherever practicable. Significant disturbance to areas of high quality or significant8 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. Low impact seismic survey methods used to minimise impacts to vegetation wherever practicable e.g. walk-in methods, use of vegetation slashing / mulching equipment. Activities are not carried out in parks or reserves established under the National Parks and Wildlife Act.	LOW
3.6.6; 5.3; Table 5-1		Spills or leaks associated with: • storage of fuel, oil and chemicals • refuelling operations and high-pressure hydraulic systems	Damage to native vegetation and wildlife habitats	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	The potential for wildlife (and stock) to access contaminants and waste is limited. As discussed in Section 5.1, fuel, oil and chemicals will be stored in their product containers with appropriate secondary containment (e.g. lined, bunded areas or on self-bunded pallets). Bulk storage and handling of fuel and chemicals is restricted to designated areas. Contaminants from spills or leaks are likely to be confined to designated areas (e.g. camp sites, laydowns), and will be immediately cleaned up. Waste will be stored in covered bins before being transported off-site for disposal. Spill and drip trays are provided to address minor drips and spills resulting from re-fuelling operations. Storage and handling of fuel and chemicals is undertaken in accordance with Safety Data Sheets (SDS), and relevant standards and guidelines such as the EPA Bunding Guidelines and Australian Standard 1940. Potential spill containment practices include containment of fuel drums within portable bunding. The storage of fuel at camp sites is contained within tankers utilising safety features such as double-skins, safety cut-off valves, top accessing etc. to minimise or eliminate the potential for spills.	LOW
3.6.3; 5.3; Table 5-1		Fire (resulting from activities)	Loss of native vegetation and wildlife habitats	L	L	H	H	L	2	No	Low	N/A	N/A	N/A	N/A	1	Fire initiated by site activities (e.g. sparks from vehicles or equipment) has the potential to impact large areas of vegetation. Measures will be in place to prevent fires including firebreaks, restriction of vehicles to tracks, seismic lines and cleared areas, maintenance of suitable fire-fighting equipment on site and liaison with the CFS. 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. Confinement of flammable sources, restrictions on certain procedures and ready access to suitable fire-fighting equipment (e.g. fire unit consisting of trailer with water tank, pump and hoses in high fire danger season). Liaise with CFS regarding operations to ensure fire concerns are addressed and any Fire and Emergency Services Act requirements are met (e.g. permits for 'hot work' on fire ban days if required). Where necessary (e.g. in fire danger season), fire break constructed around camps/operational sites. Response to fire included in Emergency Response Plan. 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	LOW

REF	TYPE OF IMPACT	EVENT(S)	POTENTIAL CONSEQUENCES	SIZE	SCOPE	DURATION	FREQUENCY	STAKEHOLDERS	SIGNIFICANCE	AVOIDANCE	PROBABILITY	DURATION	SIZE AND SCOPE	CUMULATIVE EFFECTS	STAKEHOLDER CONCERNS	SIGNIFICANCE	ASSOCIATED INFORMATION	Environmental significance
3.6.3; 5.3; Table 5-1		Storage, handling and disposal of waste	Damage to native vegetation and wildlife habitats	H	H	H	H	H	1	Yes	N/A	N/A	N/A	N/A	N/A	1	Inappropriately managed waste has the potential to result in localised damage to vegetation and habitat. Storage of waste and transport to licensed disposal or recycling facilities will be undertaken in accordance with relevant legislation and guidelines. Waste generation will be minimised where practicable, waste will be securely stored and licensed waste transport contractors will be used. As discussed in Section 3.6.6 , all wastewater will be stored and disposed of in accordance with the South Australian Public Health (Wastewater) Regulations 2013 or to the satisfaction of the Department of Health) and consistent with the Environment Protection (Water Quality) Policy 2015. Excess drill cuttings will be removed from site and disposed of at an appropriately licensed waste management facility unless otherwise agreed with the landowner. EPAs 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. 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.	LOW
	Native Fauna Impacts																The South East supports a range of threatened fauna species, and several species listed under EPBC Act NPW Act are recorded or predicted by databases to occur in the region. Searches of the BDBSA and the EPBC Act PMST were undertaken for records of listed fauna in the search area (as defined in Section 4.5.4) (NatureMaps, 2019; DEE, 2019a). The BDBSA search identified records for 54 fauna species listed under the NPW Act in the search area. The results included records for 11 Endangered, 15 Vulnerable and 28 Rare species. Further detail on listed species recorded in the search area is provided in Appendix C. The PMST search identified 25 EPBC Act listed fauna species that may potentially occur or have suitable habitat in the search area. BDBSA records indicate nine EPBC Act listed fauna species have been recorded in the search area (refer to Table 4-4).	
3.6.3; 5.3; Table 5-1		Earthworks associated with seismic line and drilling site preparation, access track, camp site, laydown and magazine construction and rehabilitation / restoration activities	Damage to native vegetation and wildlife habitats	H	H	H	H	L	1	No	Medium	Medium	Small / Confined	N/A	N/A	2	Earthworks and vegetation clearing activities have the potential to damage native vegetation and wildlife habitats (including wetland communities) and disturb or injure fauna. In the onshore Otway Basin, a large proportion of the native vegetation has been cleared or heavily modified for agriculture and forestry. Consequently, the clearance of native vegetation for access tracks, camp sites, laydowns and magazines can generally be avoided by locating this survey infrastructure in previously cleared or disturbed areas As discussed in Section 5.1, there is generally significant spatial tolerance to locate geophysical survey designs and associated infrastructure to minimise surface disturbance, and prioritise use of pre-disturbed areas. Typically, environmental sensitivities such as remnant native vegetation, presence of listed species or habitat and significant wetland areas are identified early during the planning process (refer to Section 3.6.1), and appropriate modifications are made to ensure activities are located to minimise disturbance to sensitive areas and maximise use of pre-disturbed areas. Appropriately trained and experienced personnel have assessed or scouted proposed geophysical survey areas and infrastructure locations to identify and flag significant (or listed) species and communities (including wetland communities). 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. Prioritise location of geophysical survey activities and infrastructure in areas of existing disturbed land wherever practicable. Significant disturbance to areas of high quality or significant8 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. Low impact seismic survey methods used to minimise impacts to vegetation wherever practicable e.g. walk-in methods, use of vegetation slashing / mulching equipment. Activities are not carried out in parks or reserves established under the National Parks and Wildlife Act.	LOW
3.6.3; 5.3; Table 5-1		Earthworks associated with seismic line and drilling site preparation, access track, camp site, laydown and magazine construction and rehabilitation / restoration activities	Disturbance to native fauna	H	H	H	H	L	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Earthworks and vegetation clearing activities have the potential to damage native vegetation and wildlife habitats (including wetland communities) and disturb or injure fauna. In the onshore Otway Basin, a large proportion of the native vegetation has been cleared or heavily modified for agriculture and forestry. Consequently, the clearance of native vegetation for access tracks, camp sites, laydowns and magazines can generally be avoided by locating this survey infrastructure in previously cleared or disturbed areas As discussed in Section 5.1, there is generally significant spatial tolerance to locate geophysical survey designs and associated infrastructure to minimise surface disturbance, and prioritise use of pre-disturbed areas. Typically, environmental sensitivities such as remnant native vegetation, presence of listed species or habitat and significant wetland areas are identified early during the planning process (refer to Section 3.6.1), and appropriate modifications are made to ensure activities are located to minimise disturbance to sensitive areas and maximise use of pre-disturbed areas. Appropriately trained and experienced personnel have assessed or scouted proposed geophysical survey areas and infrastructure locations to identify and flag significant (or listed) species and communities (including wetland communities). 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. Prioritise location of geophysical survey activities and infrastructure in areas of existing disturbed land wherever practicable. Significant disturbance to areas of high quality or significant8 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. Low impact seismic survey methods used to minimise impacts to vegetation wherever practicable e.g. walk-in methods, use of vegetation slashing / mulching equipment. Activities are not carried out in parks or reserves established under the National Parks and Wildlife Act. Where excavations are required to be open for an extended period (e.g. overnight), they will be covered or fenced to exclude wildlife and stock. sought regarding measures to mitigate potential impacts, particularly during breeding season. Undertake detailed assessments and EPBC Act referral (if required) if avoidance of species or habitats is not possible. Fauna mortality (if it occurs) to be captured by incident reporting system and advice from an ecologist if required.	LOW
3.6.3; 5.3; Table 5-1		Physical presence of machinery, equipment and camp and personnel.	Disturbance to native fauna	H	H	H	H	L	1	No	Low	N/A	N/A	N/A	N/A	1	Earthworks and vegetation clearing activities have the potential to damage native vegetation and wildlife habitats (including wetland communities) and disturb or injure fauna. In the onshore Otway Basin, a large proportion of the native vegetation has been cleared or heavily modified for agriculture and forestry. Consequently, the clearance of native vegetation for access tracks, camp sites, laydowns and magazines can generally be avoided by locating this survey infrastructure in previously cleared or disturbed areas As discussed in Section 5.1, there is generally significant spatial tolerance to locate geophysical survey designs and associated infrastructure to minimise surface disturbance, and prioritise use of pre-disturbed areas. Typically, environmental sensitivities such as remnant native vegetation, presence of listed species or habitat and significant wetland areas are identified early during the planning process (refer to Section 3.6.1), and appropriate modifications are made to ensure activities are located to minimise disturbance to sensitive areas and maximise use of pre-disturbed areas. Appropriately trained and experienced personnel have assessed or scouted proposed geophysical survey areas and infrastructure locations to identify and flag significant (or listed) species and communities (including wetland communities). 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. Prioritise location of geophysical survey activities and infrastructure in areas of existing disturbed land wherever practicable. Significant disturbance to areas of high quality or significant8 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. Low impact seismic survey methods used to minimise impacts to vegetation wherever practicable e.g. walk-in methods, use of vegetation slashing / mulching equipment. Activities are not carried out in parks or reserves established under the National Parks and Wildlife Act. Where excavations are required to be open for an extended period (e.g. overnight), they will be covered or fenced to exclude wildlife and stock. sought regarding measures to mitigate potential impacts, particularly during breeding season. Undertake detailed assessments and EPBC Act referral (if required) if avoidance of species or habitats is not possible. Fauna mortality (if it occurs) to be captured by incident reporting system and advice from an ecologist if required.	LOW
3.6.3; 5.3; Table 5-1		Noise / light / vibration emissions	Disturbance to native fauna	H	H	H	H	L	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Potential disturbance to wildlife from site activities (e.g. light, noise, vibration, presence of machinery, camp and personnel) is short term, localised and generally of limited significance in the region given the existing land uses and extent of vegetation clearance and habitat modification. The environmental assessment undertaken during the planning process will identify whether there are specific issues within a particular survey area (e.g. breeding of the Endangered Red-tailed Black-Cockatoo, or likely indirect impacts to adjacent conservation reserves), and changes to the survey design, and / or mitigation measures, would be made / developed to avoid potential impacts. Relevant agencies (e.g. DEW, DAWE) would be consulted during regulatory environmental approvals process where required. Activities are restricted to agreed / defined areas. Machinery, equipment and camps removed from site promptly following completion of activities, particularly in visible locations. Lighting will be positioned to minimise light emanating from sites during operations.	LOW
3.6.3; 5.3; Table 5-1		Use of roads; movement of vehicles and heavy machinery	Injury or death of native fauna	H	H	H	L	L	1	No	Medium	Short	Small / Confined	N/A	N/A	2	The movement of vehicles and machinery along roads and access tracks has the potential to impact wildlife, principally through collisions. This is likely to be relatively insignificant due to the level of existing traffic, the short-term nature of the activities and the limited extent of significant fauna habitats in the licence area. Transport procedures (e.g. speed restrictions, limitation of movements at night) will also reduce the potential level of impact.	LOW
3.6.6; 5.3; Table 5-1		Spills or leaks associated with: • storage of fuel, oil and chemicals • refuelling operations and high-pressure hydraulic systems	Access to contaminants by native fauna	H	H	H	H	L	1	No	Low	N/A	N/A	N/A	N/A	1	The potential for wildlife (and stock) to access contaminants and waste is limited. As discussed in Section 5.1, fuel, oil and chemicals will be stored in their product containers with appropriate secondary containment (e.g. lined, bunded areas or on self-bunded pallets). Bulk storage and handling of fuel and chemicals is restricted to designated areas. Contaminants from spills or leaks are likely to be confined to designated areas (e.g. camp sites, laydowns), and will be immediately cleaned up. Waste will be stored in covered bins before being transported off-site for disposal. Spill and drip trays are provided to address minor drips and spills resulting from re-fuelling operations. Storage and handling of fuel and chemicals is undertaken in accordance with Safety Data Sheets (SDS), and relevant standards and guidelines such as the EPA Bunding Guidelines and Australian Standard 1940. Potential spill containment practices include containment of fuel drums within portable bunding. The storage of fuel at camp sites is contained within tankers utilising safety features such as double-skins, safety cut-off valves, top accessing etc. to minimise or eliminate the potential for spills.	LOW
3.6.3; 5.3; Table 5-1		Fire (resulting from activities)	Loss of habitat	L	L	H	H	L	2	No	Low	N/A	N/A	N/A	N/A	1	Fire initiated by site activities (e.g. sparks from vehicles or equipment) has the potential to impact large areas of vegetation. Measures will be in place to prevent fires including firebreaks, restriction of vehicles to tracks, seismic lines and cleared areas, maintenance of suitable fire-fighting equipment on site and liaison with the CFS. 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. Confinement of flammable sources, restrictions on certain procedures and ready access to suitable fire-fighting equipment (e.g. fire unit consisting of trailer with water tank, pump and hoses in high fire danger season). Liaise with CFS regarding operations to ensure fire concerns are addressed and any Fire and Emergency Services Act requirements are met (e.g. permits for 'hot work' on fire ban days if required). Where necessary (e.g. in fire danger season), fire break constructed around camps/operational sites. Response to fire included in Emergency Response Plan. 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	LOW

REF	TYPE OF IMPACT	EVENT(S)	POTENTIAL CONSEQUENCES	SIZE	SCOPE	DURATION	FREQUENCY	STAKEHOLDERS	SIGNIFICANCE	AVOIDANCE	PROBABILITY	DURATION	SIZE AND SCOPE	CUMULATIVE EFFECTS	STAKEHOLDER CONCERNS	SIGNIFICANCE	ASSOCIATED INFORMATION	Environmental significance
3.6.3; 5.3; Table 5-1		Fire (resulting from activities)	Disturbance, injury or death of native fauna	L	L	H	H	L	2	No	Low	N/A	N/A	N/A	N/A	1	Fire initiated by site activities (e.g. sparks from vehicles or equipment) has the potential to impact large areas of vegetation. Measures will be in place to prevent fires including firebreaks, restriction of vehicles to tracks, seismic lines and cleared areas, maintenance of suitable fire-fighting equipment on site and liaison with the CFS. 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. Confinement of flammable sources, restrictions on certain procedures and ready access to suitable fire-fighting equipment (e.g. fire unit consisting of trailer with water tank, pump and hoses in high fire danger season). Liaise with CFS regarding operations to ensure fire concerns are addressed and any Fire and Emergency Services Act requirements are met (e.g. permits for 'hot work' on fire ban days if required). Where necessary (e.g. in fire danger season), fire break constructed around camps/operational sites. Response to fire included in Emergency Response Plan. 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	LOW
3.6.3; 5.3; Table 5-1		Storage, handling and disposal of waste	Damage to habitat	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	Inappropriately managed waste has the potential to result in localised damage to vegetation and habitat. Storage of waste and transport to licensed disposal or recycling facilities will be undertaken in accordance with relevant legislation and guidelines. Waste generation will be minimised where practicable, waste will be securely stored and licensed waste transport contractors will be used. As discussed in Section 3.6.6 , all wastewater will be stored and disposed of in accordance with the South Australian Public Health (Wastewater) Regulations 2013 or to the satisfaction of the Department of Health) and consistent with the Environment Protection (Water Quality) Policy 2015. Excess drill cuttings will be removed from site and disposed of at an appropriately licensed waste management facility unless otherwise agreed with the landowner. EPAs 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. 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.	LOW
3.6.3; 5.3; Table 5-1		Storage, handling and disposal of waste	Attraction of scavenging animals (native / pest species) and access to contaminants by native fauna	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	Inappropriately managed waste has the potential to result in localised damage to vegetation and habitat. Storage of waste and transport to licensed disposal or recycling facilities will be undertaken in accordance with relevant legislation and guidelines. Waste generation will be minimised where practicable, waste will be securely stored and licensed waste transport contractors will be used. As discussed in Section 3.6.6 , all wastewater will be stored and disposed of in accordance with the South Australian Public Health (Wastewater) Regulations 2013 or to the satisfaction of the Department of Health) and consistent with the Environment Protection (Water Quality) Policy 2015. Excess drill cuttings will be removed from site and disposed of at an appropriately licensed waste management facility unless otherwise agreed with the landowner. EPAs 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. 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.	LOW
	Air Impacts																Generation of dust during geophysical survey and site construction activities, and general use of unsealed roads and tracks, can result in temporary and localised impacts to air quality.	
5.5; Table 5-1		Earthworks associated with seismic line and drilling site preparation, access track, camp site, laydown and magazine construction and rehabilitation / restoration activities	Dust generation	H	H	H	H	H	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Generation of dust during geophysical survey and site construction activities, and general use of unsealed roads and tracks, can result in temporary and localised impacts to 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. Adequate buffer distances will be maintained between activities and residences.	LOW
5.5; Table 5-1		Combustion engines - air emissions	Reduction in local air quality; Generation of greenhouse gas emissions	H	H	H	H	H	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Equipment operated and maintained in accordance with manufacturer specifications. Adequate buffer distances will be maintained between activities and residences.	LOW
5.5; Table 5-1		Use of roads; movement of vehicles and heavy machinery	Dust generation	H	H	H	H	H	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Generation of dust during geophysical survey and site construction activities, and general use of unsealed roads and tracks, can result in temporary and localised impacts to 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. Adequate buffer distances will be maintained between activities and residences.	LOW
5.5; Table 5-1		Fire (resulting from activities)	Atmospheric pollution	L	L	H	H	L	2	No	Low	N/A	N/A	N/A	N/A	1	Fire initiated by site activities (e.g. sparks from vehicles or equipment) has the potential to impact air quality. Measures will be in place to prevent fires including firebreaks, restriction of vehicles to tracks, seismic lines and cleared areas, maintenance of suitable fire-fighting equipment on site and liaison with the CFS. 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. Confinement of flammable sources, restrictions on certain procedures and ready access to suitable fire-fighting equipment (e.g. fire unit consisting of trailer with water tank, pump and hoses in high fire danger season). Liaise with CFS regarding operations to ensure fire concerns are addressed and any Fire and Emergency Services Act requirements are met (e.g. permits for 'hot work' on fire ban days if required). Where necessary (e.g. in fire danger season), fire break constructed around camps/operational sites. Response to fire included in Emergency Response Plan. 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	LOW
	Social Environment																	
	Community Resource/ Existing Land Use Impacts																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 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 South East 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 South East. There are approximately 2,300 farms in the South East 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 licence 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 licence 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, with over 550,000 visitors to the South East region per year, directly employing 1,800 people (South Australian Tourism Commission 2017). Key attractions include coastal resorts at Robe and Beachport, Naracoorte Caves and Tantanoola Caves, Coonawarra, Wrattonbully, Padthaway and Mount Benson wine regions, Bool Lagoon and the Blue Lake (South Australian Tourism Commission, 2017). 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. The Katnook Gas Processing Facility feeds into the South East Pipeline System, which supplies gas to regional industries and the town of Mount Gambier.	
3.6.3; 5.4; Table 5-1		Earthworks associated with seismic line and drilling site preparation, access track, camp site, laydown and magazine construction and rehabilitation / restoration activities	Damage to infrastructure; Disturbance to stock and land use	H	H	H	H	L	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Earthworks for survey infrastructure construction and rehabilitation / restoration and minor surface disturbance associated with seismic survey and drilling activities have the potential to affect land use through disturbance to soil, groundwater, vegetation and surface water within the footprint of the activity (as discussed in Sections 5.1 to 5.3). Measures discussed in these previous sections will be implemented to ensure impacts are minimised and appropriate rehabilitation / restoration is undertaken. Poor planning and execution of site preparation, construction and rehabilitation / restoration activities also pose the potential to cause impacts to land use beyond the activities' direct footprint, for example, if access tracks or camp sites are not sited to minimise disruption to overall property access and management. Landholders will be consulted regarding the location, management and timing of proposed activities and survey infrastructure, with the aim of minimising disturbance. Ongoing liaison with landholders is carried during all stages of operations. Appropriate locations for geophysical survey infrastructure, particularly any access tracks, are chosen in consultation with landholders, and any deterioration of property tracks or other infrastructure as a result of geophysical survey related traffic and activities is rectified. Previous experience in the Otway Basin has indicated that any access tracks required can generally be located so they can become valued infrastructure, provide additional all-weather access across a property, and provide a long-term benefit to property operations.	LOW
3.6.3; 5.4; Table 5-1		Physical presence of machinery, equipment and camp and personnel.	Disturbance to stock and land use	H	H	H	H	L	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Geophysical survey activities and transport moves have the potential to disturb and possibly injure stock or interfere with other land use activities. Consultation with landholders is undertaken to ensure that the location and timing of activities minimise the potential for impact. Measures in place to minimise impacts include speed limits, fencing of access tracks if required, positioning lighting to minimise light emanating from camp sites, and prompt removal of machinery and equipment and camps from site following the completion of operations.	LOW

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5.4; Table 5-1		Noise / vibration emissions	Disturbance to stock	H	H	H	H	L	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Geophysical survey activities and transport moves have the potential to disturb and possibly injure stock or interfere with other land use activities. Consultation with landholders is undertaken to ensure that the location and timing of activities minimise the potential for impact. Measures in place to minimise impacts include speed limits, fencing of access tracks if required, positioning lighting to minimise light emanating from camp sites, and prompt removal of machinery and equipment and camps from site following the completion of operations. Equipment operated and maintained in accordance with manufacturer specifications. Transport trucks to be restricted to daylight hours as far as possible. Heavy truck drivers to be instructed not to use engine brake near dwellings. Assessments of potential noise impacts undertaken as appropriate during design and planning stages. 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). Systems in place for logging stakeholder complaints to ensure that issues are addressed as appropriate. Adequate buffers maintained between proposed activities and residences.	LOW
5.4; Table 5-1		Use of roads; movement of vehicles and heavy machinery	Injury to Stock; Damage to third party infrastructure	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	The movement of vehicles and machinery along roads and access tracks has the potential to impact land use and infrastructure through increased risk of road hazards to local road users, generation of noise and dust, potential for interactions with domestic stock and agricultural operations, and degradation of unsealed roads and tracks. Transport procedures (e.g. speed restrictions, limitation of movements at night) will also reduce the potential level of impact. Liaison with landholders will occur to ensure use of roads and tracks is undertaken to minimise impacts to landholders wherever practicable. Impacts of road use are generally short term, with peak traffic movements occurring during initial and final mobilisation to and from a project location. Landholders, local councils, potentially affected residents and police will be informed of significant activities such as initial project mobilisation and final demobilisation. Warning signs and traffic management measures will be installed where appropriate near survey locations. Project mobilisations will be restricted to daylight hours as far as possible. Any deterioration of property tracks or other infrastructure as a result of geophysical survey related traffic will be rectified in consultation with landholders.	LOW
5.4; Table 5-1		Spills or leaks associated with: • storage of fuel, oil and chemicals • refuelling operations and high-pressure hydraulic systems	Access to contaminants by stock	H	H	H	H	H	1	Yes	N/A	N/A	N/A	N/A	N/A	1	The potential for stock to access contaminants and waste is limited. As discussed in Section 5.1, fuel, oil and chemicals will be stored in their product containers with appropriate secondary containment (e.g. lined, bunded areas or on selfbunded pallets). Bulk storage and handling of fuel and chemicals is restricted to designated areas. Contaminants from spills or leaks are likely to be confined to designated areas (e.g. camp sites, laydowns), and will be immediately cleaned up. Waste will be stored in covered bins before being transported off-site for disposal.	LOW
5.4; Table 5-1		Fire (resulting from activities)	Damage to infrastructure; Disruption to land use	L	L	H	H	L	2	No	Low	N/A	N/A	N/A	N/A	1	Fire initiated by site activities (e.g. sparks from vehicles or equipment) has the potential to significantly impact land use (e.g. via damage to pasture, forestry, crops, buildings and other infrastructure). Measures discussed in Section 5.3 will be in place to prevent fires including firebreaks, restriction of vehicles to tracks, seismic lines and cleared areas, maintenance of suitable fire-fighting equipment on site and liaison with the CFS.	LOW
5.4; Table 5-1		Storage, handling and disposal of waste	Access to contaminants by stock; Litter / Loss of visual amenity	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	The potential for stock to access contaminants and waste is limited. As discussed in Section 5.1, fuel, oil and chemicals will be stored in their product containers with appropriate secondary containment (e.g. lined, bunded areas or on selfbunded pallets). Bulk storage and handling of fuel and chemicals is restricted to designated areas. Contaminants from spills or leaks are likely to be confined to designated areas (e.g. camp sites, laydowns), and will be immediately cleaned up. Waste will be stored in covered bins before being transported off-site for disposal.	LOW
5.4; Table 5-1		Storage, handling and use of explosives	Disturbance to stock, landuse and local community	H	H	H	H	L	1	No	Low	N/A	N/A	N/A	N/A	1	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 Explosives Act 1936 and Explosives Regulations 2011. Explosives will only be handled and utilised by appropriately trained and licensed personnel (i.e. holders of a SafeWork SA Blaster's Licence). 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.	LOW
	Cultural & Heritage Impacts																Beach's petroleum licences are located within the First Nations of the South East#1 (SC2017/002) Native Title claim area (Registered November 2017). 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. Aboriginal Affairs and Reconciliation (AAR), Department of the Premier and Cabinet, advised Beach in June 2019 that the Central Archive and the Register of Aboriginal Sites and Objects, currently holds records for four Aboriginal sites located in the licence area (Figure 1-1). Three of these sites are archaeological sites, while the fourth is culturally significant. Importantly, it should be noted that this register is not comprehensive, and it does not capture undiscovered sites. A desktop review of South Australian heritage places was undertaken using the South Australian Heritage Places GIS dataset (DEW, 2019b). The datasets provide a comprehensive listing and spatial location of State and Local heritage places. A search of the licence area identified 18 State Heritage Places and 87 Local Heritage Places. The majority of these heritage places are buildings (including houses, churches, cottages, art galleries, libraries, schools, barns, hotels and shops) located in or near Penola. There are three isolated heritage places located within 10 km of the boundary of Beach's PRLs and PPLs. The Yallum Park homestead and Austin Cottage dwelling are located approximately 3 km north East of PPL 168, and Kalangadoo House is located approximately 9 km south west of PPL 202. 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. A search of the Australian Heritage Database (AHD, 2019) did not identify any World, Commonwealth or National Heritage listed places in the licence area. The Australian Fossil Mammal Sites (Riversleigh / Naracoorte), which is a registered World Heritage and National Heritage site, is located in close proximity to the licence area, with the majority of the site located approximately 19 km north of the PEL 494 northern boundary.	
3.6.3; 5.6; Table5-1		Earthworks associated with seismic line and drilling site preparation, access track, camp site, laydown and magazine construction and rehabilitation / restoration activities	Damage to cultural heritage sites	H	H	H	H	H	1	No	Low	N/A	N/A	N/A	N/A	1	Potential impacts to cultural heritage arise predominantly from earthworks and vegetation clearing activities during seismic survey line and site preparation, construction, and rehabilitation / restoration activities. Cultural heritage inspections / surveys will be carried out where surface disturbance earthworks are required or as otherwise agreed with the local Aboriginal group. Any identified sites will be avoided and flagged off where necessary (as discussed in Section 3.6.2). Damage, disturbance or interference to any Aboriginal sites, objects and remains is avoided unless authorisation has been obtained under the Aboriginal Heritage Act 1988. Heritage registers and the Heritage Branch, DEW will be consulted regarding the location of non-Aboriginal heritage sites where appropriate. Cultural heritage issues will be covered in inductions and a procedure will be in place to respond in the event that any sites are discovered during activities, in accordance with the requirements of the Aboriginal Heritage Act as discussed in Section 2.2.	LOW
	Community Health & Safety Impacts																The Limestone Coast Landscape region covers seven local government areas (LGAs), and the Beach licence area is situated in two LGA including: Wattle Range Council and Naracoorte Lucindale Council. Penola is the largest population centre in the licence area. Penola has a population of approximately 3,117 people (ABS 2016). Other population centres in proximity to the licence area include Naracoorte (located to the north of PEL 494), Millicent (located to the south of PEL494), Lucindale (located to the north of PEL 494), as well as popular holiday destinations including Robe and Beachport along the coast. Population statistics for the LGAs are provided in Table 4-7. Census data from 2016 for the LGAs indicates the population of 19,968 is distributed relatively evenly across ages 0 to 64. However, there is a steady proportional population decline in older age cohorts. The median weekly household income across the two LGAs ranged from $1,023 to $1,203 (in 2016); this compares to a median weekly household income of $1,206 across South Australia.	
5.5; Table 5-1		Earthworks associated with seismic line and drilling site preparation, access track, camp site, laydown and magazine construction and rehabilitation / restoration activities	Visual impact; Light, noise, dust, vibration generation; Disturbance to local community	H	H	H	H	L	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Disturbance from site activities (e.g. seismic lines and drilling locations, and the presence of machinery and equipment, camp and personnel) can result in potential for short term impacts to landholders and nearby residents. A range of measures will be implemented to manage these potential impacts. Landholders and other stakeholders (e.g. the local council) will be consulted regarding proposed activities where appropriate, with the aim of identifying potential issues and minimising disturbance. Construction and survey preparation activities will be restricted to daylight hours. The timing and location of geophysical survey activities (e.g. seismic lines and drilling locations) is typically undertaken in consultation with landholders to minimise economic impacts and disruption to landholder activities. Disturbance to areas of importance to landholders (e.g. agricultural land, vineyards, forestry plantations, dams, stock yards and residential areas) is typically avoided by relocating or offsetting the location of seismic survey activities. 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). Adequate buffer distances will be maintained between activities and residences, and systems will be in place for logging stakeholder complaints to ensure that issues are addressed as appropriate. Assessment of potential noise impacts from a site-specific activity will be undertaken as appropriate during design and planning stages. Lighting will be positioned to minimise light emanating from camp sites during operations. Machinery, equipment and camps will be promptly removed from site following the completion of operations, particularly in visible locations. Generation of dust during geophysical survey and site construction activities, and general use of unsealed roads and tracks, can result in temporary and localised impacts to 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. Generation of vibration associated with geophysical survey activities is largely associated with localised disturbances associated with vibroseis trucks and buried sources. As discussed in Section 3.3.1, vibroseis produces a low energy density, which allows it to be used in cities and other built-up areas. Vibroseis has been used in sensitive locations without damaging buildings or the environment (APPEA, 2019).	LOW
5.5; Table 5-1		Physical presence of machinery, equipment and camp and personnel.	Visual impact and disturbance to local community	H	H	H	H	L	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Disturbance from site activities (e.g. seismic lines and drilling locations, and the presence of machinery and equipment, camp and personnel) can result in potential for short term impacts to landholders and nearby residents. A range of measures will be implemented to manage these potential impacts. Landholders and other stakeholders (e.g. the local council) will be consulted regarding proposed activities where appropriate, with the aim of identifying potential issues and minimising disturbance	LOW
5.5; Table 5-1		Use of roads; movement of vehicles and heavy machinery	Road hazard / disturbance to local road users	H	H	H	H	H	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Landholders and relevant stakeholders (e.g. local council, industry associations) consulted regarding location of proposed activities where appropriate. Activities are restricted to agreed / defined areas. Machinery, equipment and camps removed from site promptly following completion of activities, particularly in visible locations. Systems in place for logging stakeholder complaints to ensure that issues are addressed as appropriate. Adequate buffers maintained between proposed activities and residences.	LOW
5.5; Table 5-1		Unauthorised access by third parties	Injury / danger to health and safety of employees, contractors and third parties	H	H	H	L	L	1	No	Medium	Short	Small / Confined	N/A	N/A	2	Unauthorised or uncontrolled access to a geophysical survey site could expose members of the public to potential harm. Access to the survey area will be restricted (as far as is reasonably practicable) during operations (e.g. gates kept closed and appropriate signage displayed at key locations such as site entry points, main access tracks and operations specific work sites).	LOW

REF	TYPE OF IMPACT	EVENT(S)	POTENTIAL CONSEQUENCES	SIZE	SCOPE	DURATION	FREQUENCY	STAKEHOLDERS	SIGNIFICANCE	AVOIDANCE	PROBABILITY	DURATION	SIZE AND SCOPE	CUMULATIVE EFFECTS	STAKEHOLDER CONCERNS	SIGNIFICANCE	ASSOCIATED INFORMATION	Environmental significance
5.5; Table 5-1		Fire (resulting from activities)	Danger to health and safety of employees, contractors and possibly the public	L	L	H	H	L	2	No	Low	N/A	N/A	N/A	N/A	1	Fire initiated by site activities (e.g. sparks from vehicles or equipment) has the potential to significantly impact landholders and the community through damage to property or possibly loss of life. Measures discussed in Section 5.3 and 5.4 above will be implemented to manage fire risk.	LOW