Victoria Offshore Windfarm: Preliminary Marine Environment Assessment

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1 Introduction

1.1 Background

Victorian Offshore Windfarm Pty Ltd is planning to develop offshore wind energy within Victorian coastal waters, offshore of Portland, near the Victorian/South Australian border, as illustrated in Figure 1-1.

This preliminary scoping study of the marine environmental attributes and values supports:

- A referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for potential impacts to Matters of National Environmental Significance (MNES)
- Referral under the *Environmental Effects Act 1978.*

There is an opportunity for project to be assessed under the EPBC Act bilateral agreement, which allows for a coordinated assessment between the Commonwealth and State, with a joint Environmental Effects Statement (EES) and public consultation process. Further consultation with state and federal agencies will be undertaken to confirm the approval pathway.

1.2 Study Objectives

The objectives of this scoping study are to:

- develop a first-pass assessment of marine environmental, social or economic values and associated constraints for the study area
- undertake a first-pass assessment of potential impacts to the marine environment as a result of planning, construction, operation and decommissioning of the project at both a Commonwealth and State level
- inform decision-making about the form of assessment required once the project receives 'significant project' status
- inform the development of Scoping Requirements or 'Terms of Reference' for further environmental assessment of the project.

1.3 Terminology

The term *marine environment* is defined as marine waters up to the Highest Astronomical Tide (HAT) boundary.

Within this report, the conservation status of a species is defined in accordance with the provisions of relevant state legislation and its regulations and amendments (i.e *Flora and Fauna Guarantee Act 1988 (*FFG Act*)*), and/or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). *Threatened* is a common use term to collectively describe endangered and vulnerable species.

The following terms are used frequently in this report:

- The *project area* represents the area that will be further investigated in the next stage for location of project infrastructure (including marine infrastructure comprising turbines, underwater cabling

and an offshore substation). As precise locations of project infrastructure are not yet known at this early the Project Area does not necessarily represent the project's final disturbance footprint.

- The *study area* encompasses the project area and an additional 5km buffer, up to HAT.

LEGEND

- Project Area
- Study Area
- Coastal Waters Limit

Marine Park Zones

- General Managed Use Zone
- Habitat Protection Zone
- Multiple Use Zone
- Sanctuary Zone
- Special Purpose Zone
- Ramsar Wetlands
- Conservation Area

Title:

Protected Areas
Victoria

Figure: 1-1

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2 Project Description

The following project description has been provided by Victoria Windfarm Pty Ltd, based on current global industry standards and practices. The project description will be refined as design, engineering and assessment of the project progresses. It is preliminary only and will be subject to change as the design and assessment process progresses.

The Project comprises the construction, operation and decommissioning of an offshore windfarm with generating capacity of up to 495 MW connected to the existing electricity network.

Detailed site selection and design of the Project will be ongoing throughout the EES and pre-construction phases. Therefore, the following description of the Project is indicative and designed to provide context for the EES scoping process. The design envelope, possible construction methodologies and operational parameters will be developed in parallel with the EES and will be influenced by the results of environmental and technical studies, and stakeholder consultation.

2.1 Offshore components

The offshore components of the project will include:

- Up to 62 offshore wind turbines (WTGs) supported by monopile (or similar) foundations
- a network of buried or mechanically protected subsea cables along the seabed connecting the WTGs together and connecting the strings of WTGs to the offshore substation (known as inter-array cables)
- an offshore substation and substructure supported by monopile (or similar) foundations to collect and transform the output to a higher voltage
- subsea cables buried or mechanically protected transmitting electricity generated from the windfarm to the onshore substation (known as the offshore export cable).

The offshore windfarm assets will be located within State waters. At this stage, it is anticipated that individual turbines (WTGs) delivering between 8 MW and 15 MW WTGs will be installed, however the ultimate number and final location of the WTGs will be determined prior to construction and based on the Project approval and commercial and supply chain considerations.

The WTGs are expected to be supported by monopile structures. Monopiles may be installed from a jack-up vessel or a floating vessel. The transition piece is usually lifted and grouted or bolted in place from the same vessel.

Monopiles (up to 10m diameter) are generally moved into position using the main crane and upending tool and held in position by a gripper tool. They are the driven into the seabed before mounting and grouting transition pieces.

Transition pieces are usually carried and installed by the same vessel, although a two-vessel strategy in which transition pieces are installed by a separate vessel has been used on several occasions.

An approximate timetable for installation once at the windfarm site is:

- Transport and positioning: 2 hours for floating vessels; 4 hours for jack-ups

- preparations: 1 hour
- lifting and pile positioning: 1 hour
- driving: 6 hours, and
- grouting: 2 hours.

Under some ground conditions, monopiles are grouted into a pre-drilled rock socket. Under conditions with boulders, a combination of drilling and driving may be required.

Cable installation activities will be preceded with a survey to define the route. This will be followed by a pre-lay grapnel run (or alternative method) to clear any debris from the cable route.

Different strategies for cable laying may be employed involving one or two vessels, and the chosen approach depends on seabed conditions, and equipment available to the contractor and presence of any benthic communities and habitat.

Burial will provide protection to the cables, however additional protection (rock dumping, or grout bags, etc) may be required at key locations (e.g. where cables enter the WTG or offshore substation platform or when ground conditions or crossings result in the cable being laid near to or on the seabed surface). Burial of cables will also assist in avoiding impacts to marine species (sharks, rays, bony fish, turtles and crustaceans) from electromagnetic fields (EMF). Burial depths for the offshore export cable will be subject to detailed assessment but is likely to be in the range of 1-3m below seabed.

Pre-trenching and simultaneous lay and burial using a cable plough is preferred if the soil is suitable, as immediate burial and protection is obtained in a single pass which reduces costs and seabed disturbance. If seabed conditions are not suitable then a two-stage process will be used where the cable is laid on the seabed, after which a vessel with trenching vertical injector or jetting sled, undertakes the burial.

Cable ploughs can bury the cable down to 3-4 m below seabed level. The plough requires a tow force to pull the plough through the soil depending on the soil conditions and the required burial depth. Using a barge (for shallow water operations), this force is supplied by an anchor or a tow tug. For a dynamically positioned vessel, a specialist vessel with an appropriate bollard pull will be required. It is often not possible to plough close to the turbine or substation. In that case, a trenching remotely operated vehicle (ROV) may be used.

ROVs can have either a jetting system or a mechanical cutter. A high-pressure jetting system is used to fluidise the seabed and allow the cable to sink to the required depth (only in sandy sediments and softer clays). For rocky or hard clay seabed conditions, a mechanical cutter will be used.

Shore crossing is typically undertaken via trenching at shallow relief beach sites, such as those seen at this location. In hard (non-sand) coastal beach lithologies, and or steeper or cliff related coastal settings horizonal directional drilling is undertaken to create the cable shore crossing conduit.

Offshore ancillary components may also be required during pre-construction, construction and operation, such as navigational aids, meteorological and oceanographic monitoring devices. The type, number and positions will be confirmed during development of the Project, and in consultation with the relevant authorities. It is anticipated these will be located within both State and Commonwealth waters.

2.2 Coastal and onshore assets

Assets to be placed within coastal and onshore areas include:

- A landfall site with a transition joint pit connecting the marine cables from the offshore substation to the onshore cables that will run to the onshore substation
- an onshore substation, which may include further transformers
- a new overhead transmission line supplying energy generated from windfarm to the National Electricity Market (NEM), with additional equipment as required, which may include battery storage for fast frequency response to provide stability to the grid
- temporary construction areas and upgrade to access roads.

Currently a location at Portland, close to the coast and existing electricity network is being investigated for the landfall site and onshore transmission infrastructure, with final locations subject to design development, further technical and environmental studies, and discussions with Project stakeholders. The landfall site would be located landward of the mean high-water mark (MHWM) on land suitable to accommodate an underground joint pit. The transmission infrastructure is anticipated to be predominantly above ground.

The existing 550 kV network substation at Heywood Terminal Station is being investigated as the connection point to the NEM, which is located approximately 30 km from the coastline. Options being investigated include use of the Alcoa easement from the Portland Aluminium Smelter to Heywood Terminal Station, or potentially the Alcoa transmission system (should the plant cease operations), as well as a new easement from Portland to Heywood. An alternate option consisting of a new easement from Cape Bridgewater to Heywood, potentially connecting into a point on the existing easement from the Smelter to Heywood, may also be considered. For all options, the preference is to utilise existing electricity easements and other infrastructure corridors as much as practicable to minimise impacts.

Onshore ancillary infrastructure associated with the Project includes operation and maintenance facilities comprising a control room, site offices, storage facilities, crew transfer vessels (CTVs) and personnel facilities. These will be sited remote to the Project area in a local port.

2.3 Construction and maintenance vessels

Turbine installation is normally undertaken with a self-propelled jack-up vessel designed primarily for the purpose, though in some cases, jack-up barges have been towed with tugs. An example of specification for these vessels is:

- Length: 130m, Beam 40m, Draft 5m
- crew berths: 100
- crane: 1,500 tonnes
- carrying capacity: 9,300 tonnes
- maximum transit speed: 12 knots

- jack-up depth: 45m
- wind turbine component capacity: 5 sets
- number of jack-up legs: 4-6
- jack up speed: 1m/min, and
- dynamic positioning system (DP2).

Most of the vessels in operation have been used for both turbine and foundation installation. Increasingly the fleets are diverging. The increase in turbine capacity (and therefore rotor diameter) is associated with a higher hub height. At the same time, foundation mass is increasing, and they can now be installed more rapidly from a floating vessel. Floating vessels are considered a natural next step for turbine installation, offering theoretically faster installation than jack-ups.

Different specialist vessels will normally be used for export and array cable installation, as export cable-laying vessels will typically have larger carousels to accommodate longer cables. It is possible that the same vessel might be used for both operations on this Project. The vessels may need to have a shallow draft to install the cables in shallow water.

Simultaneous lay and burial can be carried out with a variety of burial tools. In that case, the cable is buried during the lay to obtain immediate protection. Otherwise, a post-lay burial is required.

Cable-laying vessels are characterised as follows:

- Up to 30m (breadth) by 140m (length) and can operate at a speed up to 14kn (transit speed).
- accommodation for a crew of up to 90.
- the current capacity of carousels is of up to 7,000t. Some contractors offer vessels with a double carousel.
- likely to be equipped with a 3D motion compensated crane with up to 25t and a 25t A-frame.
- generally equipped with a personnel transfer gangway (for example Ampelmann system) and a helideck.

CTVs and service operation vessels (SOVs) may be used to support construction and maintenance activities. SOVs are larger vessels than CTVs and can fulfil a wider range of functions being capable of operating offshore for weeks rather than a single day.

Specialist vessels are used for crew transfer to the windfarm for installation and commissioning tasks. These are typically 15-20m workboats of the kind regularly used during windfarm maintenance.

ROV support vessels are 80-100 m DP2 vessels with a moon pool and deck crane.

The types and mix of vessels will depend on vessel availability as well as distance and capacity of ports from the Project area and construction and maintenance requirements and strategies.

Where possible, vessel movements and docking would be limited to State waters. However, some navigation may be required through Commonwealth waters.

2.4 Existing port and harbour modifications

Existing port facilities will be used where possible to support the transport and marshalling of equipment and Project components from globally distributed supply chains, as well as construction and maintenance vessels and activities.

Suitable port and harbour facilities are currently being investigated based on the following criteria:

- Proximity to the Project, to allow for efficient vessel movements and transportation during construction and maintenance
- water depths and tidal conditions suitable to the proposed Project vessels and activities
- dedicated or shared berthing facilities
- portside facilities and land availability for construction and maintenance activities (including laydown, storage and assembly of WTG components)
- potential opportunity to provide local employment benefits.

Construction port requirements are typically:

- At least 8 hectares suitable for lay down and pre-assembly of product
- quayside of length 200-300m length with high load bearing capacity and adjacent access
- water access to accommodate vessels up to 140m length, 45m beam and 6m draft with no tidal or other access restrictions
- overhead clearance to sea of 100m minimum (to allow vertical shipment of towers)
- sites with greater weather restrictions or for larger scale construction may require an additional lay-down area, up to 30 hectares
- large areas of land are required due to the space taken when turbines are stored lying down on the ground.

Ancillary components at existing ports to support with construction and maintenance activities may include staff car parking areas, waste handling and refuelling facilities, staff office areas and a marine control centre for directing activities, and storage facilities for minor components).

A schematic of the Project is shown in Figure 2-1 below.

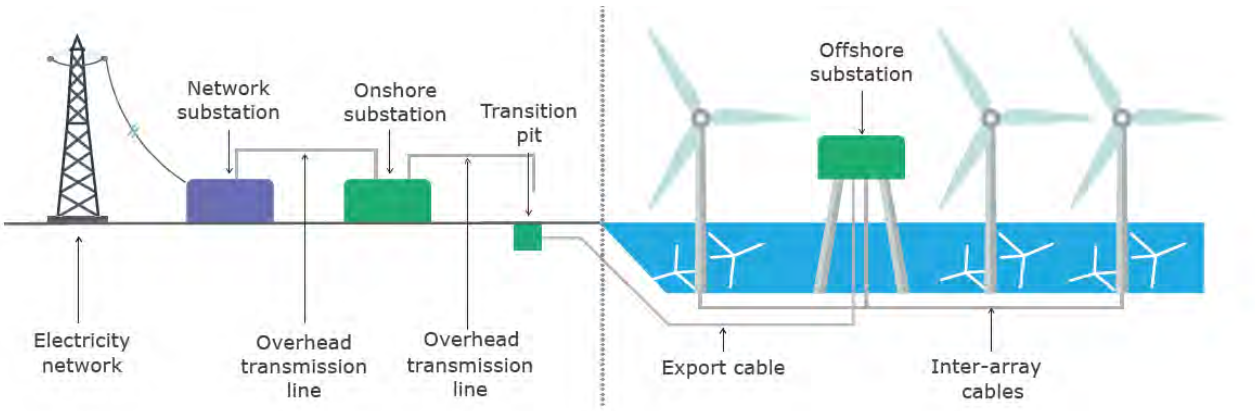

Figure 2-1 Project Schematic

2.5 Project specifications

The indicative offshore Project characteristics are detailed in Table 2-1 below, along with anticipated location in State and/or Commonwealth waters.

Table 2-1 Indicative offshore characteristics

Feature	Parameters	State waters	Commonwealth waters
Wind Turbine Generators (WTGs)		✓	
Maximum generation capacity	495 MW		
Number of turbines	33 - 62		
OWT capacity	8 – 15 MW		
Max. rotor diameter	220 m		
Max. hub height	154 m		
Design. life	30 years		
Separation between OWT	825 – 1100 m (5 x rotor diameter)		
Max. water depth at turbine locations	45 m		
Monopile foundations dimensions	6.5 – 8 m		
Monopile foundations depth	30 – 50 m		
Offshore substation		✓	
Platform size	800 m^2		
Format	66 – 132 275kV		
Monopile foundations depth	30 – 50 m		
Inter-array cables		✓	
Total length (dependent upon WTG size)	250 km – 465 km		
Format	66kV		
Offshore export cable		✓	

Feature	Parameters	State waters	Commonwealth waters
Length (straight to shore and offshore to Portland)	11km and 58km		
Format	i.e. Up to 2x275kV		
Burial depth	1 – 4 m		
Offshore construction platforms (J/U)		✓	
Number	1		
Size	Up to length: 260m, beam: 50m, draft: 12m		
Construction support vessels (CSV)		✓	✓
Number	3-5		
Size	15-20m (CTV) 80-100m (ROV support)		
Service Operation Vessels (SOV)		✓	✓
Number	1		
Size	Up to 85m in length with accommodation for 60 POB		
Navigational aids and monitoring devices		✓	✓
Type	TBD		
Number	TBD		

2.6 Key development activities

Prior to commencement of pre-construction or construction works in 2026, a number of preparatory tasks need to be completed. These tasks include:

- Initial environmental assessment and referrals to relevant State and Commonwealth referral agencies
- stakeholder engagement and community consultation
- thorough environmental field studies and investigations
- environmental approvals and permits and tenure agreements
- detailed design of Project.

2.6.1 Key construction activities

A high level overview of the key construction activities and staging within the marine environment is provided below.

2.6.2 Pre construction

- Preparation of the seabed (including dredging as necessary)

- installation of ancillary components, including navigational aids and establishment of temporary 500m exclusion zones around WTG locations.

2.6.3 Construction

- Transport of WTGs and offshore substation monopiles and foundation components to marshalling site or sites
- Sequential driving of monopiles into seabed followed by fixing of transition pieces to the monopiles
- Installation of scour protection, as required
- Erection of WTG towers and nacelles, either pre-erected or erected individually at the site
- Installation of the turbine blades
- Construction of the offshore substation platform and installation of substation components and equipment
- Pre-trenching and simultaneous lay and burial of the array cables using a cable plough or trenching ROV
- Installation of the offshore export cable using a cable plough or trenching ROV.

2.6.4 Key operational and maintenance activities

Operation generally refers to activities contributing to the high-level management of the windfarm, which will include remote monitoring, environmental monitoring, electricity sales, and administration and other back office tasks. There may be a possible 50m exclusion zone around offshore assets during operation to maintain the safety of key maintenance personnel and equipment as well as the public, as in other jurisdictions.

Maintenance refers to the up-keep and repair of the physical assets and systems, which can be divided into preventative maintenance and corrective maintenance. Preventative maintenance will include the proactive repair and replacement of known wearing components based on routine inspections or information from condition monitoring systems, and corrective maintenance will include the reactive repair or replacement of failed or damaged components. Typical O&M activities include:

- Onshore and offshore logistics
- turbine and blade maintenance, inspection and service
- foundation inspection and repair
- cable inspection and repair
- scour monitoring and management
- substation maintenance and service
- environmental monitoring and inspections.

2.6.5 Key decommissioning activities

It is expected that offshore structures (such as the WTGs) will be removed to just below the seabed as part of the decommissioning process, with cables and onshore infrastructure most likely to remain. Requirements for decommissioning will be established through the planning approvals for the Project and a decommissioning management plan will be developed prior to the commencement of decommissioning, in consultation with the relevant authorities. The decommissioning plan will include:

- Rehabilitation strategies and objectives
- Timeframes for rehabilitation
- Infrastructure (if any) agreed to remain in place
- Monitoring and mitigation measures.

3 Methodology

Publicly available information relating to the marine environmental features and values for each study area (refer to Section 1.3) was collated and reviewed, specifically:

- Matters of National Environmental Significance (MNES), as defined under the EPBC Act
- Threatened and other conservation-dependent species (e.g. rare, protected etc.) listed under the FFG Act.

Primary data sources were as follows:

- EPBC Protected Matters Search, undertaken for the study area and a 5km radius
- Species sightings records and/or benthic habitat mapping:
  - Victorian Biodiversity Atlas
  - Atlas of Living Australia
- Marine Park, Ramsar Wetland and National Park listing criteria and/or Management Plans, which include descriptions of the values of these areas
- Species Profile and Threats Database (SPRAT) for mapping of the distribution and occurrence of species and/or their habitats, together with life-history information
- Species Recovery Plans for various threatened species prepared under the EPBC Act
- Previous environmental studies within or in proximity to the study area.

An assessment was made of the likelihood of occurrence of listed species in the study area[1]. Where known, important life-history functions supported by the study area (i.e., breeding, foraging, nesting etc.) and other notable values supported were described based on mapping of *Biologically Important Areas for regionally significant marine species* (BIAs) (https://www.environment.gov.au/marine/marine-species/bias)[2] and Important Bird Areas[3] (IBA's)

Potential project threats to marine environmental values within the study area was made using a risk assessment process, provided by Arup, as illustrated in Figure 3-1. The criteria used for impact assessment (i.e. duration, likelihood, and consequence) are provided in Table 3-1 to Table 3-4. Note this is considered a first-pass assessment based on project concepts that will be further evaluated as the project evolves.

A further assessment has been carried out at this early stage to understand whether an impact had the potential to be significant, in accordance with the criteria within the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* or relevant State guidance (i.e. Ministerial Guidelines for Assessment of Environmental Effects under the *Environment Effects Act 1978*). This

[1] (i) known to occur = good quality, contemporary records; (ii) habitat/species likely to occur = as defined in SPRAT; (iii) possible occurrence = habitat/species 'may occur', as defined in SPRAT; (iv) unlikely to occur within the study area because there are insufficient records or habitat does not exist
[2] BIAs are defined as areas where aggregations of individuals of a species are known to display biologically important behaviour such as breeding, foraging, resting or migration. BIA's are designed to assist decision-making under the EPBC Act. They are identified using expert scientific knowledge about species distribution, abundance and behaviour in a region.
[3] BIAs are defined as places of international significance for birds, and are determined by an internationally agreed set of criteria by BirdLife International.

will be further evaluated following comprehensive field investigations and studies as the project progresses.

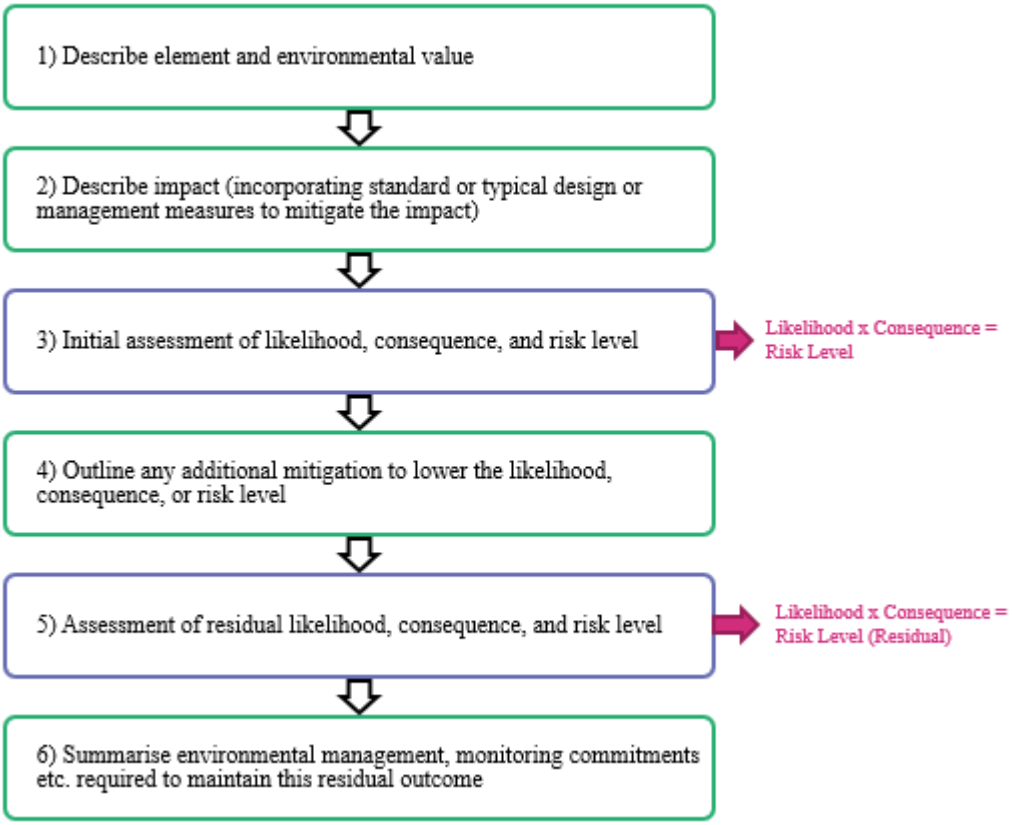

Figure 3-1 Environmental Impact Assessment Process

Table 3-1 Duration of Impact

Relative duration of environmental impacts	Description
Temporary	Days to months
Short term	Up to 1 year
Medium term	From 1 to 5 Years
Long term	From 5 to 50 Years
Permanent / irreversible	In Excess of 50 Years

Table 3-2 Likelihood of Impact

Likelihood of impacts	Risk probability categories
Highly unlikely / rare	May occur only in exceptional circumstances - can be assumed not to occur during period of the project (Probability <10%)
Unlikely	Event is unlikely to occur, but it is possible during period of the Project (Probability 10-30%)
Possible	Event could occur during period of the project (Probability 30-70%)
Likely	Event likely to occur once or more during period of the project (Probability 70-90%)
Almost certain	Very likely to occur as a result of the proposed project construction and/or operations; could occur multiple times during relevant impacting period (Probability > 90%)

Table 3-3 Consequence Criteria

Consequence	Criteria
Major Adverse	Impacts considered critical to the decision making process. They tend to be permanent, or irreversible, or otherwise long term, and/or can occur over large scale areas. Environmental receptors are extremely sensitive, and/or the impacts are of national significance. Typically mitigation measures are unlikely to remove such effects.
High Adverse	Impacts likely to be of importance in the decision making process. They tend to be permanent, or otherwise long to medium term, and/or can occur over large or medium scale areas. Environmental receptors are high to moderately sensitive, and/or the impacts are of State significance.
Moderate Adverse	Impacts relevant to decision making, particularly for determination of environmental management requirements. These impacts tend to range from long to short term, and/or occur over medium scale areas or are focused within a localised area. Environmental receptors are moderately sensitive, and/or the impacts are of regional or local significance.
Minor Adverse	Impacts recognisable, but acceptable within the decision-making process. They are still important in the determination of environmental management requirements. These impacts tend to be short term, or temporary and at the local scale.
Negligible	Minimal change to the existing situation. This could include for example be impacts which are beneath levels of detection, impacts that are within the normal bounds of variation or impacts that are within the margin of forecasting error.
Beneficial	The project results in an improvement in the baseline situation.

Table 3-4 Risk Matrix

		Consequence				
		Negligible	**Minor**	**Moderate**	**High**	**Major**
Likelihood	**Highly unlikely**	Very low	Very low	Low	Low	Medium
	Unlikely	Very low	Low	Low	Medium	Medium
	Possible	Low	Low	Medium	Medium	High
	Likely	Low	Medium	Medium	High	Very High
	Almost certain	Low	Medium	High	High	Very High

4 Description of Existing Environment

4.1 General Description of the Study Area

4.1.1 Protected Areas

4.1.1.1 Marine Parks

The study area does include the Discovery Bay Marine Park (Figure 1-1); one of the potential cable alignments does traverse through the park boundaries. The park protects reef and macroalgae habitats and supports a high diversity of marine life including whales, seabirds, fish, and Australian fur seals. (Parks Victoria, 2007).

The aims for conserving the natural values of the park are:

- Protect significant geological and seabed features
- Allow natural geological and geomorphological processes to continue without human interference
- Minimise the impact of threatening processes derived from the catchment, estuaries and other watercourses
- Maintain water quality in the park
- Prevent and minimise the impact of pollution on park values
- Minimise impacts on park values from human-induced changes to local hydrodynamic processes
- Protect natural habitats, ecological communities and indigenous flora and fauna in the park
- Improve knowledge of the park, including habitats, indigenous species and threatening processes
- Protect landscape and seascape values
- Minimise the visual impact of signs, infrastructure and management activities associated with the park
- Minimise the risk of introduction of marine pests by human activities, and their subsequent establishment in the park
- Protect indigenous places and objects from interference or damage
- Support the views of the Traditional Owners in managing the park.

The study area also includes the South Australian Lower South East Marine Park, which at its closest point is zoned as a sanctuary zone (Marine Park Local Advisory Group, 2010). The sanctuary zone was established to protect several values, including:

- The only area of sheltered fine-medium sandy beach in this part of the coastline
- Seabed habitats including rocky reef and soft-sediment habitat
- Important shorebird roosting and feeding areas, as well as habitats for migratory birds, particularly between French Point and Stony Point

- Shallow macroalgae beds, which are an uncommon feature in the area
- Intertidal rocky reef at Frenchy Point that supports a diverse invertebrate fauna.

At this stage, there is no infrastructure planned within the SA marine park, however indirect impacts will be considered.

4.1.1.2 Ramsar Wetlands

Two Ramsar wetlands are adjacent to the study area: Glenelg Estuary and Discovery Bay Wetlands and Lower Glenelg National Park.

The Glenelg Estuary and Discovery Bay Wetlands supports an uncommon inland wetland type (peatlands), as well as a threatened ecosystem and threatened species (DELWP 2017). This wetland provides habitat for 95 waterbirds (including 24 species listed under international migratory bird agreements) as well as breeding habitat for beach nesting birds (DELWP 2017).

The Lower Glenelg National Park supports a variety of habitats including canyons with limestone cliffs. The Ramsar site supports diverse flora and fauna communities and number of threatened species (red-tailed black cockatoo (*Calyptorhynchus banksia)*, rufous bristlebird, long-nosed potoroo (*Potorous tridactylus)*, southern brown bandicoot (*Isodon obesulus))* and native orchids. Wetland flats (areas subject to inundation) also line the coastline adjacent to the study area.

4.1.2 Benthic Environment

The study area is within the Otway coast. The shallow inshore areas of the Otway continental margin predominantly include limestone substrates that support a variety of assemblages (molluscs, sponges and algae) (Butler et al. 2002). Deeper areas are dominated by mega-rippled bryozoan sands while deep areas of the shelf have bioturbated, fine bioclastic sands (Butler et al. 2002).

The navigational chart for Discovery Bay identifies the substrate as mainly being rock, with some sand beyond the 90-100m depth contour.

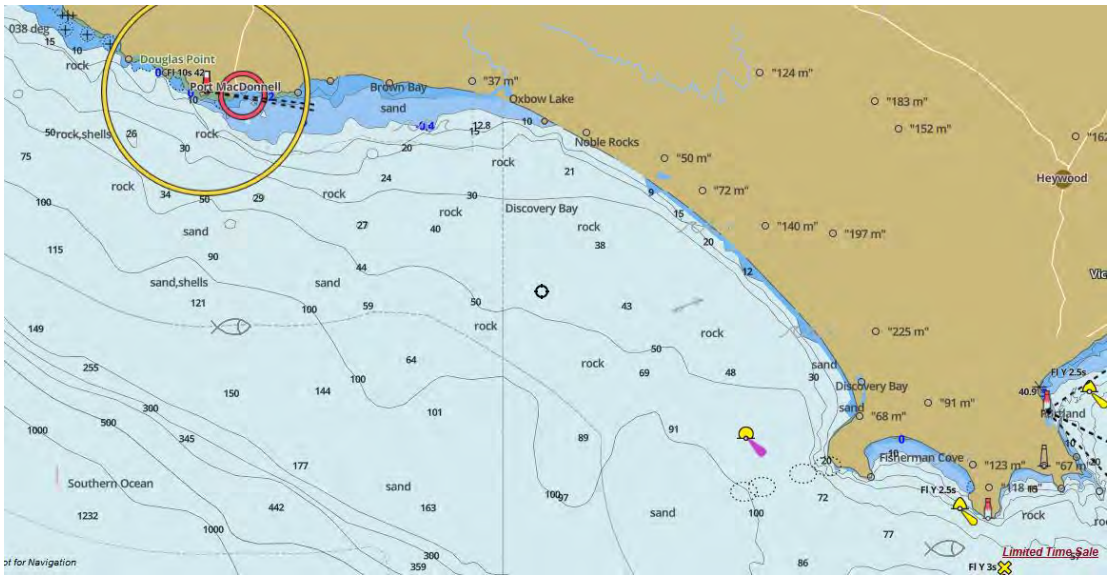

Figure 4-1 Navigational Chart for Discovery Bay (Source: GPS Nautical Charts)

4.1.3 Benthic Habitat

A large portion of the Victorian coastline, including the study area, falls within the Bonney Coast Upwelling. Broad-scale benthic habitat mapping (Refer to Figure 4-2) shows habitats within and adjacent to the study area as seagrass (mixed reef) and undifferentiated algae / invertebrates. Some reef is also identified along the shoreline adjacent to the study area. These are classed as basalt reefs (dominated by kelp including large brown kelp (*Ecklonia radiata*)) and calcarenite reefs (including sponges, ascidians, bryozoans and gorgonians). Unique biotopes within this region include the following:

- Benthic vegetation: brown algae, bull kelp and common kelp
- Sessile invertebrates: high diversity of sponge and seawhip assemblages.

The available mapping appears to be incomplete (appears to only extend a short distance from the shoreline), therefore more accurate mapping of benthic habitat will be required to confirm the extent and quality of habitat types.

LEGEND

- Project Area
- Study Area
- Reefs and Shoals

Benthis Habitat (Seamap)

- Invertebrates
- Mangroves
- Saltmarsh
- Mixed Algae
- Seagrass
- Key Ecological Features

Title:

Benthic Habitats
Victoria

Figure: 4-2

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The *Assessment of the Values of Victoria's Marine Environment* Atlas (Victorian Environmental Assessment Council, 2019) reports that the Glenelg Biounit (within which the project area sits) is characterised by extreme exposure to the prevailing weather; its location and major features are illustrated in Figure 4-3 . It is dominated by infralittoral rock and sublittoral sediment. It lists the natural values of the biounit as being:

- One of only 12 sites worldwide that is a feeding area for the blue whale (*Balaenoptera musculus)*
- Contains extensive habitat for the hooded plover (*thinornis cucullatus*), which nests along the coastline
- The Nelson Reefs occur on the South Australian border and harbour important giant kelp beds
- The Noble Rocks, which are unique as the only rocky reef along an otherwise sandy coastline.

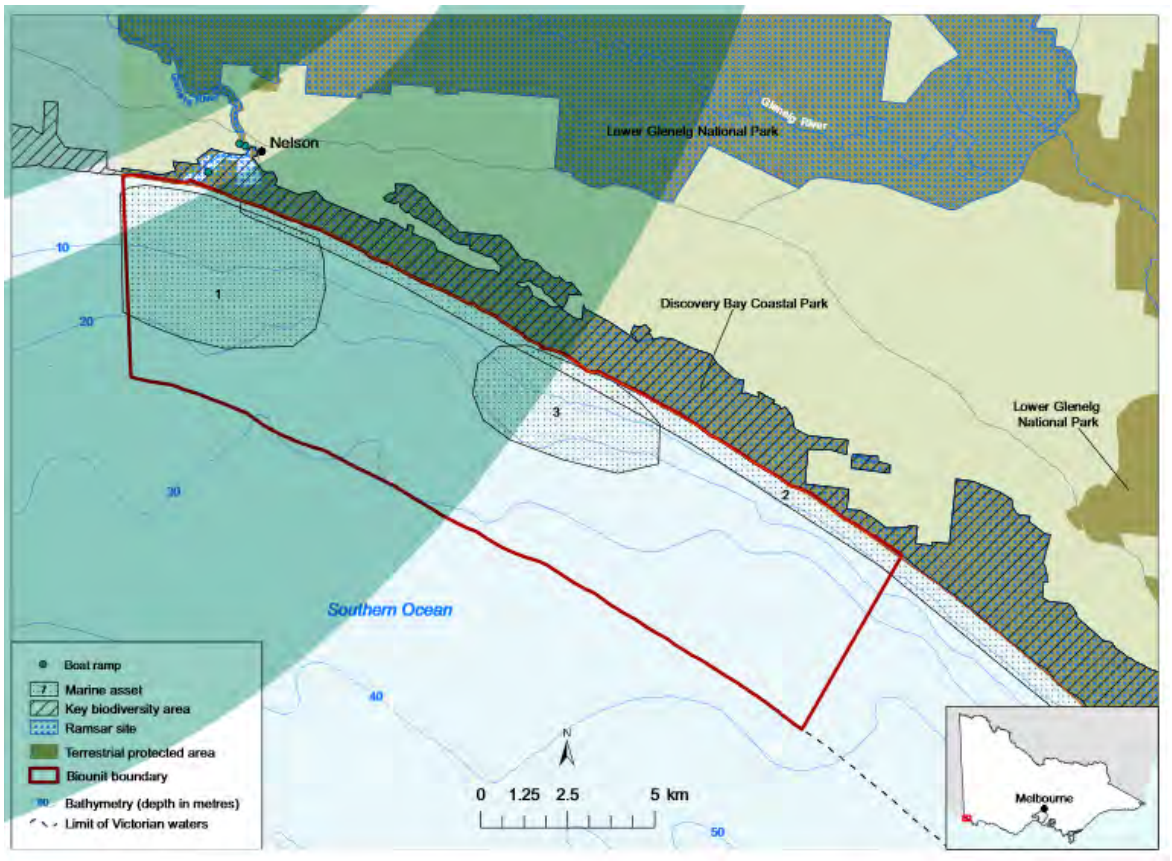


Figure 4-3 Features of the Glenelg biounit

- The Discovery Bay biounit (Refer to Figure 4-3), is dominated by infralittoral fine sand, with some low-profile reef communities. Natural values of this biounit include:
  - One of only a few Pygmy Blue Whale (*Balaenoptera musculus brevicauda*) feeding areas worldwide
  - High numbers of southern right whales and the southern elephant seal (*Mirounga leonine)* recorded

- A haul out and occasional breeding site for the Australian fur-seal (*Arctocephalus pusillus doriferus)*
- Contains extensive habitat for the hooded plover along the shoreline
- Provides feeding and roosting habitat for endangered seabirds (including the southern giant petrel (*macronectes giganteus)* and wandering albatross (*Diomedea exulans*)
- Provides nursery habitat for the great white shark (*Carcharadon carcharias*) and grey nurse shark (*Carcharias taurus*)
- Provides nursery habitat for the southern bluefin tuna (*thunnus maccoyii*)
- Contains the most productive abalone habitat in Victoria (west of Cape Bridgewater)
- Provides reef for sessile invertebrates (sponges, ascidians, bryozoans, gorgonians).

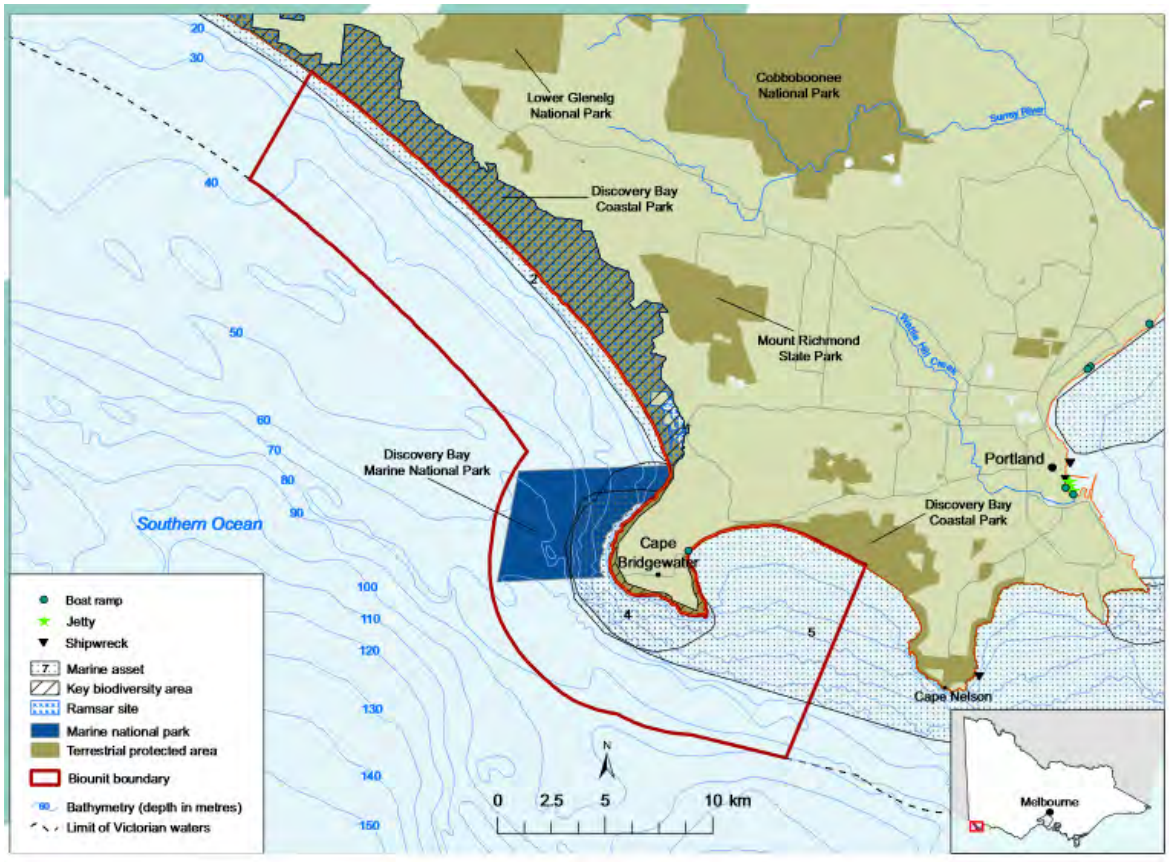


Figure 4-4 Physical features of the Discovery Bay Biounit

5 Description of the Existing Environment

5.1 Matters of National Environmental Significance

Under the EPBC Act, an action will require approval if the action has, will have, or is likely to have, a significant impact on a Matter of National Environmental Significance (MNES):

- World Heritage Properties
- National Heritage Places
- Wetlands of international importance (Ramsar wetlands)
- Nationally threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear action
- A water resource, in relation to coal seam gas development and large coal mining development.

A Protected Matters Search Tool, has identified that Nationally Threatened Species and Ecological Communities, migratory species and Commonwealth marine areas occur within the study area or immediately adjacent. These matters are further described below.

5.1.1 Threatened Ecological Community

The EPBC-listed Threatened Ecological Community (TEC) *Giant Kelp Marine Forests of South East Australia* has the potential to occur within the eastern and western sections of the nearshore environment, around Cape Bridgewater and Nelson. Commonwealth mapping of the likely extent of this TEC identifies the TEC as 'maybe occurring', as shown in Figure 5-1; site surveys will be required to confirm the area of TEC potentially impacted.

Figure 5-1 Potential extent of the Threatened Ecological Community Giant Kelp Marine Forests of South East Australia (Source: SPRAT Database)

5.1.2 Commonwealth Marine Areas

The Commonwealth Marine Area commences three nautical miles (defined as three nautical miles from Lowest Astronomical Tide (LAT) under the *Seas and Submerged Lands Act 1973)* from the coastline, also known as the Territorial Sea Baseline (TSB) and is immediately adjacent to the project site.

The nearest Commonwealth Marine Park is the Nelson Marine Park (approximately 200km south-west of the study area, with an average depth of 4,600m). The marine park is recognised as an important habitat for commercial fish, including tuna and mackerel (Director of National Parks, 2013). It is also a key migratory area for whales, including humpback, fin, blue and sei whales.

A large portion of the Victorian coastline, including the study area, falls within the Bonney Coast Upwelling. This upwelling is listed by the Commonwealth as a Key Ecological Feature, which while not a MNES in its own right, forms a component of the Commonwealth marine area MNES. The Bonney Coast Upwelling is a highly productive area provide important habitat to a wide range of species, including an important feeding area for blue whales (Butler et al. 2002), seabirds, penguins, pinnipeds and fish.

At present, no direct physical disturbance of the Commonwealth Marine Area is proposed, however indirect impacts may potentially occur, and will be considered further in this assessment.

5.1.3 Nationally Threatened Species

The protected matters search tool for the study area identified 51 listed threatened species as potentially occurring. Table 5-1 lists the threatened species (i.e. Critically Endangered, Endangered or Vulnerable) under either the EPBC or FFG Act that have been recorded as occurring, or potentially occurring, within or adjacent to the study area. Species records have been drawn from available databases, including the Victorian Biodiversity Atlas and the Atlas of Living Australia. Table 5-1 includes marine species, or species that may traverse/migrate through the marine environment (e.g. migratory birds travelling to feeding areas).

Discovery Bay to Piccaninnie Ponds IBA is adjacent to the study area.

The study area is nominated to be a Biologically Important Area for the following species:

- Whales: pygmy blue whale, southern right whale;
- Seabirds: shy albatross, wandering albatross, bullers albatross, antipodean albatross, Campbell albatross, black-bowed albatross, Indian yellow-nosed albatross, common diving petrol, Australasian gannet; and
- Sharks: white shark.

There are six EPBC-listed Critically Endangered species potentially occurring within the study area:

Critically Endangered

- Curlew sandpiper (*Calidris ferruginea)*
- Northern Siberian bar-tailed godwit (*Limosa lapponica mezbieri*)

- Orange-bellied parrot (*Neophema chrysogaster*)
- Eastern curlew (*Numenius Madagascariensis*)
- Great Knot (*Calidris tenuirostris*)
- Swift Parrot (*Lathamus discolor*).

Further commentary on how these species may utilise the marine environment is provided in the following sections.

Table 5-1 Listed Threatened Species for the VIC Offshore Windfarm study area (Area based on EPBC Protected Matters Search and other information sources described in Section 3)

Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Birds				
Actitis hypoleucos	Common sandpiper	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Apus pacificus	Fork-tailed swift	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Ardea intermedia plumifera	Plumed Egret	-	Endangered	Foraging, feeding or related behaviour **likely** to occur within area
Ardenna grisea	Sooty shearwater	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Ardenna carneipes	Flesh-footed shearwater	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Arenaria interpres	Ruddy Turnstone	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Ardea alba	Great egret	-	Threatened	Foraging, feeding or related behaviour **likely** to occur within area
Ardea intermedia	Intermediate egret	-	Threatened	Foraging, feeding or related behaviour **likely** to occur within area
Botaurus poiciloptilus	Australasian bittern	Endangered	Endangered	Species or species habitat **known** to occur within area
Calidris acuminata	Sharp-tailed sandpiper	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Calidris alba	Sanderling	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Calidris canutus	Red knot	Endangered, Migratory	Endangered	Species or species habitat **known** to occur within area

Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Calidris ferruginea	Curlew sandpiper	Critically Endangered, Migratory	Endangered	Species or species habitat **known** to occur within area
Calidris melanotos	Pectoral sandpiper	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Calidris ruficollis	Red-necked Stint	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Calidris tenuirostris	Great Knot	Critically Endangered	Endangered	Species or species habitat **known** to occur within area
Charadrius bicinctus	Double-banded plover	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Charadrius leschenaultii	Greater Sand Plover	-Vulnerable, Migratory	Critically endangered	Foraging, feeding or related behaviour **likely** to occur within area
Chlidonias hybrida	Whiskered Tern	-	Near threatened	Foraging, feeding or related behaviour **likely** to occur within area
Diomedea antipodensis	Antipodean albatross	Vulnerable, Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Diomedea epomophora	Southern royal albatross	Vulnerable, Migratory	Vulnerable	Foraging, feeding or related behaviour **likely** to occur within area
Diomedea exulans	Wandering albatross	Vulnerable, Migratory	Endangered	Foraging, feeding or related behaviour **likely** to occur within area
Diomedea sanfordi	Northern royal albatross	Endangered, Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Egretta garzetta	Little Egret	-	Endangered	Foraging, feeding or related behaviour **likely** to occur within area
Phoebetria palpebrata	Light-mantled sooty albatross	Migratory	Threatened	Foraging, feeding or related behaviour **likely** to occur within area

Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Gallinago hardwickii	Latham's snipe	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Gallinago megala	Swinhoe's snipe	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Gallinago stenura	Pin-tailed snipe	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Gelochelidon macrotarsa	Australian Gull-billed Tern	-	Endangered	Foraging, feeding or related behaviour **likely** to occur within area
Haliaeetus leucogaster	White bellied sea eagle	-	Threatened	Foraging, feeding or related behaviour **likely** to occur within area
Halobaena caerulea	Blue petrel	Vulnerable	-	Species or species habitat **may** occur within area
Hieraaetus morphnoides	Little Eagle	-	Vulnerable	Foraging, feeding or related behaviour **likely** to occur within area
Hydroprogne caspia	Caspian Tern	Migratory	Near threatened	Foraging, feeding or related behaviour **likely** to occur within area
Ixobrychus flavicollis australis	Black bittern	-	Vulnerable	Foraging, feeding or related behaviour **likely** to occur within area
Ixobrychus minutus	Little bittern	-	Endangered	Foraging, feeding or related behaviour **likely** to occur within area
Larus pacificus	Pacific Gull	-	Near threatened	Foraging, feeding or related behaviour **likely** to occur within area
Lathamus discolor	Swift parrot	Critically Endangered	Endangered	Species or species habitat **may** occur within area
Limosa lapponica baueri	Bar-tailed Godwit (baueri),	Vulnerable, Migratory	-	Species or species habitat **may** occur within area
Limosa lapponica menzbieri	Bar-tailed Godwit (menzbieri)	Critically Endangered	-	Species or species habitat **may** occur within area

Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Macronectes giganteus	Southern Giant Petrel	Endangered, Migratory	Vulnerable	Species or species habitat **may** occur within area
Macronectes halli	Northern Giant Petrel	Vulnerable	Near threatened	Species or species habitat **may** occur within area
Neophema chrysogaster	Orange-bellied Parrot	Critically Endangered	Critically endangered	Species or species habitat **known** to occur within area
Numenius madagascariensis	Eastern Curlew	Critically Endangered, Migratory	Vulnerable	Species or species habitat **likely** to occur within area
Numenius phaeopus	Whimbrel	Migratory	Vulnerable	Foraging, feeding or related behaviour **likely** to occur within area
Numenius minutus	Little Curlew	Migratory	-	Species or species habitat **likely** to occur within area
Nycticorax caledonicus	Nankeen Night-Heron	-	Near threatened	Foraging, feeding or related behaviour **likely** to occur within area
Pachyptila turtur subantarctica	Fairy Prion	Vulnerable	Vulnerable	Species or species habitat **known** to occur within area
Pandion haliaetus	Osprey	Migratory	--	Species or species habitat **likely** to occur within area
Pelagodroma marina	White-faced Storm-Petrel	-	Vulnerable	Foraging, feeding or related behaviour **likely** to occur within area
Pelecanoides urinatrix	Common Diving-Petrel	-	Near threatened	Foraging, feeding or related behaviour **likely** to occur within area
Phalacrocorax fuscescens	Black-faced Cormorant	-	Near threatened	Foraging, feeding or related behaviour **likely** to occur within area
Phalacrocorax varius	Pied Cormorant	-	Near threatened	Foraging, feeding or related behaviour **likely** to occur within area

Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Phoebetria fusca	Sooty Albatross	Vulnerable, Migratory	-	Species or species habitat **likely** to occur within area
Platalea regia	Royal Spoonbill	-	Near threatened	Foraging, feeding or related behaviour **likely** to occur within area
Pluvialis squatarola	Grey Plover	Migratory	Endangered	Foraging, feeding or related behaviour **likely** to occur within area
Pterodroma leucoptera leucoptera	Gould's Petrel	Endangered	-	Species or species habitat **may** occur within area
Pterodroma mollis	Soft-plumaged Petrel	Vulnerable	-	Species or species habitat **may** occur within area
Rostratula australis	Australian Painted Snipe	Endangered	Critically endangered	Species or species habitat **known** to occur within area
Rostratula benghalensis	Painted snipe	-	Critically endangered	Foraging, feeding or related behaviour **likely** to occur within area
Sternula albifrons	Little tern	Migratory	Vulnerable	Foraging, feeding or related behaviour **likely** to occur within area
Sterna caspia	Caspian tern	Migratory	Near threatened	Foraging, feeding or related behaviour **likely** to occur within area
Sterna nilotica	Gull-billed tern	Migratory	Endangered	Foraging, feeding or related behaviour **likely** to occur within area
Sterna striata	White-fronted Tern	-	Near threatened	Foraging, feeding or related behaviour **likely** to occur within area
Sternula nereis nereis	Australian Fairy Tern	Vulnerable	Endangered	Species or species habitat **known** to occur within area
Thalassarche bulleri	Buller's Albatross	Vulnerable, Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Thalassarche bulleri platei	Northern Buller's Albatross	Vulnerable	-	Foraging, feeding or related behaviour **likely** to occur within area

Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Thalassarche cauta	Shy Albatross	Endangered, Migratory	Vulnerable	Foraging, feeding or related behaviour **likely** to occur within area
Thalassarche chrysostoma	Grey-headed Albatross	Endangered, Migratory	-	Species or species habitat **may** occur within area
Thalassarche impavida	Campbell Albatross	Vulnerable, Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Thalassarche melanophris	Black-browed Albatross	Vulnerable, Migratory	Vulnerable	Species or species habitat **may** occur within area
Thalassarche salvini	Salvin's Albatross	Vulnerable, Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Thalassarche steadi	White-capped Albatross	Vulnerable, Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Thinornis cucullatus cucullatus	Eastern Hooded Plover	Vulnerable	-	Species or species habitat **known** to occur within area
Thinornis rubricollis	Hooded plover	-	Vulnerable	Breeding or nesting behaviour **known** to occur within area
Thinornis rubricollis rubricollis	Hooded plover (eastern)	Vulnerable	Vulnerable	Species or species habitat **likely** occur within area
Tringa nebularia	Common Greenshank	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Tringa stagnatilis	Marsh Sandpiper	Migratory	-	Foraging, feeding or related behaviour **likely** to occur within area
Xenus cinereus	Terek sandpiper	Migratory	Endangered	Foraging, feeding or related behaviour **likely** to occur within area
Whales, Dolphins and Seals				
Balaenoptera borealis	Sei Whale	Vulnerable, Migratory	-	Foraging, feeding or related behaviour **known** to occur within area

Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Balaenoptera musculus	Blue whale	Endangered, Migratory	Critically endangered	Foraging, feeding or related behaviour **known** to occur within area
Balaenoptera physalus	Fin whale	Vulnerable, Migratory	Data deficient	Foraging, feeding or related behaviour **known** to occur within area
Caperea marginate	Pygmy right whale	Migratory	-	Foraging, feeding or related behaviour **known** to occur within area
Eubalaena australis	Southern right whale	Endangered, Migratory	Critically endangered	Breeding and calfing **known** to occur within area
Megaptera novaeangliae	Humpback whale	Vulnerable, Migratory	Vulnerable	Species or species habitat **likely** to occur within area
Neophoca cinerea	Australian sea-lion	Vulnerable	-	Species or species habitat **known to** occur within area
Arctophoca tropicalis	Subantarctic fur seal	Endangered	-	Species or species habitat **known** to occur within area
Mirounga leonina	Southern elephant seal	Vulnerable	-	Species or species habitat **known** to occur within area
Orcinus orca	Killer whale	Migratory	-	Species or species habitat **known** to occur within area
Physeter macrocephalus	Sperm whale	Migratory	-	Species or species habitat **known** to occur within area
Tursiops australis	Burrunan dolphin	-	Endangered	Species or species habitat **possibly** occurs within area
Lagenorhynchus obscurus	Dusky dolphin	Migratory	-	Species or species habitat **possibly** occurs within area
Turtles				
Caretta caretta	Loggerhead turtle	Endangered, Migratory	-	Foraging habitat likely to occur within study area

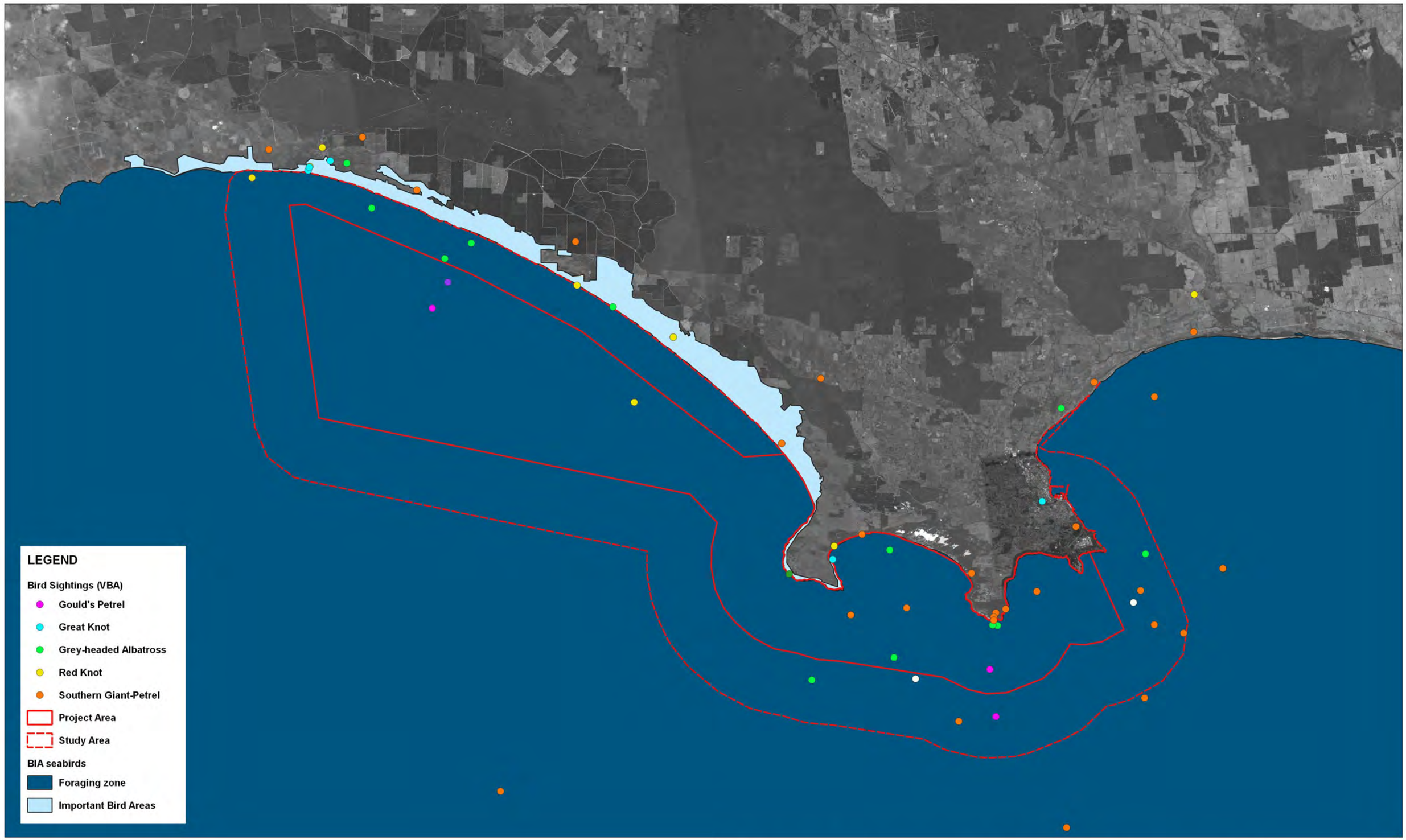
Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Chelonia mydas	Green turtle	Vulnerable, Migratory	-	Foraging habitat likely to occur within study area
Dermochelys coriacea	Leatherback Tturtle	Endangered, Migratory	Critically endangered	Foraging habitat likely to occur within study area
Sharks and Fish				
Isurus oxyrinchus	Shortfin mako	Migratory	-	Species or species habitat **likely** to occur within area
Prototroctes maraena	Australian grayling	Vulnerable	Vulnerable	Species or species habitat **unlikely** to occur
Carcharodon carcharias	White shark	Vulnerable, Migratory	Threatened	Foraging, feeding or nursery-related behaviour **known** to occur within area
Lamna nasus	Porbeagle	Migratory	-	Species or species habitat **possibly** to occur within area
Galaxiella pusilla	Eastern dwarf galaxias	Vulnerable	-	Species or species habitat **unlikely** to occur within area
Nannoperca obscura	Yarra pygmy perch	Vulnerable	-	Species or species habitat **unlikely** to occur within area
Nannoperca variegate	Variegated pygmy perch	Vulnerable	-	Species or species habitat **unlikely** to occur within area
Ambassis agassizii	Agassiz's chanda perch	-	Regionally extinct	Unlikely to occur within area
Lovettia sealii	Australia whitebait	-	Critically endangered	Unlikely to occur within area
Mugilogobius paludis	Pale mangrove goby	-	Vulnerable	Species or species habitat **possibly** occurs within area
Neochanna cleaveri	Australia mudfish	-	Critically endangered	Species or species habitat **possibly** occurs within area
Potamalosa richmondia	Freshwater herring	-	Regionally extinct	Species or species habitat **possibly** occurs within area

Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Thunnus maccoyii	Southern bluefin tuna	Conservation dependent	Threatened	Foraging, feeding or related behaviour **known** to occur within area
Bats				
Miniopterus orianae bassanii	Southern bent-wing bat/Common bent-wing bat	Critically Endangered	Threatened	Species or species habitat possibly occurs within study area (but only nearshore, close to caves/seacliffs)
Marine Benthic Species				
Megascleres australis	Giant Gippsland earthworm	Vulnerable	Endangered	Species or species habitat **unlikely** occurs within area
Eucalliax tooradin	Ghost shrimp species	-	Vulnerable	Species or species habitat **possibly** occurs within area
Michelea microphylla	Ghost shrimp species	-	Vulnerable	Species or species habitat **possibly** occurs within area
Amphiura trisacantha	Brittle star species	-	Vulnerable	Species or species habitat **possibly** occurs within area
Apsolidium densum	Sea-cucumber species	-	Vulnerable	Species or species habitat **possibly** occurs within area
Apsolidium handrecki	Sea-cucumber species	-	Vulnerable	Species or species habitat **possibly** occurs within area
Ophiocomina australis	Brittle star species	-	Vulnerable	Species or species habitat **possibly** occurs within area
Pentocnus bursatus	Sea-cucumber species	-	Vulnerable	Species or species habitat **possibly** occurs within area
Thyone nigra	Sea-cucumber species	-	Vulnerable	Species or species habitat **possibly** occurs within area
Trochodota shepherdi	Sea-cucumber species	-	Threatened	Species or species habitat **possibly** occurs within area

Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Ralpharia coccinea	Stalked hydroid species	-	Threatened	Species or species habitat **possibly** occurs within area
Bassethullia glypta	Chiton species	-	Vulnerable	Species or species habitat **possibly** occurs within area
Platydoris galbana	Marine opisthobranch species	-	Vulnerable	Species or species habitat **possibly** occurs within area
Rhodope genus	Marine opisthobranch species	-	Threatened	Species or species habitat **possibly** occurs within area

5.1.3.1 Seabirds

There are several records of a number of threatened seabirds being present within the study area. The study area is mapped as a BIA for the black-browed albatross (*Thalassarche melanophris*), butlers albatross, Campbell albatross (*Thalassarche impavida*), Indian yellow-nose albatross (*Thalassarche carteri),* shy albatross (*Thalassarche cauta*), wandering albatross (*Diomedea chionoptera*) and the antipodean albatross (*Diomedea antipodensis*) as shown in Figure 5-2.



LEGEND

Project Area

Study Area

Title:

EPBC Status Seabird Sightings (Victorian Biodiversity Atlas) Victoria

Figure: 5-2

Rev: A

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Albatross and petrel species largely breed in Antarctica and islands south of Australia (Australian Government, 2016). Albatross and giant petrel species exhibit a broad range of diets and foraging behaviours, and hence their at-sea distributions are diverse. Combined with their ability to cover vast oceanic distances, all waters within Australian jurisdiction can be considered foraging habitat, however the most critical foraging habitat is considered to be those waters south of 25 degrees where most species spend the majority of their foraging time. It is unlikely the study area would be considered critical to the survival of threatened seabird species due to their large foraging range; further detailed assessment of their use of the area and the risks posed by turbine strike will be required however.

5.1.3.2 *International Migratory Shorebirds*

International migratory shorebirds refer to shorebirds and waders that typically migrate on an annual basis through the East Asian-Australasian Flyway (Bamford *et al.* 2008). These species breed in wetland environments in the northern hemisphere during the northern summer, before migrating south to Australia and other locations over winter (Australian summer).

As part of the annual migration, shorebirds tend to aggregate at significant coastal wetland and intertidal sites across Australia, with smaller aggregations occurring in inland habitats. The study area and surrounds provides suitable roosting and foraging habitat for shorebirds, including intertidal mud flats, shoals, reef and beach habitats.

The Glenelg Estuary and Discovery Bay Ramsar Wetland, immediately adjacent to the study area, is reported to regularly support the following threatened and/or migratory waterbirds and shorebirds (Butcher et al, 2015), :

- Australian bittern (*Botaurus poiciloptilus*) – Endangered under the EPBC Act
- Fairy tern (S*terna nereis nereis*) – Vulnerable under the EPBC Act
- Hooded plover (*Thinornis rubricollis*) – Vulnerable under the EPBC Act.

In general, the Ramsar wetland provided habitat for up to 95 waterbird species, including 24 species listed under international agreements.

Shorebirds species would congregate around nearshore habitats but may occasionally utilise the study area for foraging purposes. Figure 5-3 shows shorebird (and terrestrial species) sighting records for the study area and surrounds.

LEGEND

Bird Sightings (VBA)

- Australasian Bittern
- Australian Painted-snipe
- Common Bent-wing Bat (southern ssp.)
- Curlew Sandpiper
- Eastern Bristlebird
- Eastern Curlew
- Orange-bellied Parrot
- Plains-wanderer
- Red-tailed Black-Cockatoo (south-eastern)
- Regent Honeyeater
- Swift Parrot
- Important Bird Areas

LEGEND

- Project Area
- Study Area

Title:

EPBC Status Shorebird Sightings (Victorian Biodiversity Atlas)

Figure: 5-3

Rev: A

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5.1.3.3 Parrots

5.1.3.3.1 Orange-bellied parrot

The orange-bellied parrot (*Neophema chrysogaster*) inhabits coastal and surrounding areas including saltmarshes, littoral heathlands and scrublands. The orange-bellied parrot breeds in Tasmania and then migrates to southern mainland Australian for winter; it is considered Critically Endangered, with less than 50 birds remaining in the wild. The orange-bellied parrot (Critically Endangered) has been recorded regularly through the 80's and 90's within the study area, however the last record was in 1994 (ALA, 2021).

Typically, the birds migrate to Victoria closer to Port Phillip Bay, then disperse east and west, along the Victorian coastline, as shown in Figure 5-4.

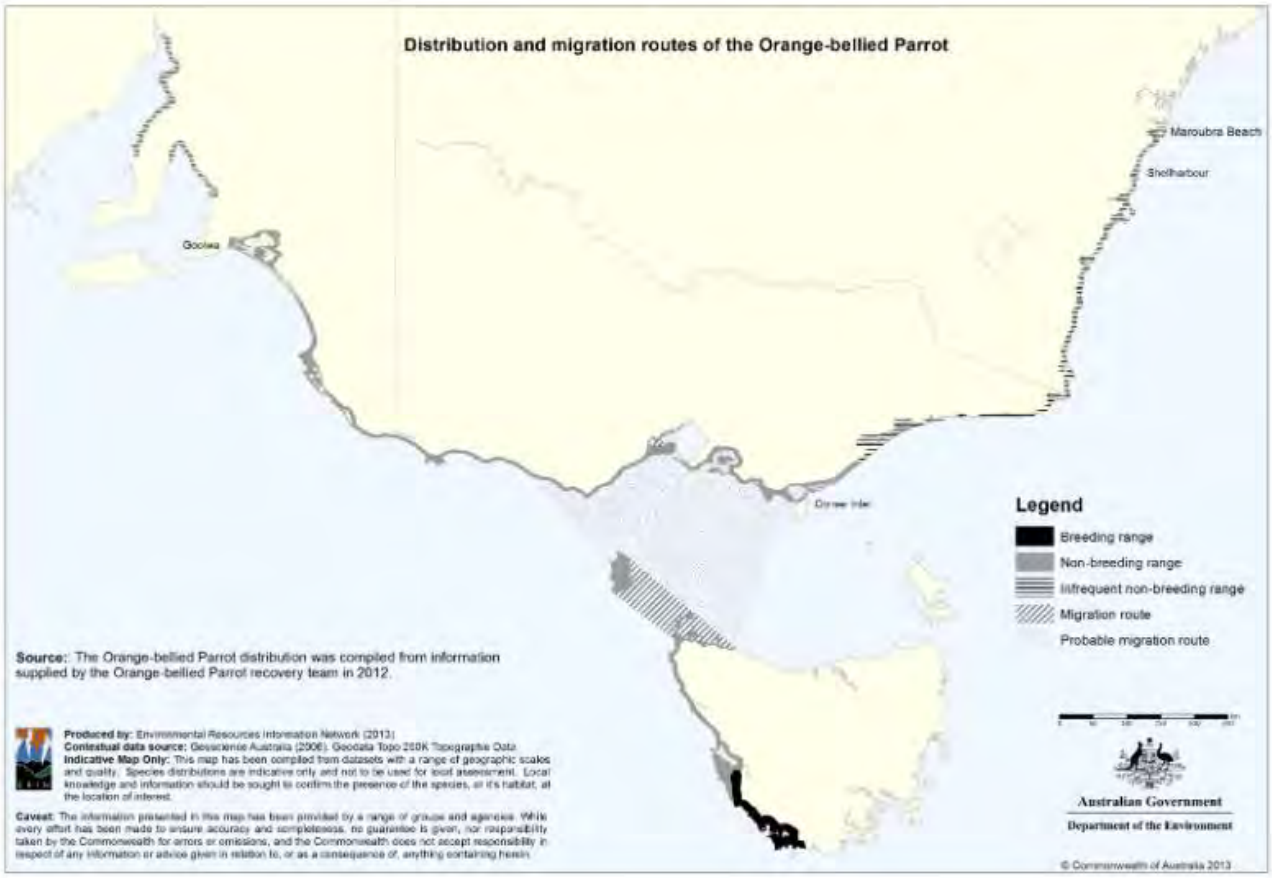


Figure 5-4 Known distribution of the orange-bellied parrot (Australian Government, 2016)

It would appear that although habitat for the species exists within the study area, it is not currently utilised by the species, and would likely not be considered habitat critical to its survival as a species.

5.1.3.3.2 Swift parrot

Similarly, swift parrots (Critically Endangered under the EPBC Act) breed in Tasmania and migrate to mainland Australia in autumn. During winter the parrots disperse across a broad landscape, foraging on nectar in eucalypt woodlands mainly in inland Victoria and New South Wales. The migratory pathways of the species is not well understood, however it is considered most likely they

cross the Victorian coastline around Port Phillip Bay including the Mornington and Bellarine Peninsulas. There are no contemporary records of the species occurring along the coastline of south-western Victoria, near the study area, however recent mapping (Figure 5-6) does indicate the species **may** occur. Whilst the study area does not contain habitat for the species i.e. Eucalypt woodlands, it is possible that individuals pass through the study area whilst migrating to their preferred habitat.

The draft Swift Parrot Recovery Plan (Commonwealth of Australia, 2019) lists the construction of wind turbines in South-eastern Australia as a potential threat to survival of the species, if they are poorly sited.

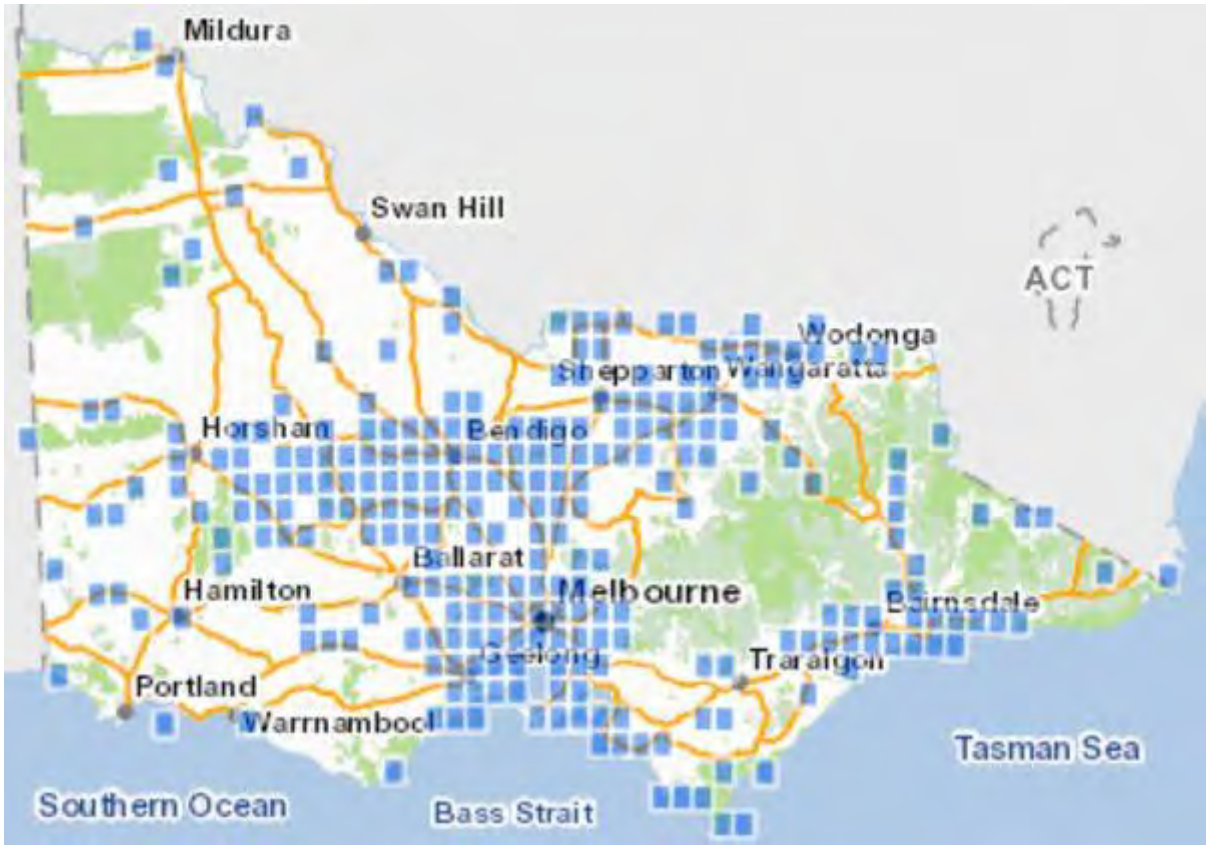


Figure 5-5 All known records of Swift Parrot in Victoria. Source: Victorian Biodiversity Atlas, 2019

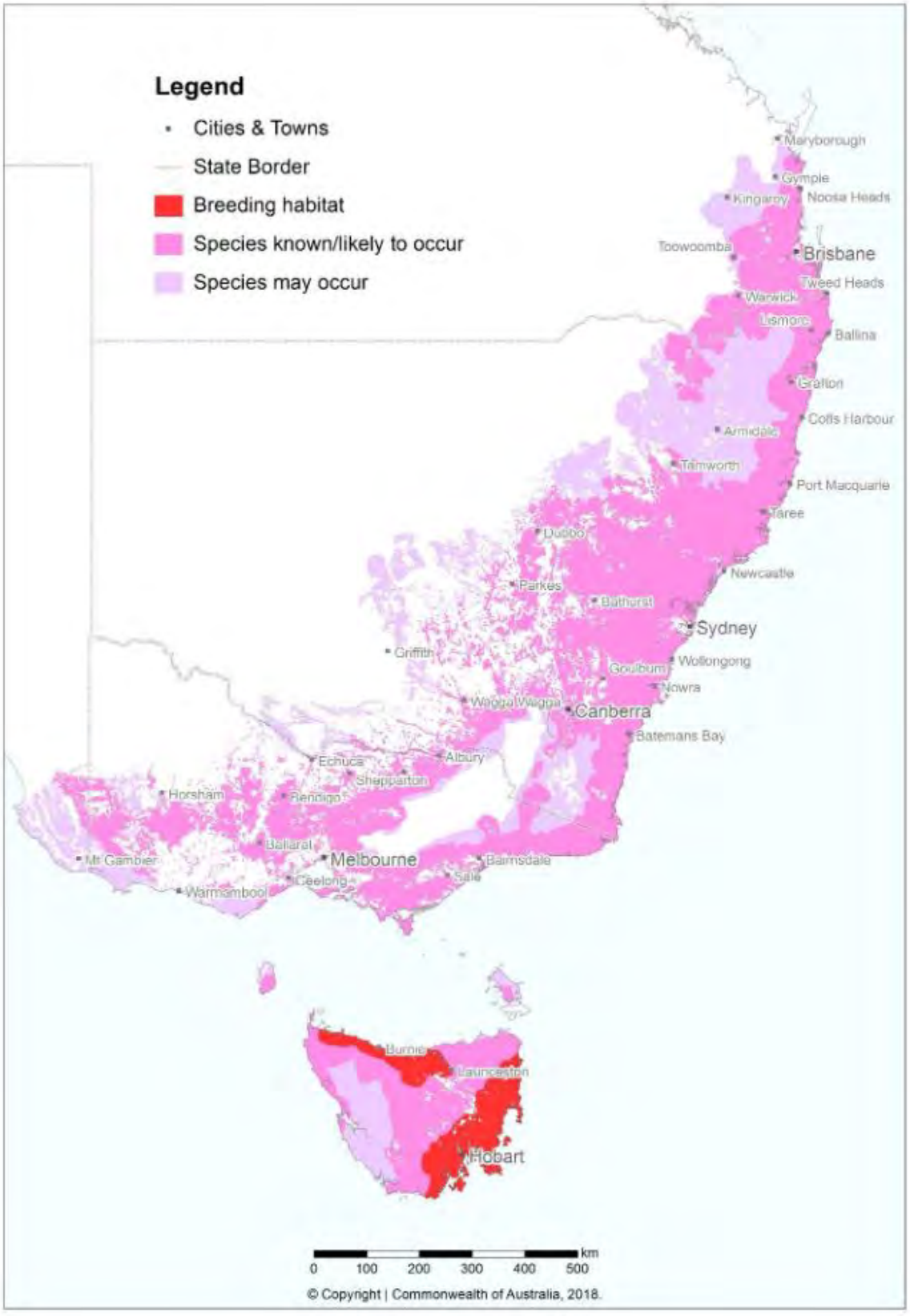


Figure 5-6 Distribution of the Swift Parrot in Australia (Source: *Draft National Recovery plan for the Swift Parrot*, Commonwealth of Australia, 2019

5.1.3.4 Cetaceans

The **southern right whale** (*Eubalaena australis*), which is listed as Endangered under the EPBC Act, migrates between summer feeding areas in the Southern Ocean to inshore coastal waters off Australia. The western coastal areas of Victoria are classified as a large established aggregation area where calving occurs for the Southern Right Whale (see Figure 5-7 DSEWPC 2012). The area around Portland is established as a BIA for these whales, as illustrated in Figure 5-8.

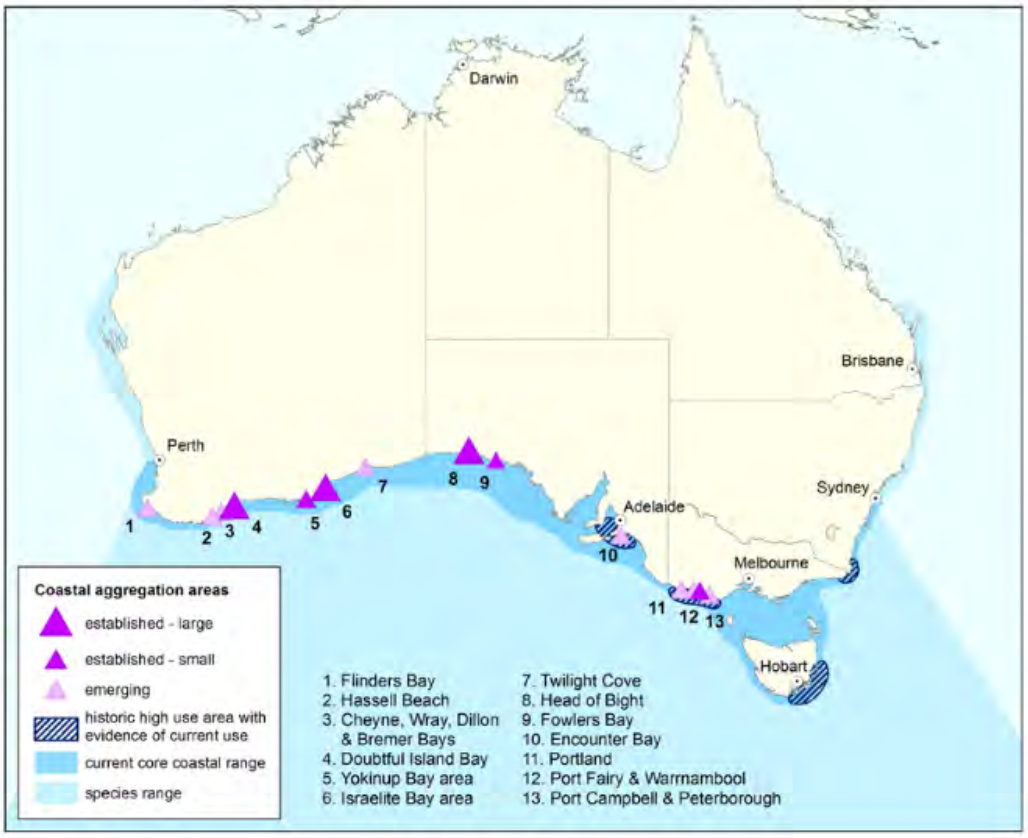
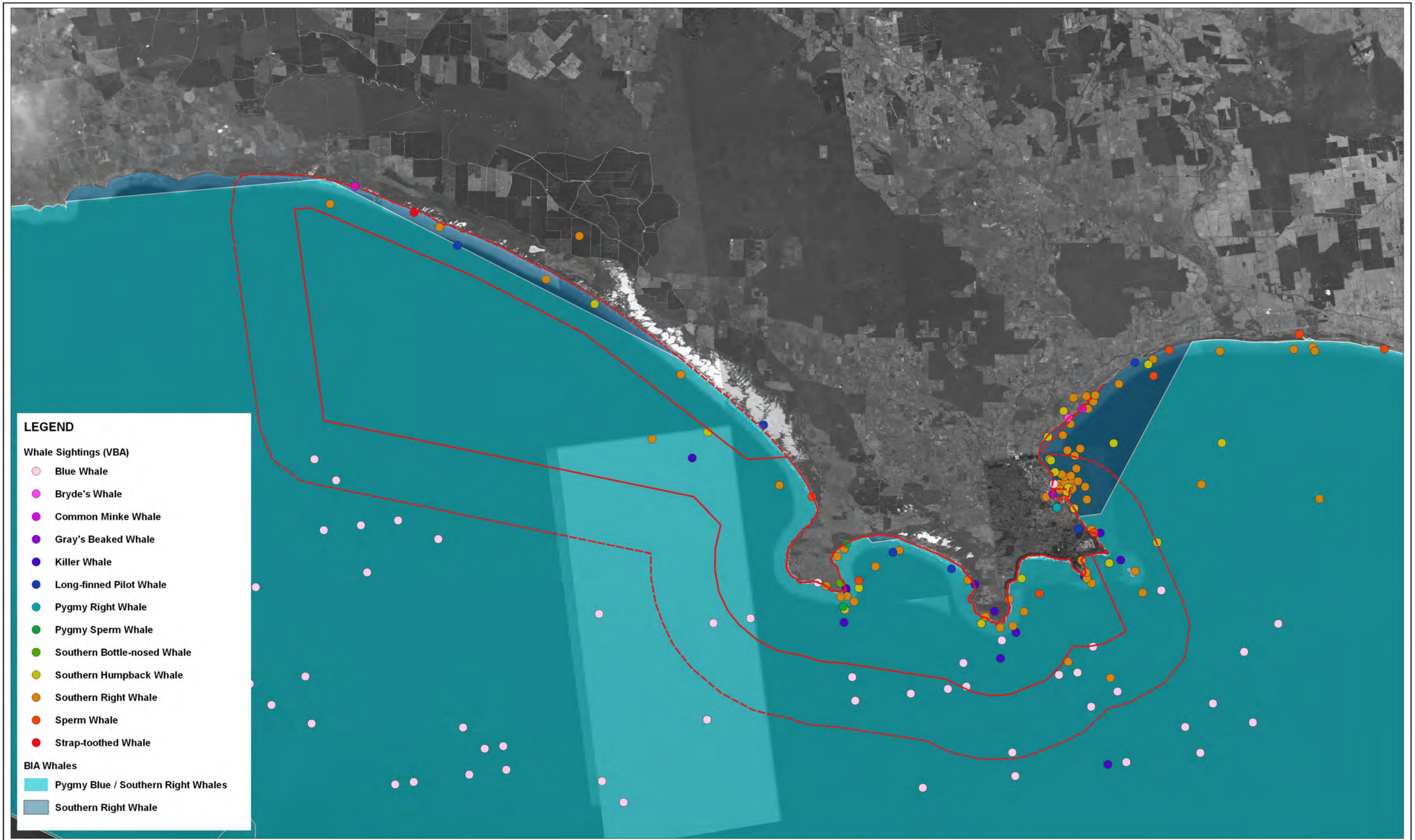


Figure 5-7 Southern Right Whales Coastal Aggregation (DSEWPC 2012)



LEGEND

- Project Area
- Study Area

Title:

Whale Sightings (Victorian Biodiversity Atlas) Victoria

Figure: 5-8

Rev: A

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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In 2020, nine southern right whale sightings were reported in the vicinity of the study area (SWIFFT 2020). The importance of the Portland area for females with calves is also identified in Stamation et al (2020), which highlights the study area as being a key area for breeding females, as shown in Figure 5-9.

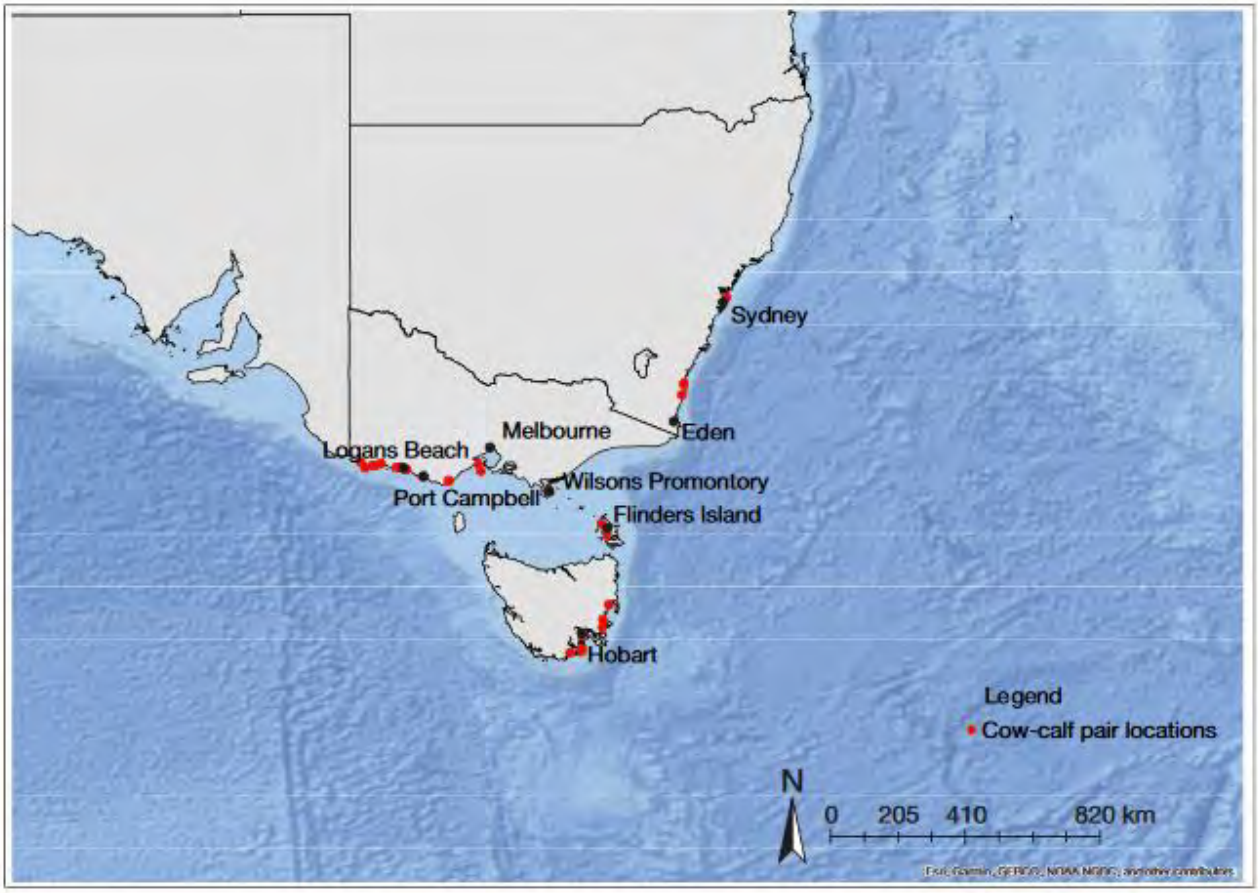


Figure 5-9 Location of mother-calf pairs identified in southeastern Australian waters between 1993-2017 (Stamation et al, 2020)

Other species are known to occur, including the EPBC-listed endangered blue whale; two sub-species are known in Australia the Antarctic blue whale and the pygmy blue whale. The distribution of each subspecies varies and is not fully understood (Double et al. 2014). The Antarctic blue whale tends to remain at higher latitudes and migrate to lower latitudes for feeding, breeding and calving during the Australian summer (Branch 2007, Širovic et al. 2009, Woinarski et al. 2014). The pygmy blue whale is known to aggregate each year during the summer off southern Australia due to seasonal upwellings that concentrate high densities of prey (Attard et al. 2010, Gill et al. 2011).

Key areas of aggregation include the Perth Canyon off Western Australia, the Bonney Upwelling and adjacent waters off South Australian and Victoria (Rennie et al. 2009, Attard et al. 2010, Gill et al. 2011).

The pygmy blue whale aggregates between Cape Otway, Victoria, and Robe, South Australia, in relatively shallow shelf waters enriched by seasonal cold water upwelling driven by south-east winds.

Aggregation in the Bonney Upwelling between the Great Australian Bight and Bass Strait occurs November–May (Gill et al. 2011).

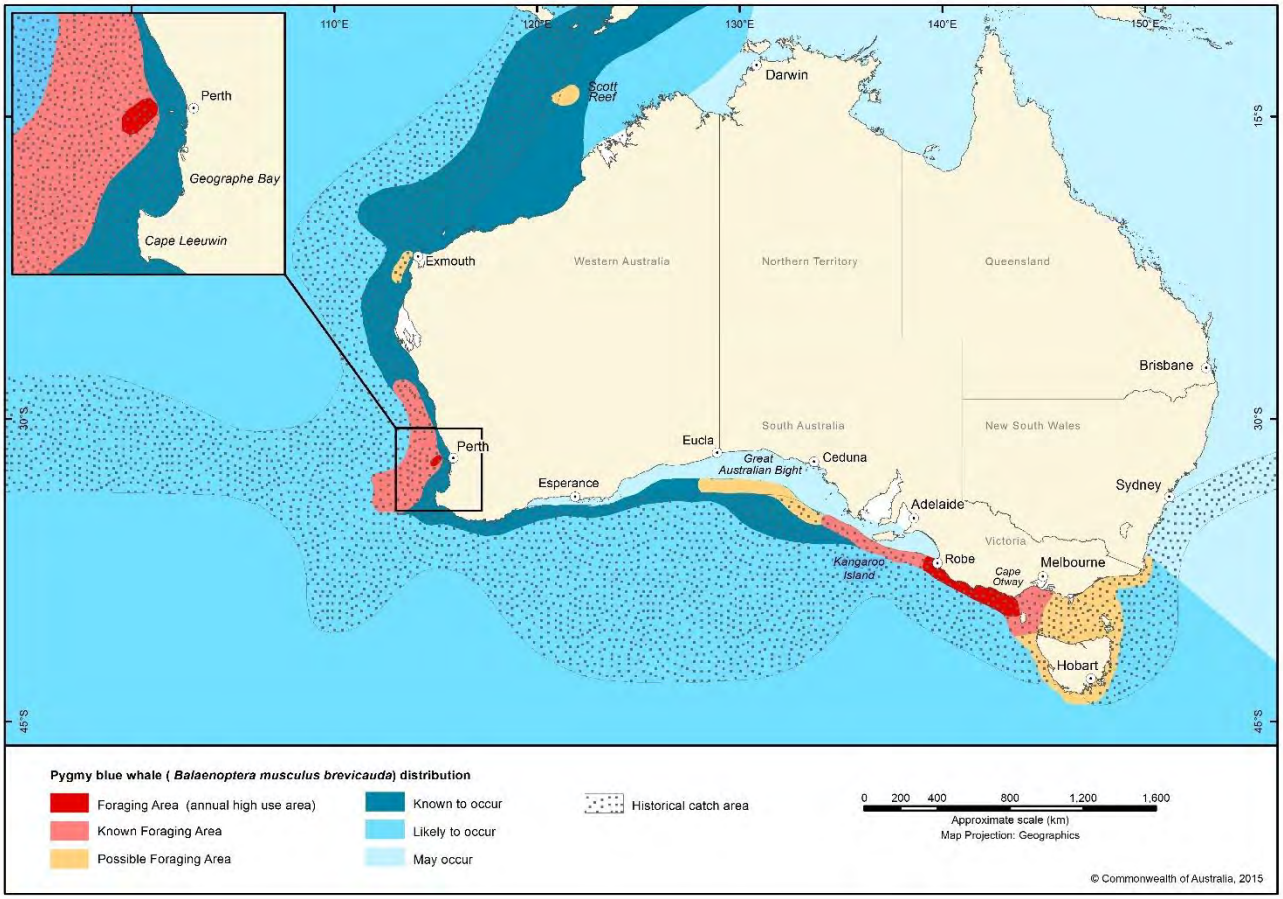


Figure 5-10 Area of distribution for the pygmy blue whale

To the west of Portland, where the upwelling surfaces, the whales often aggregate in a relatively narrow band around a mean depth of 86 m, along or near surface temperature fronts. This aggregation point has elevated levels of chlorophyll a, which is downstream from upwelling centres and attracts swarms of the krill *Nyctiphanes australis*. To the east of Portland where there is no surface upwelling, krill and whales are more widely dispersed across the shelf, with blue whales occurring at a mean depth of 75 m (Gill 2004).

Further investigations will be required to identify if blue whales come closer to shore at Portland, and whether underwater noise or vibration produced by wind turbines would cause the species to avoid the area. Figure 5-11 shows known and possible migratory routes for the species.

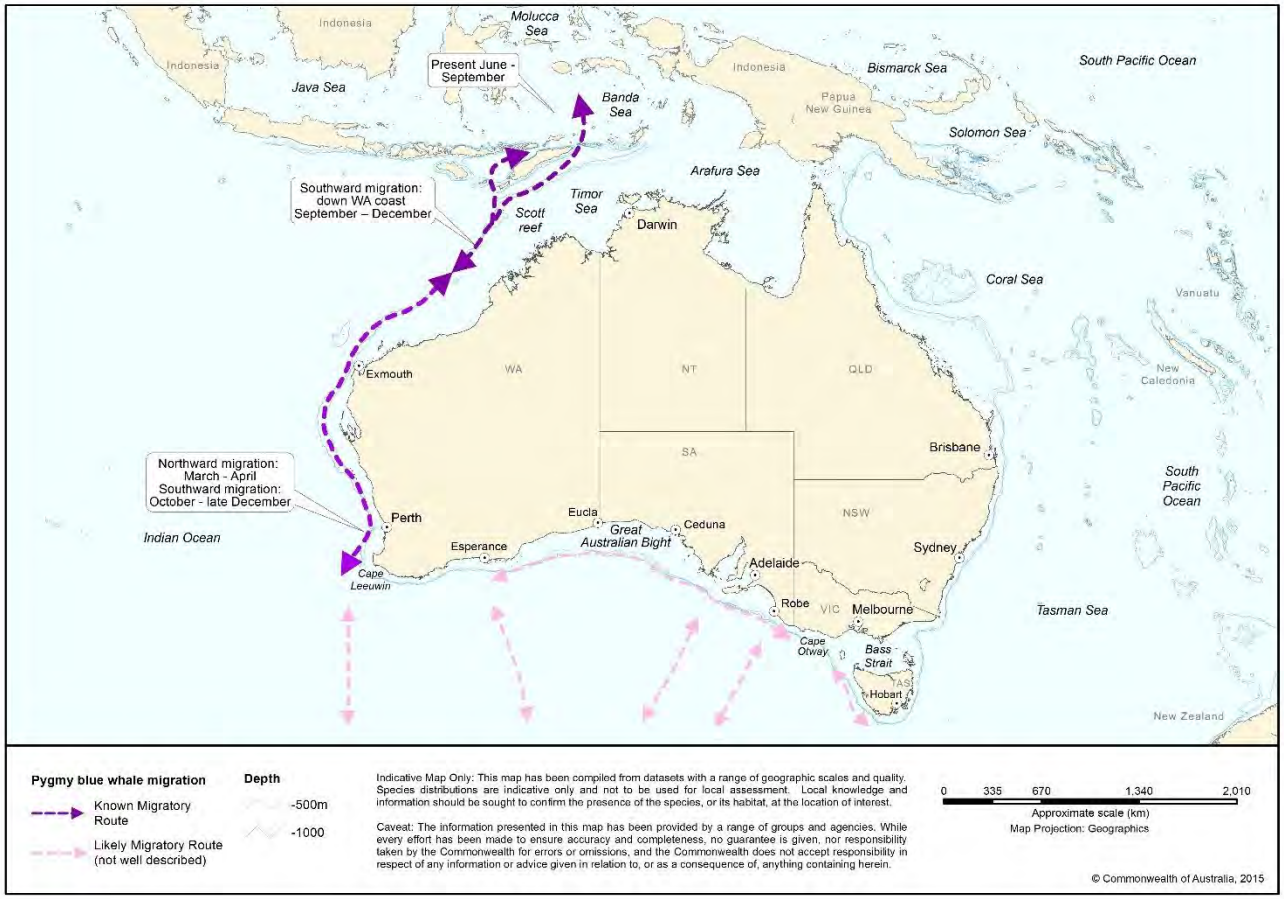


Figure 5-11 Known and potential migration routes for the pygmy blue whale

Noise interference (loud noises or long exposure) is sited in the Conservation Plan as being a potential threat to the species, causing avoidance behaviour. Potential forms of noise interference include seismic and drilling operations, mining, some types of dredging, infrastructure construction and operation, vessel noise and low flying planes, chronic vessel noise. The Conservation Plan also states that '*new forms of industry with the potential to create underwater noise include near-shore renewable energy technologies such as wind farms and tidal turbines, and further work on the underwater noise levels produced from these developments is needed*'.

The humpback whale (*Megaptera novaeangliae*) has also been regularly recorded near the study area and is mapped as part of the core range for the species (Figure 5-12), but is not considered a breeding, resting or feeding area.

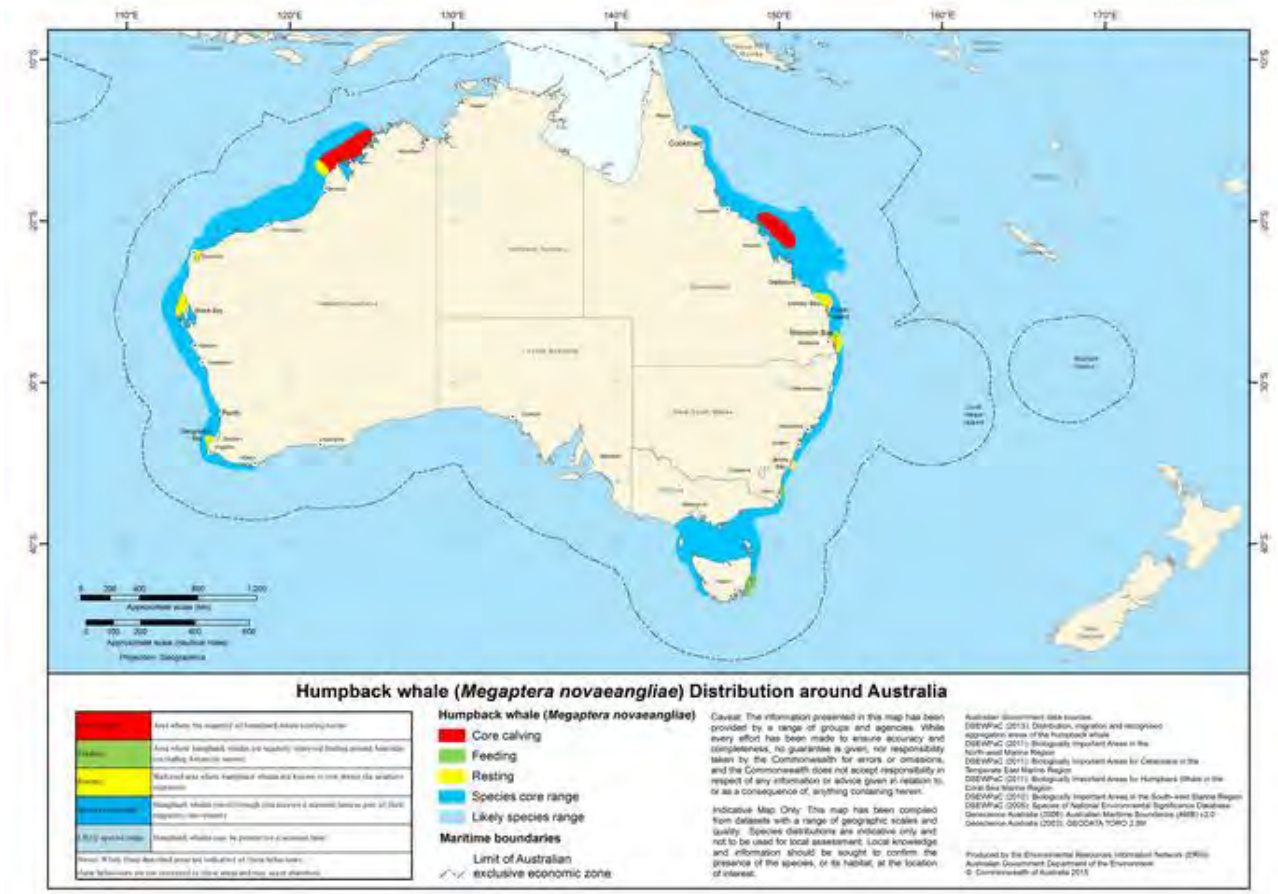


Figure 1 Distribution of the humpback whale in waters off the Australian mainland (taken from TSSC 2015).

Figure 5-12 Distribution of the humpback whale in Australia (SPRAT, 2015)

Other threatened whale species may occur occasionally in the study area (i.e. fin, brydes and sei whales) however these are infrequently recorded and tend to occur further offshore i.e. 20-60km) (SPRAT, 2021) with no known mating or calving activity in Australian waters.

5.1.3.5 Pinnipeds

There is a known colony of Australian sea lions *(neophoca cinerea*) at Cape Bridgewater, in the eastern section of the study area, as shown in Figure 5-13. It is likely that individual animals forage within the study area and may be sensitive to physical disturbance and underwater noise or vibration.

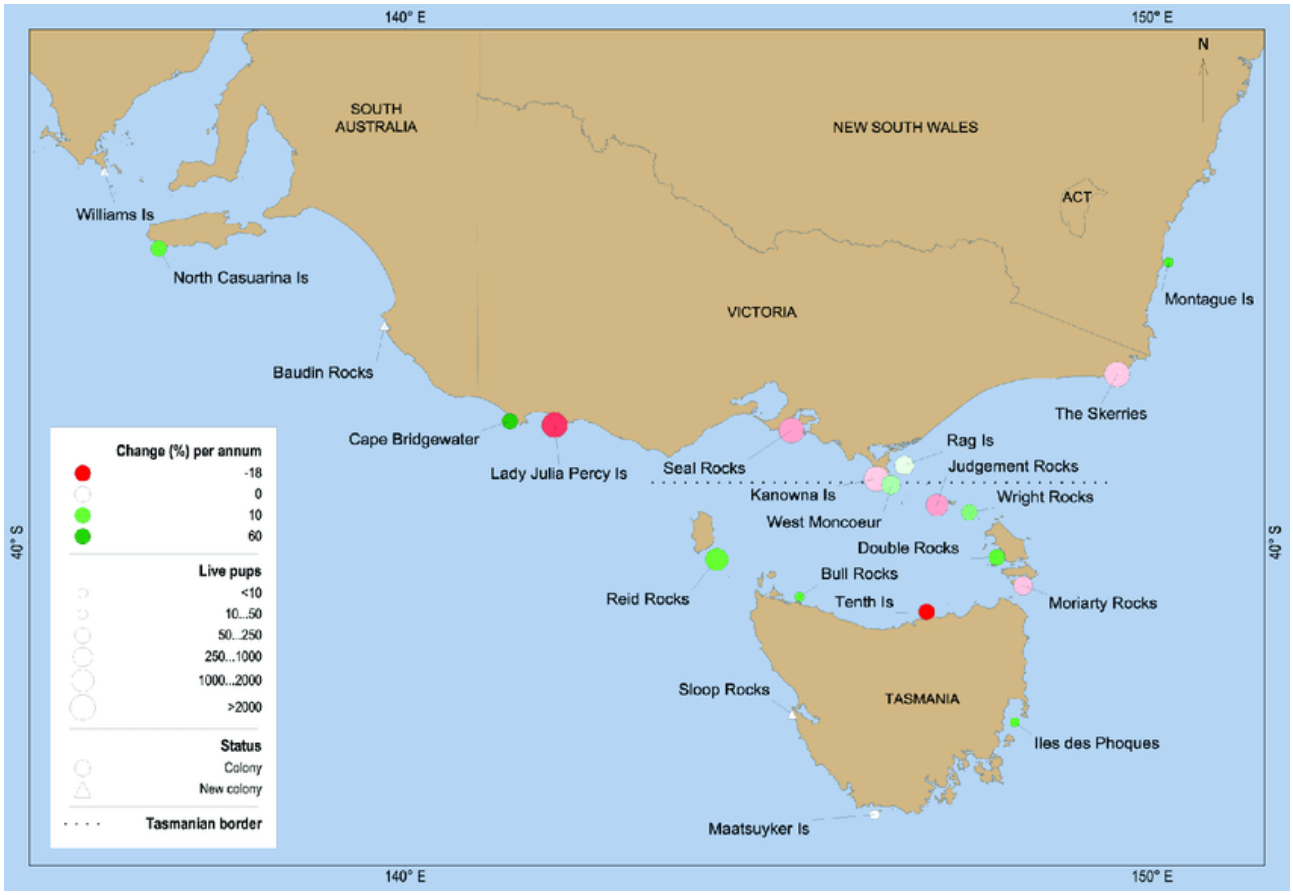
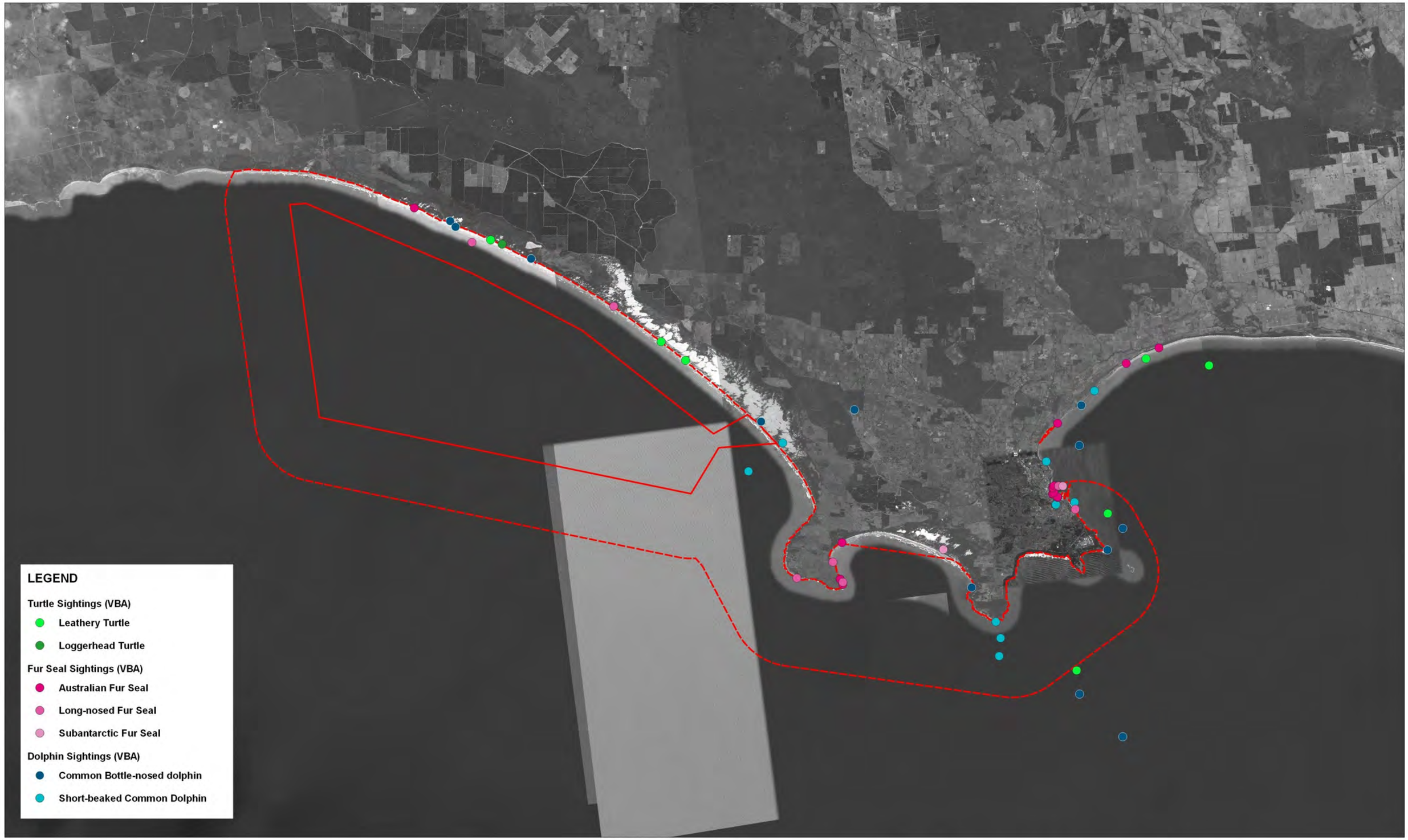


Figure 5-13 Map of Victorian Australian sea lion colonies (McIntosh et al, 2018)

The southern elephant seal (*Mirounga leonina*, listed as Vulnerable under the EPBC Act) breeds in Antarctic waters but does on occasion forage in southern Australia. There are a number of sightings of species individuals in the study area, including recent sightings in 2020 and 2018 (Atlas of Living Australia). The study area is not listed as habitat or potential habitat within the Species Profile and Threats Database (Commonwealth of Australia, 2021).

Similarly, individual subantartic fur seals (*Arctocephalus tropicalis*) may occasionally utilise the study area, however haul out and breeding areas are only known further south, mainly on Macquarie Island.

Turtle, Seal and Dolphin sightings for the study area are shown in Figure 5-14.



LEGEND

- Project Area
- Study Area

Title:

EPBC Status Megafauna Sightings (Victorian Biodiversity Atlas) Victoria

Figure: 5-14

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5.1.4 Turtles

There are a number of sightings of threatened turtle species along the shoreline, including the leatherback and loggerhead Turtles (*Dermochelys coriacea* and *Caretta caretta* respectively); they would be using the nutrient rich waters surrounding the site for feeding purposes, however nesting occurs further northwards. The study area is not likely to be considered key habitat for turtles.

5.1.4.1 Sharks and Fish

The white shark (*Carcharodon carcharias*) is widely, but not evenly, distributed in Australian waters, with observations more frequent in some areas (Australian Government, 2014). These areas include waters in and around some fur seal and Australian sea lion colonies such as: the Neptune Islands (South Australia); areas of the Great Australian Bight as well as the Recherche Archipelago and the islands off the lower west coast of Western Australia (Malcolm et al., 2001; EA, 2002). Given the proximity of a seal colony at Cape Bridgewater, the study area may attract a higher number of white sharks. The study area is mapped as a BIA for the species, as illustrated in Figure 5-15.

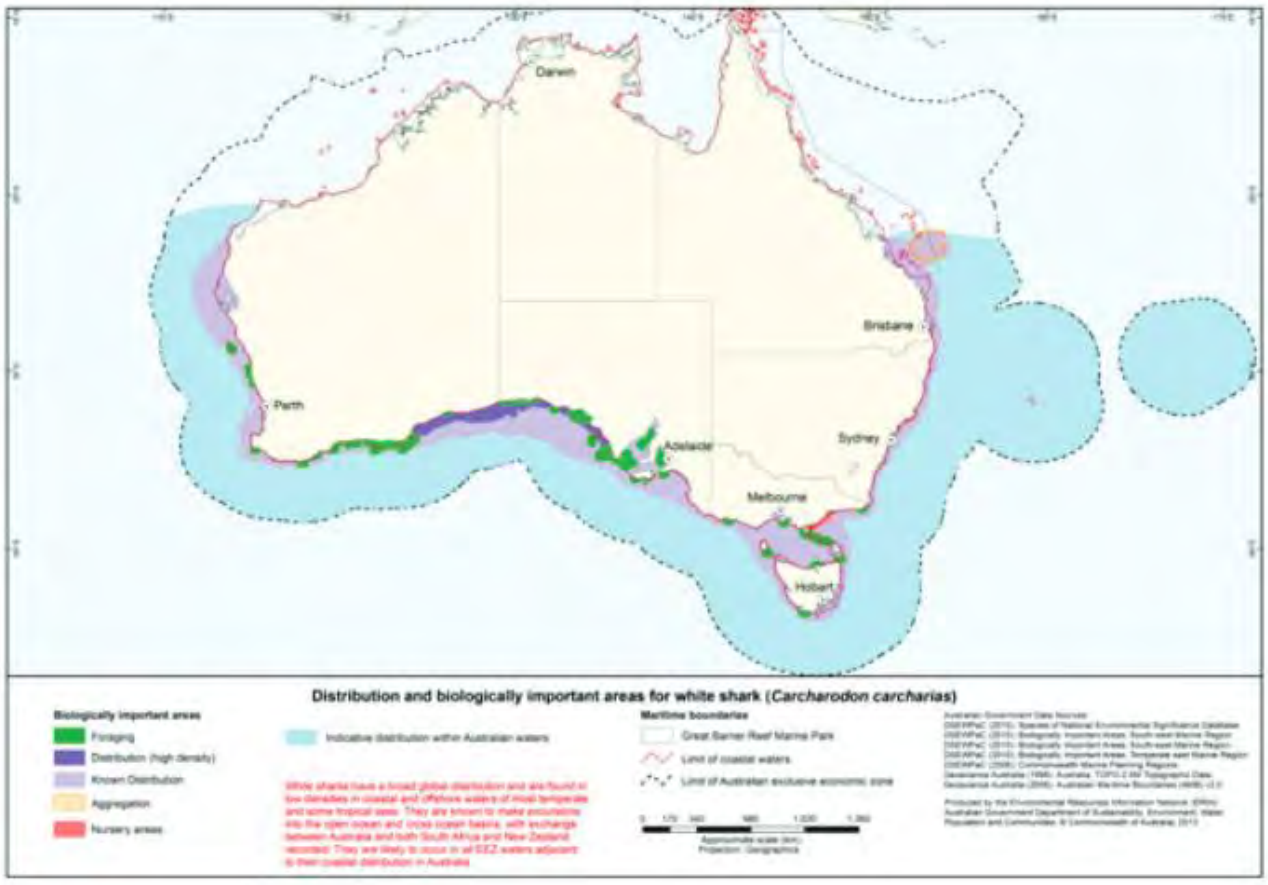

Figure 5-15 Distribution and biologically important areas for the white shark (Australian Government, 2013).

5.1.5 Migratory Species

Table 5-1 lists species that a considered Migratory under the EPBC Act. There are an additional 25 migratory bird species, several whale and two fish species that are listed as migratory but are not considered threatened. It is considered likely that all of these species use the study area for foraging, although breeding activity is unlikely.

5.2 State Matters

5.2.1 Vegetation Communities

Ecological Vegetation Classes (EVCs) are a unit for classifying vegetation communities in Victoria. Within the study area, it is possible that the following communities with conservation status exist:

- Coastal saltmarsh - Vulnerable
- Estuarine wetland – Endangered
- Coastal headland scrub – Vulnerable.

There are no known critical habitats or Habitat Conservation Orders (HCO's) as declared under the FFG Act within the study area.

5.2.2 Threatened species

In addition to species listed as threatened under the EPBC Act, there are a further 25 shorebirds, six seabirds, five fish, 13 benthic fauna and a dolphin species that are listed as threatened under the FFG Regulations and/or the Victorian Advisory List, and potentially occur within the study area. Shorebirds, seabirds and fish species are separately discussed in Sections 5.1.3.1, 5.1.3.2 and 5.2.3.

5.2.2.1 Benthic fauna

The nearshore environment within the study area contains a number of areas of reef, which would be expected to support sponges, ascidians, bryozoans and gorgonians. A detailed benthic habitat survey would be required to identify whether this includes any threatened species under the FFG Act.

5.2.3 Fisheries Values

The Bonney Coast Upwelling helps to increase the primary productivity of Discovery and Bridgewater Bay in Victoria to support a variety of marine habitats such as the *Heterozostera* seagrass meadows within Bridgewater Bay that provide an important nursery and feeding ground for a range of commercially important species.

There are a number of Protected Aquatic Biota (PABs) declared under the *Fisheries Act 1995*. These include Syngnathidea (i.e. seahorses, pipefish and seadragons) and the great white shark. A permit is required from the Victorian Fisheries Authority to take, injure, damage or destroy these species.

Within the area there are licenses for western rock lobster, abalone and pipis and no aquaculture leases (VEAC 2019). Within the project and study area the only commercial catch recorded is Blacklip Abalone. The area around between Cape Nelson and Cape Bridgewater has previously

been reported as the largest catch of Blacklip Abalone in the Western Zone of Victoria and in the top ten locations within Victoria (Gorfine 2002). A large number of species are recorded to be caught nearby off Portland including: Australian Salmons, Bluethroat Wrasse, Giant Crab, Gummy Shark, King George Whiting, Ocean Jacket, Pale Octopus, Pipi, School Shark, Silver Trevallies, Snapper, Southern Rock Lobster and Southern Sand Flathead.

The area is listed as habitat for the Endangered Southern Bluefin Tuna. adults of this species are mostly captured in deeper water near the edge of the continental shelf; juveniles will however be found closer to shore and potentially occasionally within the study area.

A number of other state-threatened freshwater or marine fish species also may occur in the study area; these fish have been listed as they have a marine component to their breeding cycle, although the majority of their lifecycle is in freshwater; they are most likely to spawn on rocky reef areas.

Any areas of reef will be important to the lifecycle of these important commercial and threatened species.

5.2.4 Coast and Marine Values

The *Marine and Coastal Act 2018* provides for the protection of the coastline and the ongoing management of long-term challenges to the marine environment, particularly climate change, population growth and coastal structures. Any structures will require approval under this act. The objectives of the this Act are to protect marine and coastal ecosystems, acknowledge the role traditional owners play in managing sea country, to protect the coastal environment and promote sustainable use and development of the marine and coastal environment in appropriate areas.

The *Victorian Coastal Strategy 2014* further sets out guidance for agencies and decision making within the marine estate. For new development in the coastal zone, a project must:

- Have a demonstrated need to be located on the coast
- Protect environmentally and culturally significant places
- Accommodate biodiversity, connectivity and adaptation
- Not interfere with natural coastal processes
- Enable equitable access to the coast
- Generates public benefits
- Avoid areas subject to coastal hazards.
- Must be integrated with the coastal landscape and setting
- Doesn’t tie up parcels of seabed/land for future use so they cannot be utilised in the present.

Furthermore, infrastructure adjacent to the coast (particularly on Crown Land) must have a demonstrated need to be located on the coast and a demonstrated public benefit. Coastal Crown Land is not to be used for structures unless they provide significant community benefit, and their functionality depends on them being near the water.

The strategy encourages renewable energy infrastructure within the coastal and marine environment provided they are not sited in Marine National Parks or sanctuaries, significant coastal landscape areas or areas with incompatible uses.

5.2.5 Acidic or Contaminated Soils

There is no soil mapping available of either acidic or contaminated soils within the Victorian marine environment. A map of coastal acid sulfate soils is provided in Figure 5-16; it indicates that acid material may be present, however geotechnical surveys will be required to determine if they are present in the study area, and if so, the level of acidity.

Given there is no major industrial or urban sources of contamination near to the study area, it is unlikely that the marine environment would contain contaminants that exceed acceptable limits; again, further testing to the level recommended in the *National Assessment Guidelines for Dredging 2009* (Australian Government, 2009) will be required where disturbance of the seabed is proposed.

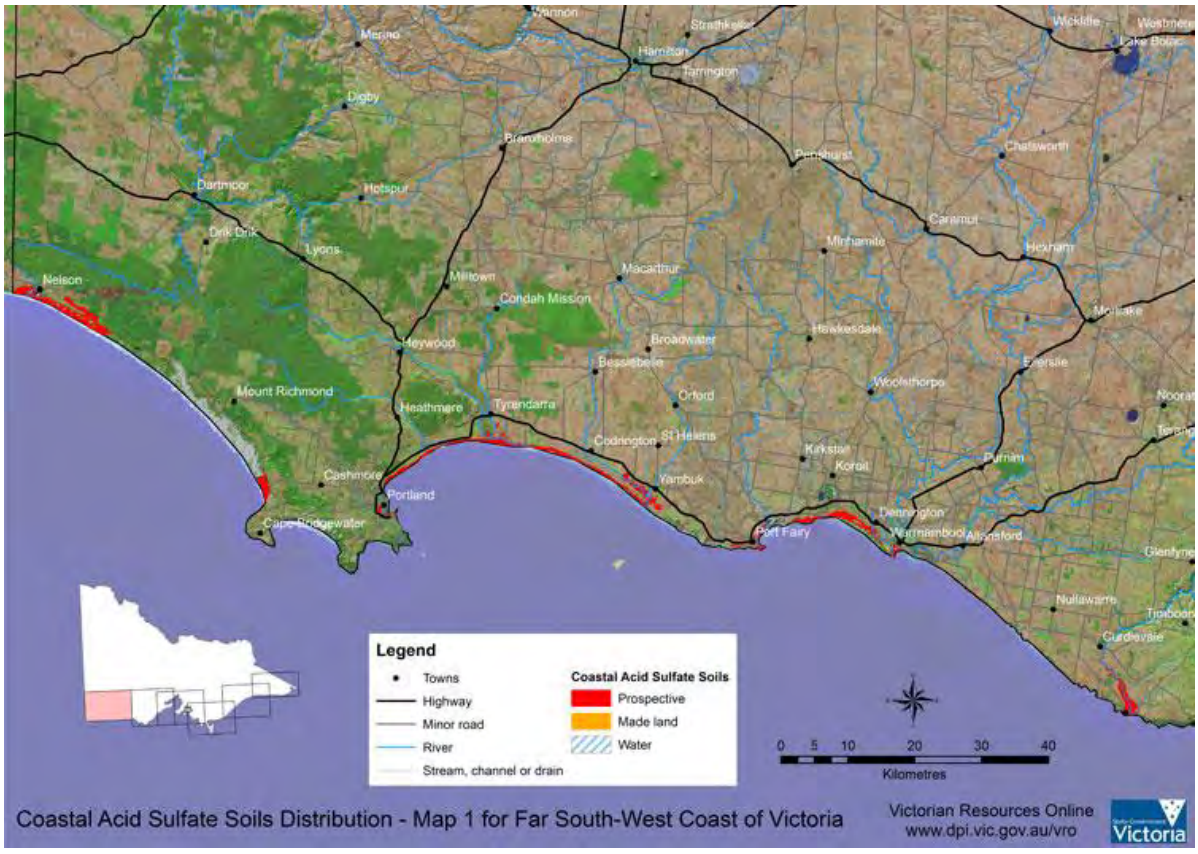

Figure 5-16 Coastal acid sulfate soils in far south-west Victoria (DPI, 2021)

5.2.6 Water quality

The Victorian Government undertakes regular monitoring of marine water quality within Port Phillip Bay and the Gippsland Lakes area; there is no data available for western Victoria. The catchment of the study area is largely agricultural, which would potentially contribute elevated nutrients and sediments to the marine environment; there are limited industrial or urban land uses. Baseline water quality monitoring will be undertaken prior to any works.

5.2.7 Indigenous heritage

The study area is considered part of the Sea Country of the Gournditch-Mara (who are also the relevant native title group) with creation stories explaining the spiritual connection of the Gournditch-Mara with Deen Maar Island, the sea and the afterlife (State of Victoria, 2007). Whales in particular, hold spiritual and totemic significance. There area number of shell middens at Cape Duquesne. The Discovery Bay Marine National Park Management Plan suggests that cultural heritage material could still be present beneath the waters of Discovery Bay.

The Kooyang Sea County Plan (Framlingham Aboriginal Trust and Winda Mara Aboriginal Corporation, 2004) sets out issues of concern for sea country management, which include the conservation of whales, commercial fishing, cultural heritage site protection, environmental degradation and unsustainable land uses.

Consultation with relevant first nation people will assist in identifying any specific values relevant to the study area, and how these may be protected.

5.2.8 Non-indigenous cultural heritage

The coastline was utilised for professional sealers and whalers in the early 1800's, however there is no physical evidence of these camps remaining (State of Victoria, 2007). The whaling industry ceased by the mid 1800's, as whale numbers declined. There are several known shipwrecks around Cape Bridgewater, however the location of these wrecks is unknown. It is possible that relics may be present beneath the sea surface however; benthic habitat and geotechnical investigations may pick up sub-surface structures that could present shipwreck artefacts.

5.3 Summary of baseline values

Table 5-2 provides a summary of environmental values for the study area.

Table 5-2 Summary of values for the study area

Attribute	Relevance	Victoria
Marine Park	State	Includes South Australian marine park and Victorian marine park (Discovery Bay Marine Park)
Ramsar Wetland	MNES	Immediately adjacent to, but outside Glenelg Estuary and Discovery Bay Ramsar Wetland (on land)
Other Protected Areas	State	Nearby but outside Lower Glenelg National Park (on land)
Commonwealth Marine Areas	MNES	Commonwealth waters outside project site but in study area. Bonney Coast Upwelling listed as a Key Ecological Feature of Commonwealth Marine area.
Habitat Types	MNES and State	Nearshore sections of the site and sections of study outside the site comprised of low profile reef, seagrass meadows and subtidal sands No habitat mapping data for deeper waters of the site and areas outside the site in the study area, but navigation chart shows areas of reef, gravel, shells and sand
Threatened Ecological Communities	MNES	Endangered Giant Kelp Marine Forests of South East Australia may occur.
Threatened and Migratory Species	MNES, State	BIA: • Whales: southern right whale, pygmy blue whale • Seabirds: black-browed albatross, Campbell albatross, Indian yellow-nosed albatross, shy albatross, wandering albatross, antipodean albatross • Fishes: White Shark Study area may be part of migratory pathway of Critically Endangered orange-bellied parrot and Swift Parrot that migrate from Tasmania, but values undefined. Also supports known and potential habitat for many other threatened and listed migratory species, particularly migratory shorebird species.
Protected Aquatic Biota	State	A range of protected syngathidae species are likely to occur within the study area.
Coastal and Marine Values	State	The study area supports a number of coastal values, including biodiversity, coastal processes, public benefits and coastal landscapes
Important Fisheries Habitat or Function	State	Seagrass provide important finfish and shellfish habitat Reefs provide habitat for important commercial fisheries species (especially southern rock lobster, southern bluefin Tuna as well as abalone etc.) as well as threatened freshwater fish species.
Indigenous Cultural Heritage	State	The study area is within Gournditch-Mara sea country.

6 Potential Impacts and Mitigation

A general description of potential impacts, risks and mitigation measures is provided below. The assessment of risk is preliminary, based on the high-level project concepts (Section 2). Section 7 provides a more detailed risk assessment against Commonwealth and State significance criteria.

6.1 Pile Driving – Construction/Decommissioning

Pile driving generates intense pulses of noise that have the potential to impact marine fauna including threatened and listed migratory species (whales/dolphins, pinnipeds, turtles, sharks), and species of high fisheries significance (finfish, rock lobster etc.).

The study areas support high value habitat for a range of threatened/migratory marine species, including cetaceans (whales/dolphin species), pinnipeds, sharks and marine turtles. The mosaic of rock outcrops, reefs, kelp forests and sandy substrates in the study area provide high value fisheries habitat for shellfish (e.g. rock lobsters, abalone) and finfish species. These species are sensitive to high noise levels generated by pile driving (SA DPTI 2012; Madsen *et al.,* 2006; Vella *et al.,* 2001; Tida and Brtiffa 2016). Marine birds can also be exposed to underwear noise when diving.

Impacts can be permanent (death/injury), long-term (e.g. permanent hearing loss) or short-term (behavioural, including avoidance), depending on exposure and sensitivity of species. The degree of noise exposure depends on the nature of works (i.e. depth of piles, duration/timing of works, application of mitigation strategies) and local environmental conditions (i.e. bathymetry, physical properties of the water column). Piles will need to be driven deep into the seafloor, which can produce an effects range (hearing loss or displacement) many kilometres from the works site (Madsen *et al.,* 2006; SA DTI 2012; Muller *et al.,* 2019).

The unmitigated preliminary risk rating for noise impacts to threatened/migratory and fisheries species in all three study areas is Very High, assuming impacts to endangered species (Consequence Major x Likelihood Likely).

Mitigation measures to reduce impacts include seasonal construction windows (vary depending on species), safety zones/lookout, pingers etc. (e.g. SA DPTI 2012). With the application of best practice mitigation measures, Likelihood may reduce to Unlikely, and the preliminary risk rating is therefore Medium.

6.2 Habitat Loss – Construction/Operation

Seabed, kelp or reef habitat areas in the construction footprint (turbines, cables etc.) will be likely permanently removed, although if cabling is buried, benthic habitats may recover slowly from disturbance. The study area contains subtidal sands, rock outcrops and deepwater reefs. Seagrass meadows are also present in sections of the study area. The study area may also support the TEC *Giant Kelp Marine Forests of South East Australia*.

Habitats in the study area are contiguous with those in adjacent areas, and there is a high degree of connectivity in ecosystem processes. However, given the extent of habitat loss is relatively small (extent to be determined), it is unlikely that habitat loss will physically fragment habitats to the extent

that major flow-on impacts to benthic communities and the values they support will occur. It is also unlikely that habitat loss would result in significant displacement of listed threatened/migratory species and high value fisheries species, except at localised scales (i.e. at and directly adjacent to the turbines or cables). Burying cabling will likely assist in habitat recovery, assuming installation occurs in soft substrate habitat.

Assuming pylons and cabling cannot avoid direct impacts to any TEC (if present), the preliminary risk rating for direct habitat loss and fragmentation is Very High (Consequence Major x Likelihood Almost Certain).

Assuming pylons and cabling are constructed to avoid direct impacts to any TEC (if present), seagrass or reef habitat, the preliminary risk rating for direct habitat loss and fragmentation is Medium (Consequence Minor x Likelihood Almost Certain).

6.3 Turbidity – Construction/Decommissioning

Modelling will be required to assess turbidity generated by construction and decommissioning activities. Pile driving or dredging to install cabling in clean sands is expected to generate a short-term, low intensity sediment plume. Any cutting of rock will also release sediments into the water column, creating a temporary turbid plume. It is likely that the plume would dissipate rapidly and would be unlikely to impact on adjacent light sensitive habitats or impede fauna vision.

There are few practical ways of reducing turbidity. The unmitigated and mitigated preliminary risk rating for turbidity impacts to any sensitive receptors (e.g. seagrass, macroalgae) is Low (Consequence Moderate x Likelihood Unlikely).

6.4 Disturbance of Acidic or Contaminated soils - Construction

It is probable that acidic soils will be encountered during disturbance of the seabed through piling or cabling activity. Provided this material remains below water, it should not impact water quality. Should piled or dredged material be brought to land, a more detailed investigation of acidity will be required to determine if treatment is necessary. It is possible, but unlikely, given the lack of contamination sources in the catchment that contaminated material would be disturbed, particularly given the distance of the site from the nearshore environment. Soil sampling will be required however to confirm this assumption. If a contaminant does exceed thresholds, it would need to be removed and placed ashore within a contained area/licensed landfill.

The unmitigated risk of impacts to water quality from the disturbance of acidic or contaminated material is Medium (likelihood Possible x Consequence Moderate).

6.5 Vessel Strike – Construction/Operation/Decommissioning

Vessel movements pose a risk of fauna strike, especially for large, slow-moving fauna near the surface such as whales. Whales are vulnerable due to their slow swimming speed and lack of awareness of the threats posed by vessel (DoEE 2017). Pinnipeds and dolphins are also at risk of collision with high spend vessels. Further details will be required to determine vessel traffic intensities, but it would be higher during the construction and decommissioning stages than operations.

The unmitigated preliminary risk rating for vessel strike impacts to threatened/migratory species in all three study areas is Medium (Consequence High x Likelihood Unlikely).

Potential mitigation measures include for example, seasonal windows to avoid peak periods for whales, go slow procedures etc. Through the application of these measures, the preliminary risk rating for vessel strike impacts is Low (Consequence High x Likelihood Highly Unlikely).

6.6 Marine Pests – Construction/Operation

Construction and maintenance vessels may introduce marine pests to the study area. There are two key vectors for introduced marine pests entering a port: biofouling of the vessel hull, or the release of pests into the marine environment via ballast waters (Hewitt and Campbell, 2010). The turbines also provide a surface for fouling pest species.

Translocation of exotic marine pests into a new environment is a potentially important issue for the project. The environmental and economic impacts due to the introduction of exotic marine pests can be significant. Marine pests, once established, can be difficult to eradicate and can have serious and permanent consequences for the marine environment, fisheries productivity and public health.

In addition to standard statutory measures, additional mitigation measures could be adopted (e.g. hull inspections, local sourcing of vessels etc.). The unmitigated and mitigated preliminary risk ratings for introduced pests are Medium (Consequence Major or High[4] x Likelihood Unlikely).

6.7 Spills – Construction/Operation/Decommissioning

Vessels, turbines and facilities utilise use and store a variety of fuels, oils, lubricants, bio-fouling paints and other chemicals. These substances can have lethal and sub-lethal effects to organisms (Yuewen and Adzigbli, 2018) and can persist in the environment for long periods of time. An uncontrolled release could occur from (for example) vessel collision, equipment failure, leaks etc.

A marine pollution risk assessment should be undertaken to inform the development of spill management strategies within contingency plan. The Project is unlikely to involve the storage and handling of large quantities of chemicals, nor generate frequent vessel movements.

Standard chemical storage, handling and maintenance procedures will be required. The preliminary risk rating for spills to the marine environment is Low (Consequence Moderate x Likelihood Unlikely) for both the mitigated and unmitigated case.

6.8 Noise/Vibration Generated by Turbine – Operation

Noise and vibration levels generated by turbines is lower than pile driving and unlikely to cause acute impacts (injury/ mortality) to marine fauna (Madsen *et al.,* 2006; Tougaard *et al.,* 2020). The noise and vibration generated by turbines is persistent (but dependent on wind speeds) which may result in changes to the behaviour of fauna. This may include for example avoidance or attraction responses, increases in intensity of vocal communication, and masking of noises used by fauna (Vella *et al.,* 2001).

[4] depending on pest species and their potential to affect sensitive habitat, such as seagrass, kelp TEC etc.

The degree of impact is dependent on cumulative noise and vibration levels generated by the windfarm array (varies depending on foundation type), background noise levels, and the sensitivity of fauna (Vella *et al.,* 2001; Madsen *et al.,* 2006). Background noise sources in the study areas include environmental (biological, waves etc.) and vessel traffic (ships, fishing boats etc.). Further work will be required to characterise background and Project generated noise, and potential impacts to fauna.

Given that the study area is an important area for many noise sensitive species, and assuming background noise levels are low, it is conservatively assumed that the unmitigated noise risk rating for marine fauna is High (Consequence High x Likelihood Likely). Further work would be required to assess this risk, and the effectiveness of any mitigation measures.

6.9 Electromagnetic Fields - Operation

Electrical cables between the turbine, transformer and shore-based facilities will produce electromagnetic fields (EMF). Many marine invertebrate and vertebrate fauna species are sensitive to EMF (reviewed by Francis and Lyon, 2013), which summarised as follows:

- Elasmobranchs (sharks, rays) are sensitive to low frequency electrical fields, which they use for prey detection. Responses to electrical fields can include behavioural changes (attacking on the source of the field), physiological changes, and effects to the ability to orientate.
- Bony fish respond to changes in electrical fields but have less developed detection systems than elasmobranchs.
- Many marine species use magnetic fields for navigation (e.g. seasonal migrations), including many sea turtles, whales, sharks, fishes and crustaceans (Fisher *et al.,* 2010; Hutchinson *et al.,* 2020). Spurious magnetic fields could theoretically interfere with navigation of these species, depending on magnetic field properties and biological traits that determine sensitivity.

While studies indicate that many marine fauna species can respond to EMF, there is little field evidence that EMF emissions from undersea cables cause significant impacts to marine fauna (e.g. avoidance of an area). Impacts will largely depend on cable configuration (e.g. bundled to reduce current, shielding etc.) and whether the laid on the seafloor or buried (and burial depth).

The unmitigated preliminary risk (assuming cables of seafloor, unshielded cables etc.) to threatened species (especially sharks, but also other species) is Medium (Consequence High x Likelihood Possible). Further analysis will be required if laying unshielded cables directly on the seafloor is proposed. This will need to consider exposure and sensitivity of receptors most be exposed to EMF (i.e. benthic invertebrates such as lobsters and crabs, and demersal (bottom living) fish) and marine fauna living overlying water column (e.g. most sharks, fish, marine mammals).

Impacts can be mitigated to very low levels if the cable is buried sufficient deep (e.g. 1.0 to 1.5 metres) and cables are well designed (e.g. Bundesamt für Seeschifffahrt und Hydrographie 2019). Should cables be buried at a sufficient depth and/or be designed to reduce EMF fields, the mitigated preliminary risk rating is Low (Consequence High x Likelihood Highly Unlikely).

6.10 Hydrodynamic Impacts - Operation

The marine structures will alter local hydrodynamic processes. This may result in localised changes to sedimentary processes (i.e. scour and sediment deposition). Modelling will be required to assess hydrodynamic impacts to seafloor habitats and coastal geomorphological processes.

Assuming impacts are highly localised and structures are located away from TECs or other sensitive habitats, the unmitigated risk rating to benthic habitats is Medium (Consequence High x Likelihood Possible). Further work is required to properly assess this risk.

6.11 Bird Strike and Avoidance of Rotors - Operation

The study area provide potential feeding areas for seabirds and piscivorous shorebirds. The study area is also likely to be traversed by migratory bird species. There is a risk of birds colliding with rotors, resulting in injury or mortality. Birds may also avoid areas near the rotors, resulting in habitat displacement and altered movement patterns.

- Migratory species - The turbines are proposed to be located in offshore waters, avoiding nearshore areas commonly frequented by shorebirds for feeding and roosting. Shorebirds may pass through offshore waters when moving to and from other sites. In the case of migrants, flights once underway tend to be at high altitude, well above turbine height, to maximise flight and energy efficiency. Birds wait for suitable conditions before embarking on migration, but may be forced to lower their flight altitude if they encounter bad weather during migration (Newton 2007). Therefore, migrants are at risk of collision with wind farms mainly during takeoff and descent, when their flight paths take them through the height range of the rotor-sweep zone (Drewitt & Langston 2008)
- Large pelagic seabirds - At most risk are large pelagic seabirds, which feed in offshore waters and, being slow fliers, may be unable to evade the moving rotors.
- Orange bellied parrot and the swift parrot migrates from mainland Australia to Tasmania to breed, potentially intersecting the study area, although no recent records of the species exist. The flight height while on land is just above vegetation height (Shepherd 1994 in Hokley undated), however their flight height over the ocean is unresolved.

While the likelihood of impact could be Possible, the consequence is Major (especially for endangered and critically endangered species if multiple individuals are impacted). On this basis the preliminary risk rating is High. Further assessment will be required, taking into consideration issues raised in *EPBC Act Policy Statement 2.3 Wind Farm Industry* (DEWHA 2009). This will need to consider design measures to reduce risk (e.g. turbine tower height, location relative to any important areas etc.).

6.12 Light Pollution

Vision is a critical cue for wildlife, including seabirds, turtles and fish species to orient themselves in terms of finding food, avoiding predation and communicating (Australian Government, 2020). Artificial light is known to adversely affect many species in the marine environment and can result in behavioural changes such as avoidance, disorientation or reduced reproductive effort. It can also attract predators or change the availability of habitat or food resources. Artificial light can disorient flying birds during migration, and potentially will avoid roosting sites in brighter areas. The National

Light Pollution Guidelines (Australian Government, 2020) suggest that light mitigation may be necessary within 20 km of a BIA for a listed species.

Navigational or hazard lighting on offshore wind turbines may potentially cause impact to marine species, however mitigation measures such as minimising lighting, the use of lights that appear red to the eye and avoiding lighting the water surface can assist in reducing impacts. With mitigation, the preliminary risk rating is Medium (Likelihood Possible x Consequence Moderate).

6.13 Artificial Reef Creation and Fishing Exclusion – Operation

The turbine towers will provide hard substrate that will be colonised by a diverse range of benthic flora and fauna species. The structures will also act as fish aggregation devices for fish. A fish 'sanctuary' would also be created if fishing activities are prohibited around the structures (Linley *et al.,* 2007). Cabling between towers could potentially create a navigational hazard, which could exclude trawling activity. It is expected that the windfarm would lead to localised increase in fish biomass in the study area. The increase fish biomass could attract predators to the area (pinnipeds, sharks, dolphins), assuming they acclimatise to the sound emissions from the turbines. This could lead to localised changes to marine communities in the vicinity of the turbines, including beneficial effects to many reef-associated species, but potential adverse effects to other species due to changes in biological interactions (competition, predation etc.).

The preliminary risk rating associated with changes to communities in the vicinity of the towers is Low (Consequence Minor x Likelihood Possible) to Beneficial.

6.14 Cultural and Social Access – construction and operations

It is likely there will some level of temporary exclusion within the study area during construction, of approximately 500m per pilon. During operations, there is likely to be a small exclusion area around the base of each wind tower (approximately 50m per Pilon), otherwise public access will be maintained. This should allow recreational and cultural access to the study area to largely remain open.

The preliminary risk rating associated with access is Low (Consequence Minor x Likelihood Possible).

6.15 Cultural Heritage

The protection of Sea Country will be of importance to the indigenous groups; further consultation will be required to understand how the project will impact on these values and the significance of the study area.

Table 6-1 Marine assets – preliminary risk summary

Risk ID	Aspect	Impact pathway	Project phase	Initial risk assessment with standard mitigation (i.e. statutory compliance) in place			Justification for risk rating	Possible additional mitigation measures	Residual risk assessment with additional mitigation in place (i.e. those actions recommended as part of the impact assessment)		
				Likelihood	Consequence	Risk rating			Likelihood	Consequence	Risk rating
Pile drivingcausing injury/death of listed threatened/migratory species	Sharks, whales, dolphins, seals, turtles	Construction noise	Construction	Likely	Major	Very High	Permanent impacts to multiple individuals, including endangered species Modelling required	Seasonal construction window, bubble curtains etc.	Unlikely	Major	Medium
Pile driving causing injury/death of high value fisheries species	Lobsters, finfish, prawns, crabs	Construction noise	Construction	Likely	Minor	Medium	Impacts to individuals, whose populations are secure Impacts unlikely to cascade to population level (short or long term) Modelling required	Bubble curtain etc.	Possible	Minor	Low
Habitat loss resulting in impacts to TECs and high value habitats	Kelp TEC (if present)	Installation of cables, structures	Construction/ operation	Almost Certain	Major	Very High	Permanent impacts to Endangered TEC	Design avoids TEC or high value habitat	Almost Certain	Minor	Medium
Turbidity generated by construction impacts to sensitive receptors	Kelp TEC (if present) Threatened/migratory species High value fisheries habitat and species	Installation of cables, structures	Construction/ decommissioning	Unlikely	Moderate	Low	Plumes expected to be temporary, low magnitude features (modelling required)	-	Unlikely	Moderate	Low
Disturbance of acidic or contaminated material	Water quality, marine fauna	Installation of cables, structures	Construction	Possible	Moderate	Medium	Keeping material within the marine environment, or bringing ashore for treatment prior to disposal	Avoiding known areas of contamination	Unlikely	Minor	Low
Vessel strike causing injury/death of listed threatened/migratory species	Whales, turtles, seals	Construction vessels, maintenance vessels	Construction/ operation/ decommissioning	Unlikely	High	Medium	Low vessel traffic Unlikely to affect multiple individuals → cascading impacts to populations	Seasonal construction windows, go slow measures etc.	Highly Unlikely	High	Low
Marine pest introductions	Kelp TEC (if present) Threatened/migratory species High value fisheries habitat and species	Construction vessels, maintenance vessels	Construction/ operation/ decommissioning	Unlikely	High	Medium	Potential long-term impact to TECs	Hull inspections, local sourcing of vessels from pest free areas etc.	Unlikely	High	Medium
Spills	Kelp TEC (if present) Threatened/migratory species High value fisheries habitat and species Water quality	Construction vessels, maintenance vessels, turbines etc.	Construction/ operation/ decommissioning	Unlikely	Moderate	Low	Low vessel traffic Statutory measures minimise risk	Additional house-keeping measures	Unlikely	Moderate	Low
Low frequency noise from turbines	Threatened/migratory species	Turbine noise	Operation	Likely	Major	Very High	Behavioural changes, potentially avoiding waters near turbines. Further work required to assess whether this could affect multiple individuals of a threatened species, as well as design measures that can be taken to minimise underwater noise.	-	Likely	High	High

Risk ID	Aspect	Impact pathway	Project phase	Initial risk assessment with standard mitigation (i.e. statutory compliance) in place			Justification for risk rating	Possible additional mitigation measures	Residual risk assessment with additional mitigation in place (i.e. those actions recommended as part of the impact assessment)		
				Likelihood	Consequence	Risk rating			Likelihood	Consequence	Risk rating
EMF - change to movement patterns, behavioural changes	Threatened/migratory species High value fisheries habitat and species	Cables/plant	Operation	Possible	High	Medium	Potential for behavioural changes to individuals near the seafloor. Assumed not to affect multiple individuals in population, - requires further assessment	Cabe buried Cable design to reduce EMF	Highly Unlikely	High	Low
Hydrodynamic impacts to TEC or important habitats	TEC High value seagrass,	Turbine tower operation	Operation	Possible	High	Medium	Potential for localised impacts to any nearby TEC (to be assessed by modelling)	Design measures to avoid impacts to TEC (e.g. placement/ design of pylons)	Unlikely	High	Medium
Bird strike	Threatened / migratory species	Turbine operation	Operation	Possible	Major	High	Potential to multiple impact individuals in a population (including endangered species)	Tower design and placement to minimise exposure	Unlikely	Major	Medium
Artificial reef creation + fishing exclusion	Threatened/migratory species High value fisheries habitat and species	Turbine operation	Operation/ Decommissioning	Possible	Minor	Low to Beneficial	Natural reefs present at all three sites, therefore not introducing a new substrate type to area	-	Possible	Minor	Low to Beneficial
Social surroundings (recreational access)	Residents and recreational users	Construction processes and turbine operation	Construction/Operation/ Decommissioning	Almost Certain	Minor	Medium	Disruption will be temporary and localised	Consultation and notification of disruptions	Possible	Minor	Low
Social surroundings (cultural heritage)	First nation people	Infrastructure, loss of access	Construction/Operations	Likely	High	High	Intangible cultural values of Sea Country	Consultation with first nation people, management agreements	Possible	Moderate	Medium

7 Preliminary Impact Assessment

7.1 Matters of National Environmental Significance

Under the EPBC Act, a significant environmental impact is defined as 'an impact which is important, notable, or of consequence, having regard to its context or intensity'. Whether or not an action is likely to have a significant impact depends on the sensitivity, value and quality of the environment that is impacted, and upon the intensity, duration, magnitude and geographic extent of the impact.

For an impact to be considered 'likely', it is not necessary for the impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility.

If there is scientific uncertainty about the impacts of an action, and potential impacts are serious or irreversible, the precautionary principle is applicable. A lack of scientific certainty will not itself justify a decision that an action is not likely to have a significant impact on the environment.

The Commonwealth has provided 'significant impact criteria' for each MNES, as described below in the following sections.

7.1.1 Threatened Ecological Community

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- Reduce the extent of an ecological community
- Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
- Adversely affect habitat critical to the survival of an ecological community
- Modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
- Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example, through regular burning or flora or fauna harvesting
- Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
    - assisting invasive species, that are harmful to the listed ecological community, to become established, or
    - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or
    - interfere with the recovery of an ecological community.

There is the potential for the TEC *Giant Kelp Marine Forests of South East Australia* to occur within the study area. Further site investigations are required to determine if the ecological community occurs and if so, whether it may be disturbed. It is mostly likely to occur around Cape Nelson and the western portion where conditions are most suited to presence of giant kelp; currently no turbines are planned in this location.

Should the TEC be present, it forms only a small area of the total extent of the community. Provided turbines and cabling can avoid direct disturbance to habitat likely to support the TEC, the action is unlikely to have a significant impact to a TEC.

7.1.2 Critically Endangered or Endangered Species

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population
- reduce the area of occupancy of the species
- fragment an existing population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of a population
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
- introduce disease that may cause the species to decline
- interfere with the recovery of the species.

Critically Endangered or Endangered Species that are likely to occur in the study area, and the potential impact of the project on this species is provided in Table 7-1. The assessment herein considers potential impacts related to the marine environment only (i.e. terrestrial infrastructure impacts are not considered). The assessment is preliminary only. Further site-specific studies are required to confirm the use and values of the study area by critically endangered or endangered species.

Table 7-1 Potential Impacts to Critically Endangered or Endangered Species known to, or likely to occur, within the study area

Species	Potential Impacts	Potential Significance of Impact
Curlew sandpiper (*Calidris ferruginea)*	Preferred habitat is present (intertidal mudflats, and freshwater and brackish wetlands near the coast including swamps, lakes and lagoons; Higgins and Davies 1996). This species may occasionally traverse marine environments of the study area. Potential hazards therefore include strike by wind turbines (particularly during flight take-off and landing) and light pollution. The construction, operation and decommissioning of wind turbines in the marine environment are unlikely to lead to a long-term decrease in the population, its area of occupancy or modification of its habitat.	Not Significant
Great knot *(Calidris tenuirostris)*	The study area is not known as a critical habitat for the species, and there are few contemporary records of the species in southern Australia. The study area is not considered a key site for the species (Bamford et al, 2008). This species may occasionally traverse marine environments in the study area. Potential hazards therefore include strike by wind turbines and light pollution. The construction, operation and decommissioning of wind turbines in the marine environment are unlikely to lead to a long-term decrease in the population, its area of occupancy or modification of its habitat.	Not significant
Eastern Curlew (*Numenius madagascariensis*)	The eastern curlew prefers intertidal mudflats for foraging purposes. There are some areas of habitat present within the study area, however it is not considered a key site for the species (Bamford et al, 2008). This species may occasionally traverse marine environments in the study area. Potential hazards therefore include strike by wind turbines and light pollution. The construction, operation and decommissioning of wind turbines in the marine environment are unlikely to lead to a long-term decrease in the population, its area of occupancy or modification of its habitat.	Not significant
Bar-tailed godwit (*Limosa lapponica menzbieri*)	This species forages near the edge of water in shallow water, especially exposed sandy or soft mud substrates on intertidal flats and beaches. The study area is not known as a major habitat for the species (Bamford et al, 2008). This species may occasionally traverse marine environments in the study area. Potential hazards therefore include strike by wind turbines and light pollution. The construction, operation and decommissioning of wind turbines in the marine environment are unlikely to lead to a long-term decrease in the population, its area of occupancy or modification of its habitat.	Not significant
Australian painted snipe (Rostratula australis)	This species prefers shallow terrestrial freshwater wetlands, saltmarsh or dams. This species is considered unlikely to traverse the marine environment.	Not significant
Australian bittern (*Botaurus poiciloptilus*)	This species prefers reedy wetlands, with the Discovery Bay Ramsar wetland considered to provide regular habitat. There are several recent records of individuals within the Ramsar wetland.	Potentially significant
Albatross and petrel species (BIA for shy albatross)	The study area is mapped as an area of Biological Importance for albatross species. These species are known to forage within the study area and adjacent marine environments. The foraging behaviour and specific values of the study area for these species are not well known. These species spend a large proportion of time at sea for foraging. It is conservatively assumed that bird strike by wind turbines has the potential to cause direct bird mortality, which may lead to a long term decrease in size of	Potentially significant

Species	Potential Impacts	Potential Significance of Impact
	a population. Further research into the occupancy area of the species, and the risk of bird strike is required.	
Orange-bellied parrot (*Neophema chrysogaster)*	This species utilises coastal terrestrial and wetland communities, and suitable habitats occur directly adjacent to the study area. There are historical records of this species in the vicinity of the study area, but the absence of contemporary records suggest it may not occur here at present. The study area may have formed a historical movement corridor for this species. Should local populations recover, wind turbines could have the potential to modify, destroy, remove, isolate or decrease the availability of habitat as a result of bird strike.	Potentially significant
Swift parrot (*Lathamus discolor)*	This species potentially migrates through the study area to suitable Eucalypt woodland habitat further northwards, although sighting records in western victoria are limited. The study area does not contain any breeding or foraging habitat. Wind turbines have the potential to modify, destroy, remove or isolate the availability of habitat as a result of bird strike.	Potentially significant
Blue whale (*Balaenoptera musculus*)	The eastern study area is mapped as a high use area and BIA for the species. Underwater noise (construction and operation) could lead to avoidance behaviour. This may reduce the area of occupancy available to a population. Further investigation is required to understand the potential for underwater noise to be generated during construction or operation and the potential for this to impact the use of the area by the blue whale.	Potentially significant
Southern right whale (*Eubalaena australis*)	The study area is mapped as a BIA for the species. The study area is also a known aggregation area, where breeding and calving activity occurs. Underwater noise (construction and operation) could lead to avoidance behaviour. This may reduce the area of occupancy available to a population. Further investigation is required to understand the potential for underwater noise to be generated during construction or operation and the potential for this to impact the use of the area by southern right whale.	Potentially significant
Loggerhead and leatherback turtles (*Caretta caretta* and *Dermochelys coriacea*)	These species may occasionally forage within the study area. Foraging activity could potentially be interrupted by underwater noise. Further investigation is required to understand the potential for underwater noise to be generated during construction or operation and the potential for this to impact the use of the area by turtles. The study area is not mapped as BIA for turtle species.	Potentially significant
Sub-antarctic fur seal (*Arctocephalus tropicalis*)	Important habitat for this species are rocky coastal habitats, with breeding largely occurring on Macquarie Island. Important feeding habitat is waters immediately surrounding Macquarie Island, however individuals do forage widely in Australian mainland coastal areas, as far north as Queensland. The species may occasionally forage within the study area, but this would be a rare occurrence, and it is not considered an important breeding or foraging habitat.	Not significant
Southern bent-wing bat (*Miniopterus schreibersi bassanii)*	The Southern bent-wing bat has a wide foraging range, including forested areas, coastal vegetation (including beaches), and woodlands near large natural waterways. It only occurs between south western victoria (near Warrnambool) and Robe in South Australia. It will roost in coastal cliffs. A cluster of bats was observed in 2015 in a sea cave at Portland, within the study area; Portland is considered an important population of the species (Southern bent-wing bat National Recovery Plan (State of Victoria, 2015)). However, most individuals largely cluster around two main nursery sites; therefore the marine environment of the study area is not considered an important breeding or foraging habitat.	Not significant

7.1.3 Vulnerable species

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of an important population of a species
- reduce the area of occupancy of an important population
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of an important population
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- introduce disease that may cause the species to decline, or
- interfere substantially with the recovery of the species.

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

Vulnerable species that are likely to occur in the study area, and the potential impact of the project on this species is provided in Table 7-1; these consider potential impacts related to the marine environment only (i.e. terrestrial infrastructure impacts are not considered). The assessment is preliminary only, and based on desktop information; further site-specific studies are required to confirm the use of the study area by critically endangered or endangered species.

Table 7-2 Potential Impacts to Vulnerable species known to, or likely to occur, within the study area

Species	Potential Impacts	Potential Significance of Impact
Albatross and Petrel species (Antipodean albatross, southern royal albatross, wandering albatross, blue petrel, northern giant petrel, sooty albatross, buller's albatross, campbell albatross, black-browed albatross, salvin's albatross, white-capped albatross)	Whilst these species are known to occasionally forage within the study area and are mapped as BIA's for several species, it is unlikely that the site supports an important population or would be critical to the survival of the species. Potential impacts to seabirds are bird strike and artificial light.	Not Significant
Shorebird species (bar-tailed godwit, fairy prion, Australian fairy tern, eastern hooded plover)	Whilst these species may forage on the foreshore, they would only occasionally utilise the marine environment. Potential impacts to shorebirds include bird strike or artificial light. The eastern hooded plover is a resident shorebird, and the Discovery Bay National Park is considered an important population for the species in Victoria (greater than 5% of the population) (SWIFFT, 2021).	Potentially significant (Eastern hooded plover only)
Pinnipeds (Australian sea lion, southern elephant seal)	Whilst pinnipeds are likely to occur within the study area, it is not considered an important population for either species. Potential impacts to pinnipeds include underwater noise or loss of foraging habitat.	Not significant
Whale species (sie, fin, humpback)	Whilst these species occasionally utilise the study area, it is not identified as a BIA or an area supporting an important population. Potential impacts to whales include underwater noise or artificial light.	Not significant
Green turtle (*chelonia mydas*)	Green turtles nest, forage and migrate in northern Australia, although individuals can stray into temperate waters. The study area is unlikely to support an	Not significant

Species	Potential Impacts	Potential Significance of Impact
	important population of the species.	
Sharks (white shark, Australian grayling)	The study area is mapped as a BIA for the white shark. The two main nursery areas for the species are Stockon, NSW and the eastern coast of Victoria, which are some distance away. Potential impacts to sharks include underwater noise or loss of foraging habitat. Further research is required to determine of the study area would support foraging habitat that is critical to the survival of the species.	Potentially significant

7.1.4 Listed Migratory Species

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

An area of 'important habitat' for a migratory species is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- habitat that is of critical importance to the species at particular life-cycle stages, and/or
- habitat utilised by a migratory species which is at the limit of the species range, and/or
- habitat within an area where the species is declining.

Table 5-1 lists migratory species that occur, or are likely to occur in the study area. These are mostly critically endangered, endangered or threatened species already considered above including a number of shorebirds and whale species.

Table 7-3 Potential Impacts to migratory species known to, or likely to occur, within the study area

Species	Potential Impacts	Potential Significance of Impact
Shorebird species	Whilst these species may forage on the foreshore, they would only occasionally utilise the marine environment; the study area is not mapped as an important site for most migratory shorebirds (Bamford et al, 2008) however some individuals may migrate southwards or along the coastline to other important sites in South Australia or Tasmania. The Discovery Bay Conservation Park, adjacent to the study area is considered an important area for the sanderling (*Calidris alba*) and potentially provides habitat for up to 24 migratory bird species. Potential impacts to shorebirds include bird strike or artificial light.	Potentially Significant
Whale and dolphin species	The study area may possibly be a considered important habitat for the southern right whale or blue whale, although is unlikely to support an ecologically significant proportion of a population for either of these species. Potential impacts include underwater noise and artificial light.	Potentially significant
Turtle species	The study area is unlikely to support an ecologically significant proportion of a population for any turtle species.	Not significant
Fish (porbeagle)	The porbeagle primarily inhabits oceanic waters, occasionally moving into coastal waters. The study area is unlikely to support an ecologically significant proportion for any migratory fish species.	Not significant
Dusky dolphin	The species occurs only occasionally in Australia, and there are no sightings within the study area. The study area is unlikely to support an ecologically significant proportion for the species	Not significant

7.1.5 Commonwealth Marine Area

An action is likely to have a significant impact on the environment in a Commonwealth marine area if there is a real chance or possibility that the action will:

- result in a known or potential pest species becoming established in the Commonwealth marine area
- modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results
- have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution
- result in a substantial change in air quality[4] or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity; social amenity or human health

- result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected, or
- have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of an historic shipwreck.

Although works do not take place in Commonwealth waters (but immediately adjacent), there is still potential for indirect impacts to waters, as a result of spills, cable laying (or removal), piling activity the introduction of pest species or changes to hydrodynamics. With appropriate controls in place, these impacts are considered to be a low risk, which is localised. They are unlikely to have a 'substantial' or 'persistent' adverse impact on the Commonwealth marine environment. Impacts to Commonwealth Marine Areas is expected to be Not Significant.

It should be noted that the nearest Commonwealth Marine Park is at least 200km away and would be unlikely to be directly or indirectly impacted by the project.

7.2 State Matters

The *Ministerial Guidelines for Assessment of Environmental Effects under the Environmental Effects Act 1978 (*State of Victoria, 2006) provides guidance on how potential impacts to state significant environmental matters are to be assessed.

A 'significant effect' is defined by the following factors:

- The **significance** of an environmental asset:
  - Character of the potentially affected environmental assets
  - Geographic occurrence of the environmental assets
  - Values or importance of the environmental assets, based on expert knowledge, relevant policy and evidence of social values
- Potential **magnitude, extent and duration** of adverse effects on environmental assets in the short, medium and longer term, as a result of the development, operation and where relevant, decommissioning of a project
- Potential for more extended adverse effects in space and time, as a result of interactions of different effects and environmental processes affecting environmental assets.

The significance criteria outlined in Section 3 have been used to determine whether there is potential for the project to have a 'significant effect', taking into consideration the definition above.

7.2.1 State Marine Park

The Discovery Bay Marine Park is within the study area. Potential impacts to the marine park include:

- Loss of habitat values within the marine park from cabling installation and maintenance
- Impacts to water quality as a result of infrastructure construction or decommissioning, or spills from equipment

- Interference with landscape values and seascape values as a result of visual intrusion.

The risk of water quality impacting the park values is considered low (Refer to Table 6-1); there is potential for the wind turbines to interfere with the landscape values of the park. Further visual impact assessment will be required to determine the level of risk this presents.

7.2.2 Protected Communities and Species

As detailed in Table 5-1 and Section 5.2.2, there are a number of marine species that may occur within the study area that are protected under the FFG Act, in addition to those already protected under the EPBC Act. These include shorebirds, seabirds, dolphin, fish and echinoderm species associated with reefs (i.e.sea stars, sea-cucumbers etc). Potential impacts to these species include habitat loss, impacts to water quality, changes to hydrodynamics that scour the seabed, turbine strike and underwater noise/light. The level of risk these impacting processes pose to state protected species is described generally in Table 6-1.

A number of important marine habitats also occur within the study area including macroalgae (or Kelp) beds, reef and seagrass meadows.

7.2.3 Fisheries Values

The study area does support habitat that is important to the reproduction lifestyle of several commercial fishing species; these may potentially be disrupted in the short term by piling activity, cabling or EMF; at present, this considered to be a potential risk to individuals but is unlikely to significantly impact a population or a breeding cycle. Further research is required to understand the significance of the impact however. The infrastructure can provide additional habitat for fish species.

7.2.4 Water Quality

Dredging or trenching during cable installation (potentially 1-3m wide trenches), may lead to the production of turbid plumes, however these would be expected to be temporary and minor in nature. Other potential impacts to existing water quality arise from unexpected spills to the marine environment from fuels, oils or anti-fouling paint applied during maintenance activity or from construction/operation vessels. Similarly, these would be expected to be minor in nature with impacts localised. Potential impacts to water quality are unlikely to have a long term or consistent significant impact.

8 Next Steps

Following acceptance of the referral by the Victorian Government, the proponent will commence further detailed investigations, to inform an Environmental Assessment or Review. This review will be undertaken in accordance with a scoping document or other requirements provided by the EPA and/or DAWE.

These marine studies will likely include the following as a minimum:

- Water quality monitoring – to characterise the existing marine water quality in the study area.
- Sediment quality – to characterise contaminant status of bed sediments, and their geotechnical properties that may be disturbed during turbine construction and dredging for cables.
- Metocean studies – to characterise the wave and current environment in the vicinity of the proposed turbines.
- Marine ecology – to characterise existing marine ecology values, including benthic infauna at the proposed turbines, along with presence and biodiversity of fish and marine mammals, particularly whales. This is likely to involve aerial surveys to gain a better understanding of how whales utilise the study area.
- Shorebird surveys – the study area is known to be populated by threatened and migratory shorebird species, including migratory species protected under international treaties. Detailed surveys of each study area (over representative seasons) are likely to be required, with a particular focus on take-off landing migration patterns.
- Benthic habitat assessment – to characterise benthic habitats (e.g. seagrass, reefs, kelp) in vicinity of the proposed turbine/cables and their habitat value.
- Underwater noise Assessment – to gain a greater understanding of background noise, the noise/vibration likely to be generated by the turbines and the potential disturbance this causes to marine megafauna.
- Community engagement – to gain a better understanding of how residents, visitors, user groups (i.e. commercial fishers) and first nation people use the study area.

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