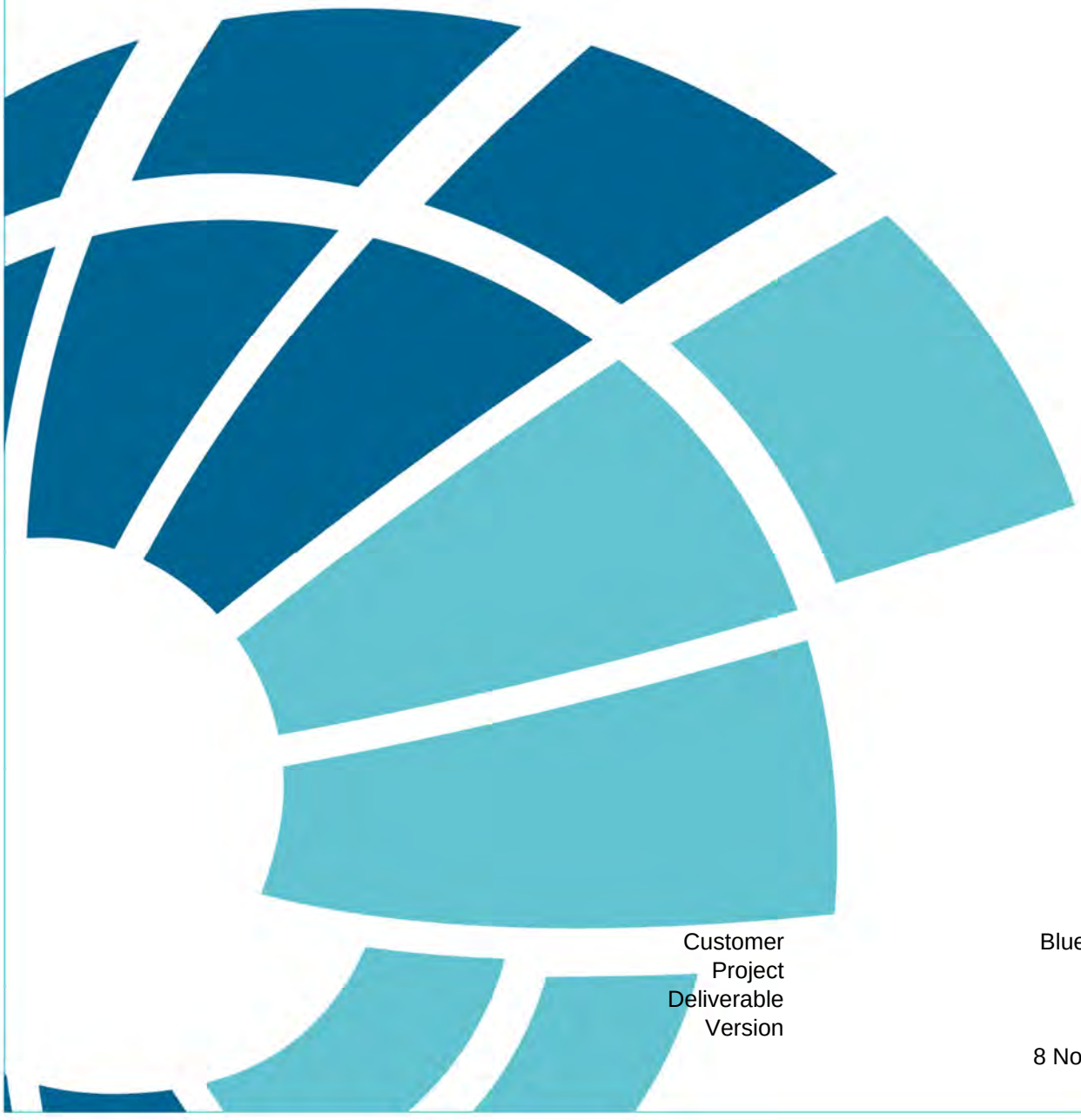
Southern Winds Offshore Wind Project

Preliminary Desktop Marine Environmental Assessment



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Amendment Record

The Amendment Record below records the history and issue status of this document.

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01	21 July 2022	BlueFloat Energy	Draft Report
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03	6 October 2022	BlueFloat Energy	Final Report
04	8 November 2022	BlueFloat Energy	Updated Final Report

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Figures

1 Introduction

1.1 Background

BlueFloat Energy are planning to develop offshore wind energy within Commonwealth marine waters, located off the South Australian and Victorian coastline as illustrated in **Figure 1.1**. This will be known as the Southern Winds Offshore Wind Project (OWP).

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)
- A referral under the *Environment Effects Act 1978* (Vic) (EE Act).

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 level of assessment required once the project receives approval to proceed to the next phase
- inform the development of Scoping Requirements for further environmental assessment of the project.

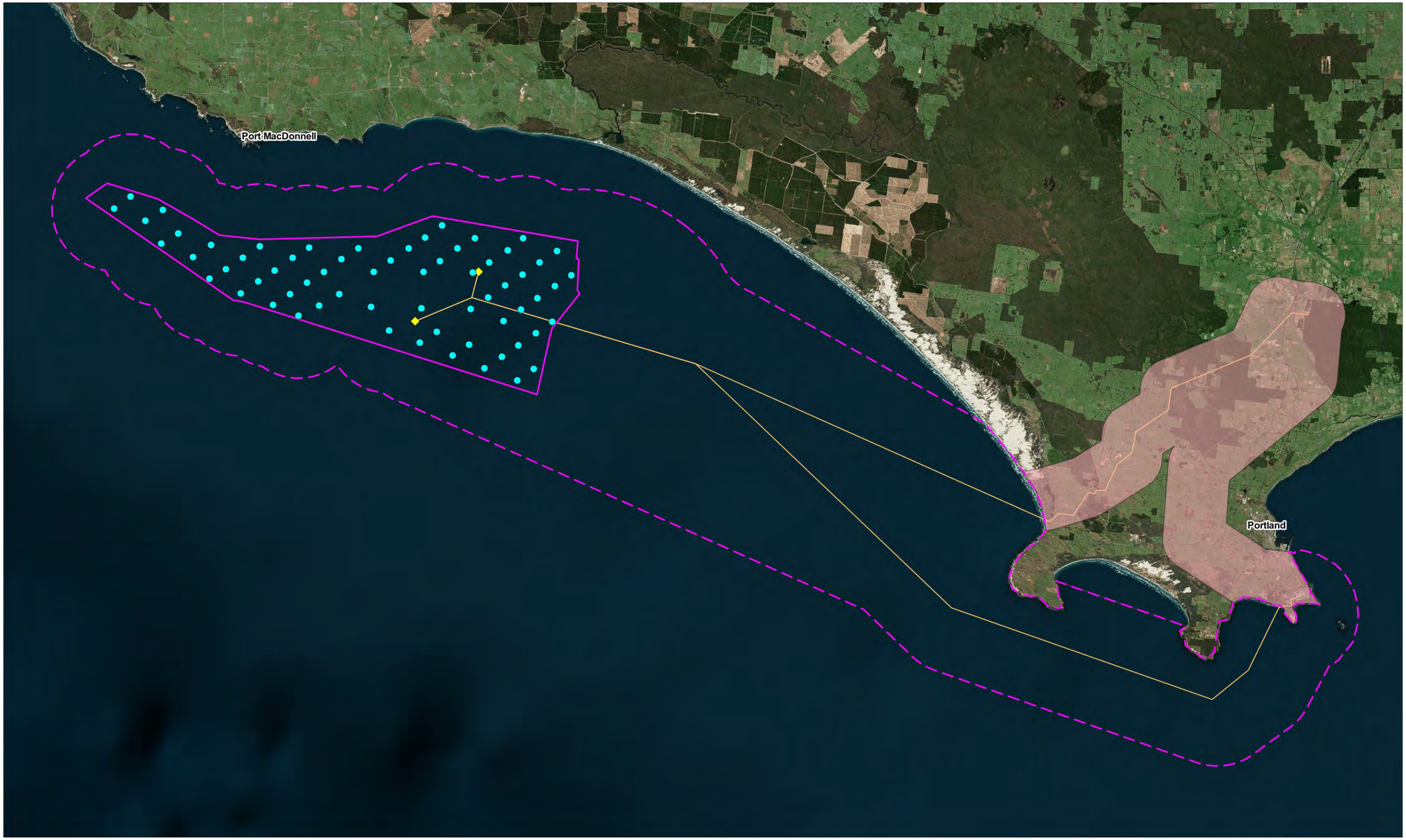
1.3 Terminology

The following terms are used frequently in this report:

The term *marine environment* is defined as all marine and coastal waters up to the Highest Astronomical Tide (HAT) boundary. This is distinct from 'Commonwealth marine environment' which is the area between 3 and 200 nautical miles from the coast.

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 EPBC Act. Threatened is a common use term to collectively describe endangered and vulnerable species.

The Project Area is defined as the direct footprint of wind turbines, substations and subsea cabling routes up to the shoreline; Figure 1.1 shows both the entire Project Area (including terrestrial components e.g. onshore connections) and the marine Study Area.



LEGEND

- Wind Farm Layout
- Substation
- Connection Routes
- Project Boundary
- Marine Study Area
- Terrestrial Study Area

Title:

Project Location

Figure: 1-1

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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As shown in **Figure 1.1**, the Study Area extends beyond the Project Area. The purpose of the Study Area is to provide additional context to the existing site conditions and for identification of potential impacts. It provides flexibility in siting and design as a response to the outcomes of Phase 1 and subsequent assessments.

The Study Area includes:

- A 5 km buffer around the offshore wind farm components (wind turbines and offshore substations) and subsea export cable routes up to the shoreline.
- A 1 km buffer around the onshore overhead (or underground where needed) transmission line and the onshore substation (referred to as the transmission line corridor) except where alternatives are considered.

The following definitions apply within the Study Area:

- *Offshore* refers to all areas from the low water line along the coast out to sea. For the purpose of the Project, the Study Area and Project Area lie in Commonwealth and State Waters (see definitions below).
- *Onshore* refers to all land-based areas above the low water line.
- *State Waters* refers to area from the low water line along the coast up to 3 nautical miles seaward.
- *Territorial Waters* and *Contiguous Zone* (Commonwealth) refers to land from the State Water boundary up to 12 and 24 nautical miles respectively, from the low water line along to the coast.
- *Exclusive Economic Zone* extends from the Territorial Waters and Contiguous Zone up to 200 nautical miles from the low water line along to the coast.

2 Relevant Legislation and Planning Advice

As discussed in **Section 1**, this report provides the preliminary marine environmental assessment for the Southern Winds OWP to support referrals under the EPBC and EE Acts. Other relevant legislation specific to the marine environment that will need to be considered as the project (and environmental assessment) progresses are summarised below. Because the project is largely within the Commonwealth marine area, this review focuses on Commonwealth legislation, however there are a range of state legislative requirements and policies that also need to be considered for works in state waters.

It should be noted that whilst there is no infrastructure in South Australian waters, turbines are offshore of South Australia, therefore relevant legislation that provides context has been considered where applicable and referred to in this document e.g. *Marine Parks Act 2007* (SA) or the *National Parks and Wildlife Act 1972* (SA) which addresses the status of threatened species.

2.1 Australian Maritime Safety Authority Act 1990

The *Australian Maritime Safety Authority Act 1990* (AMSA Act) sets out the processes and procedures for responding to marine pollution events, particularly oil spills. The proponent will be required to work under this act to put procedures in place to both minimise and respond to potential spill events during both construction and operational phases.

2.2 Biosecurity Act 2015

The *Biosecurity Act 2015* (BA) manages the introduction of exotic pests and diseases in Australia. Of most relevance is requirements around vessels that enter Australian waters and requirements for ballast exchange offshore and pest inspections. This Act will guide requirements for any incoming vessels (or other goods and services) required for construction or operational purposes.

2.3 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the primary piece of legislation for management and assessment of environmental protection in commonwealth waters. It provides for the protection of a range of MNES which include commonwealth waters, threatened and migratory species (for further information on MNES Refer to **Section 5.4**).

The Act also sets out requirements for activities in the Australian Whale Sanctuary, which protects all cetaceans (whales, dolphins) in Australian waters. Requirements will include ensuring vessels do not cause interference to whales, having monitors in place during construction etc. Any field work associated with whale monitoring may also require a separate approval under the EPBC Act.

2.4 Environment Protection (Sea Dumping) Act 1981

The Environment Protection (Sea Dumping) Act 1981 (Sea Dumping Act) regulates the loading and dumping of waste at sea within Australian Waters. The National Assessment Guidelines for Dredging (NAGD) (2009) set out the assessment framework for dredging activities which informs the suitability of dredge material for offshore placement. Under the Sea Dumping Act, an approval is required for the placement of material within Commonwealth Waters. Commonly, the NAGD are also used to determine the suitability of material for placement in state waters.

If there is a need to undertake dredging either for cabling installation or drilling works, then an assessment against the guidelines will be necessary; this involves consideration of the following:

- Opportunities to beneficially reuse or recycle dredge material (this includes land reclamation, beach nourishment, offshore berms, and capping material, agriculture and product uses (aquaculture, construction material, liners) and environmental enhancement (restoration and establishment of wetlands, upland habitats, nesting islands and fisheries).
- If hazardous, can the material be treated to destroy, reduce or remove the hazardous constituents
- What the comparative risks are to the environment and human health of alternatives
- What the costs and benefits are of proposed alternatives.

2.5 Fisheries Administration Act 1991

The *Fisheries Administration Act 1991* is largely responsible for the management of Australian fisheries (i.e. those in Commonwealth waters). Of particular relevance to this project is the allocation of fishing rights and plans of management; refer to **Section 5.3** in regards to further information about Commonwealth Fisheries.

2.6 Protection of the Sea (Prevention of Pollution from Ships) Act 1938

The *Protection of the Sea (Prevent of Pollution from Ships) Act 1938* largely deals with the management of marine pollution associated with air emissions, water quality and noxious substances such as sewage discharged from ships. Vessels used for construction and operations of the facility will be required to adhere to the requirements of this Act.

2.7 Underwater Cultural Heritage Act 2018

The *Underwater Cultural Heritage Act 2018* protects shipwrecks, sunken aircraft and their associated artefacts, that occurred 75 or more years ago, regardless of whether their location is known. A permit may be required to enter and utilise the area within a shipwreck protection zone. The Project must adhere to the following additional requirements:

- Do not disturb or damage underwater heritage and its surrounding environment or remove artefacts, during the course of your visit
- Observe the requirements of protected zones
- Provide authorities with a notification of any new underwater heritage discovery within 21 days
- Report any suspicious or illegal activity that you observe happening around underwater heritage sites.

3 Project Description

The Southern Winds Offshore Wind Project (OWP) (herein known as the 'Project') is located approximately 8-20 kilometres (km) off the coastline between Port MacDonnell (South Australia) and Nelson (Victoria), approximately 60 km west of Portland (Victoria) township. **Figure 1.1** shows the Project Area which contains the offshore and onshore components of the Project, including the transmission line route, associated with its construction, operation and decommissioning.

Within the Project Area, the Project involves 77 'bottom-fixed' wind turbines , two offshore substations and associated infrastructure with the capacity to generate up to 1.155 gigawatts (GW) of electricity. The wind turbines will have a capacity between 15 MW and 20 MW, hub heights between 165 m and 190 m and rotor diameters of 250 m to 275 m.

Two potential subsea cable and onshore transmission routes are being considered from the offshore substations to the proposed grid connection:

- Option 1 proposes subsea export cables to travel southeast from the more easterly offshore substation for approximately 72 km, landing near the NW corner of the Narrawong Coastal Reserve, just 1.5 km from the Portland Aluminium Smelter. Close to the landfall site, these subsea cables would be connected to onshore cables in a transition joint bay. These onshore cables would then continue to the existing switchyard at the smelter site (connecting in via a new onshore substation located adjacent to the smelter switchyard).

- Option 2 proposes subsea export cables to travel southeast from the more easterly offshore substation for approximately 42 km, landing near the south-eastern corner of the Discovery Bay Ramsar site at Cape Bridgewater (avoiding the Discovery Bay Marine National Park). Close to the landfall site, the subsea cables would be connected to onshore cables in a transition joint bay. These onshore cables would then continue underground or overhead north-east through Gorae West for approximately 29 km to the Heywood Terminal Station (connecting in via a new onshore substation located adjacent to the terminal station). Transition to an overhead line, if applicable, would likely be located within 5 km of the coast.

The offshore wind farm component of the Project is located within the Territorial Sea and the Exclusive Economic Zone (both Commonwealth waters), with the grid connection within the Glenelg Local Government Area (LGA) in Victoria. The offshore wind farm component for the Southern Winds OWP would encompass an area of approximately 290km^2.

4 Methodology

Publicly available information relating to the marine environmental features and values for the Study Area (**Figure 1.1**) was collated and reviewed, specifically:

- MNES, as defined under the EPBC Act
- Threatened and other conservation-dependent species (e.g. rare, protected etc.) listed under the FFG Act and *National Parks and Wildlife Act 1972* (South Australia)

Primary data sources were as follows:

- EPBC Protected Matters Search, undertaken for the Study Area
- Species sightings records and/or benthic habitat mapping:
  - Victorian Biodiversity Atlas
  - South Australia Nature Maps
  - Atlas of Living Australia
  - Sea Maps 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; in particular, EPBC Act referrals for the Victoria Offshore Wind Farm have been utilised.

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] (IBAs).

An 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 EE Act). This will be further evaluated following comprehensive field investigations and studies as the project progresses.

[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] IBA's are defined as places of international significance for birds, and are determined by an internationally agreed set of criteria by BirdLife International.

5 Description of the Existing Environment

5.1 General Description of the Marine Environment

The *South-east marine region profile* (Department of Environment, 2015) describes the ecosystems, conservation values and uses of south-eastern Australia commonwealth marine waters, including waters offshore of the Discovery Coast, as shown in **Figure 5.1**.

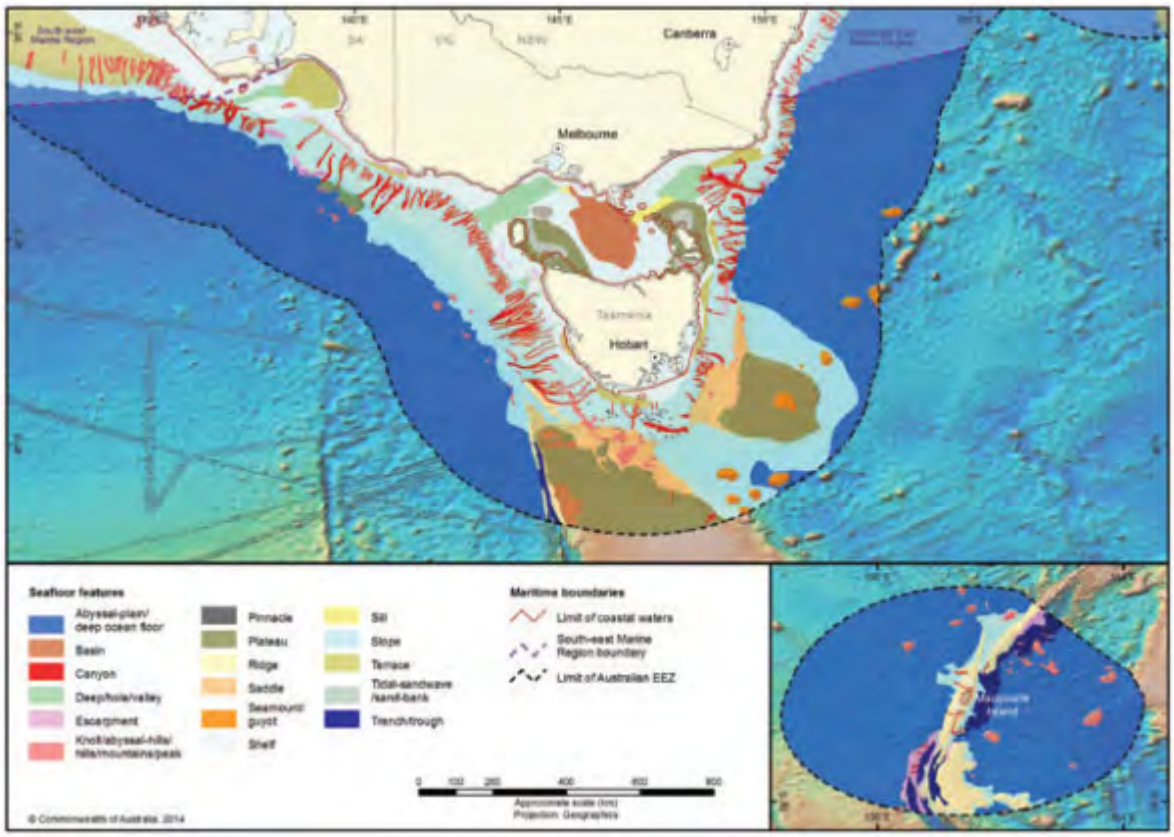


Figure 5.1 South east marine region and seabed features

The region is generally considered to have low productivity (i.e. a low production of organic matter by phytoplankton), with the exception of localised hotspots which include the Bonney Upwelling in south eastern South Australia (within which the Project lies), the Bass Strait Water Cascade on the shelf break east of Bass Strait and the flow of the East Australian Current along the eastern edge of the Region.

The Key Ecological Features (KEF) of the marine environment are listed as:

- Bonney coast upwelling
- East Tasmania subtropical convergence zone
- Bass cascade
- Upwelling east of Eden
- Big horseshoe canyon

- West Tasmania canyons
- Seamounts south and east of Tasmania
- Shelf rocky reefs and hard substrates.

There are approximately 46 threatened species that are known to use the region, as described below:

- Bony fishes – there are seven species of bony fish, including the southern bluefin tuna *(Thunnus maccoyii)* which is an apex predator species
- Shark species – these include the white shark (*Carcharodon carcharias*) and porbeagle (*Lamna nasus*)
- Seahorses, pipehorses and seadragons
- Cetaceans – includes the southern right whale (*Eubalaena australis*), humpback whale (*Megaptera novaeangliae)* and blue whale (*Balaenoptera musculus*)
- Pinnipeds – there are 6 piniped species, including the Australian sea lion (*Neophoca cinerea*)
- Seabirds – a large number of seabirds, including albatross and petral species
- Turtles – four species of turtles, including important foraging areas for the leatherback turtle (*Dermochelys coriacea*).

Bonney Coast Upwelling

The Study Area (including connection routes, turbine structures and offshore substations) does sit within the Bonney Coast Upwelling KEF. This is a seasonal upwelling that brings cold nutrient rich water to the sea surface and is a high productivity area. This, in turn, attracts a high diversity of species; in particular, it is a key feeding area for blue whales as well as many other listed species. The abundance of krill in the upwelling is a food source for many seabirds and fish which then attracts penguins and seals which feed on them. It regularly occurs between November/December and March/April annually (CSIRO, 2004).

Marine Biounits

The *Assessment of the Values of Victoria's Marine Environment Atlas (Victorian Environmental Assessment Council, 2019)* reports that the Glenelg Biounit (within which the Study Area sits) is characterised by extreme exposure to the prevailing weather; its location and major features are illustrated in **Figure 5.2** . It is dominated by infralittoral rock (e.g. hard surfaces in the near shore zone that typically support seaweed/kelp communities) and sublittoral (i.e. areas in the nearshore environment that are permanently covered by water) sediment. It lists the natural values of the biounit as being:

- One of 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 occurs 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.

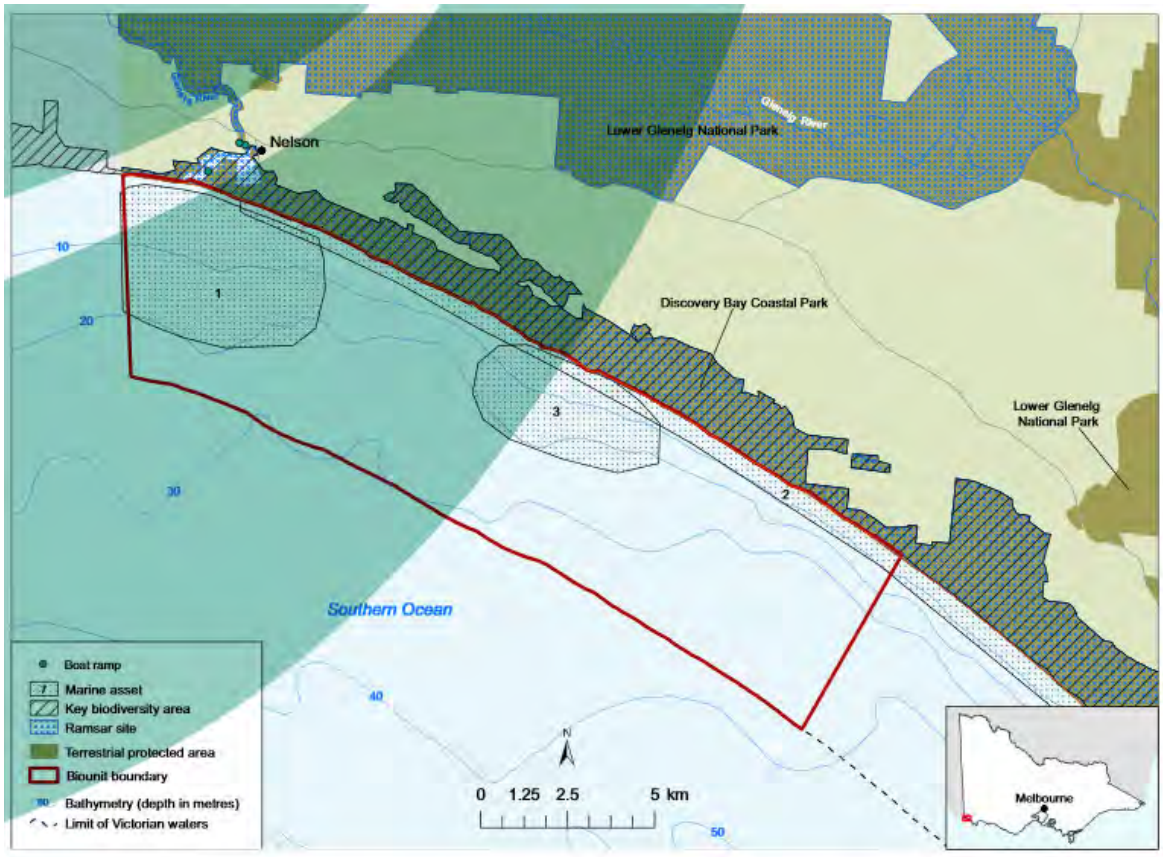


Figure 5.2 Features of the Glenelg biounit

The Study Area is also situated within the Cape Nelson Biounit characterised by high-energy, wave-dominated beaches and rocky shores, sublittoral reef and sediments, coastal cliffs and lagoons (Refer to **Figure 5.3**). Dominant benthic profiles are infralittoral fine sand, high energy lower infralittoral zone and high energy common kelp communities.

Natural values of this biounit include:

- Aggregation area for the southern right whale (*Eubalaena australis*)
- Deen Maar supports an Australian fur seal breeding colony (*Arctocephalus pusillus*) and white sharks also occur near this area.
- Important area for seabirds (common diving-petrel (*Pelecanoides urinatrix*), fairy prion (*Pachyptila turtur*), Caspian tern (*Hydroprogne caspia*), little penguin (*Eudyptula minor*), white-bellied sea eagle (*Haliaeetus leucogaster*) and shy albatross *(Thalassarche cauta*)) and migratory shorebird breeding area. The biounit also supports the highest breeding density of hooded plovers.
- Rocky reefs support diverse fish, invertebrate and macroalgae communities
- Seagrass meadows in Portland Bay supports populations of kingfish, whiting, flathead, mulloway and snapper, as well as rare brown algae (*Cystophora cymodocea*)
- Dutton Way beach supports rare snapping shrimp (*Alpheus australosulcatus*)
- highest breeding density of hooded plovers and migratory shorebird breeding area
- Port Fairy Boulder shores include basalt boulders with steep drop-off and protected lagoons which support high biodiversity of micro-habitats, and associated flora and fauna

- Protected listed communities and species (e.g. orange-bellied parrot (*Neophema chrysogaster*)), endemic or rare species particularly vulnerable to environmental change.

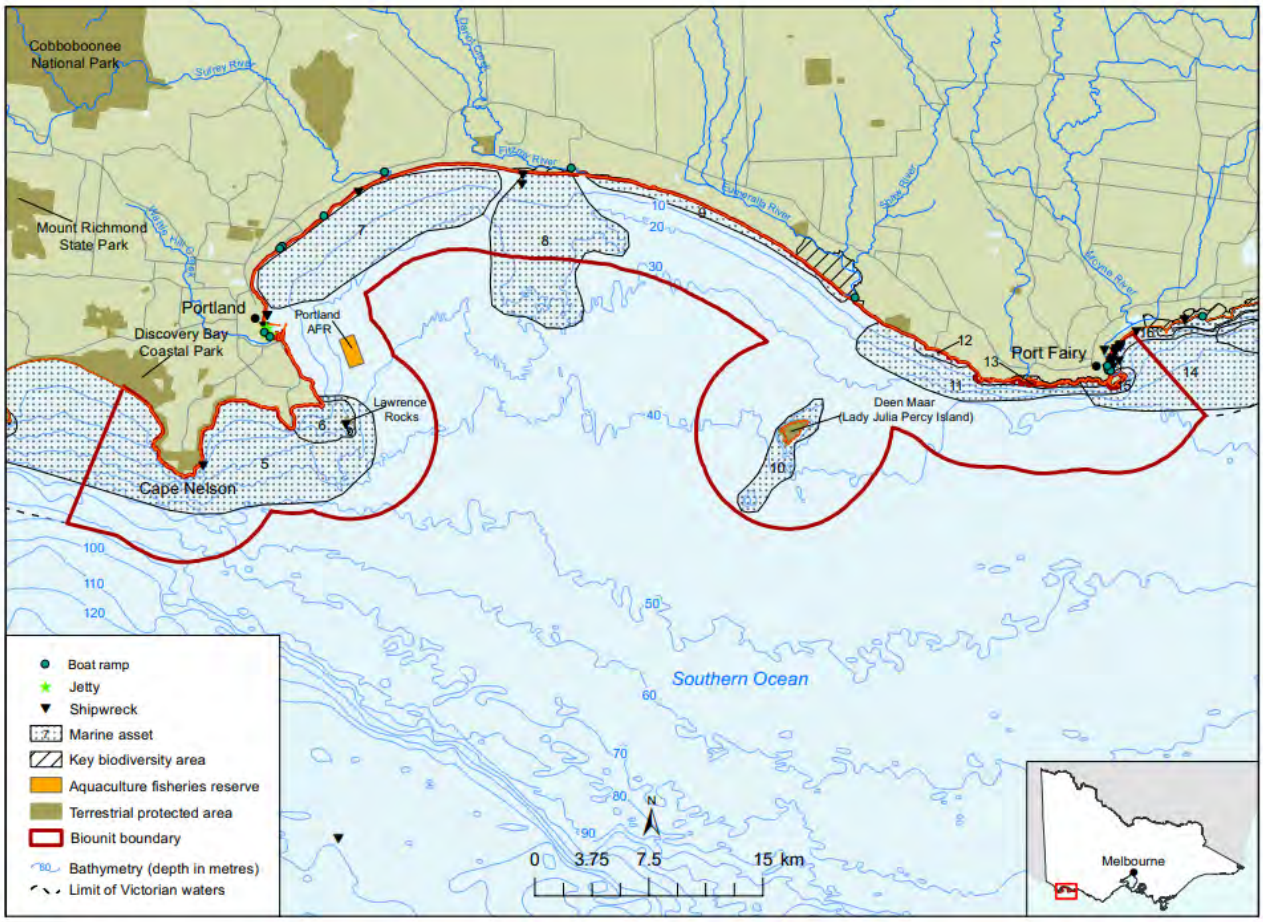


Figure 5.3 Features of the Cape Nelson biounit

The Study Area surrounding the option 2 subsea cable route is located within the adjacent Discovery Bay biounit (Refer to **Figure 5.4**). This biounit 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).

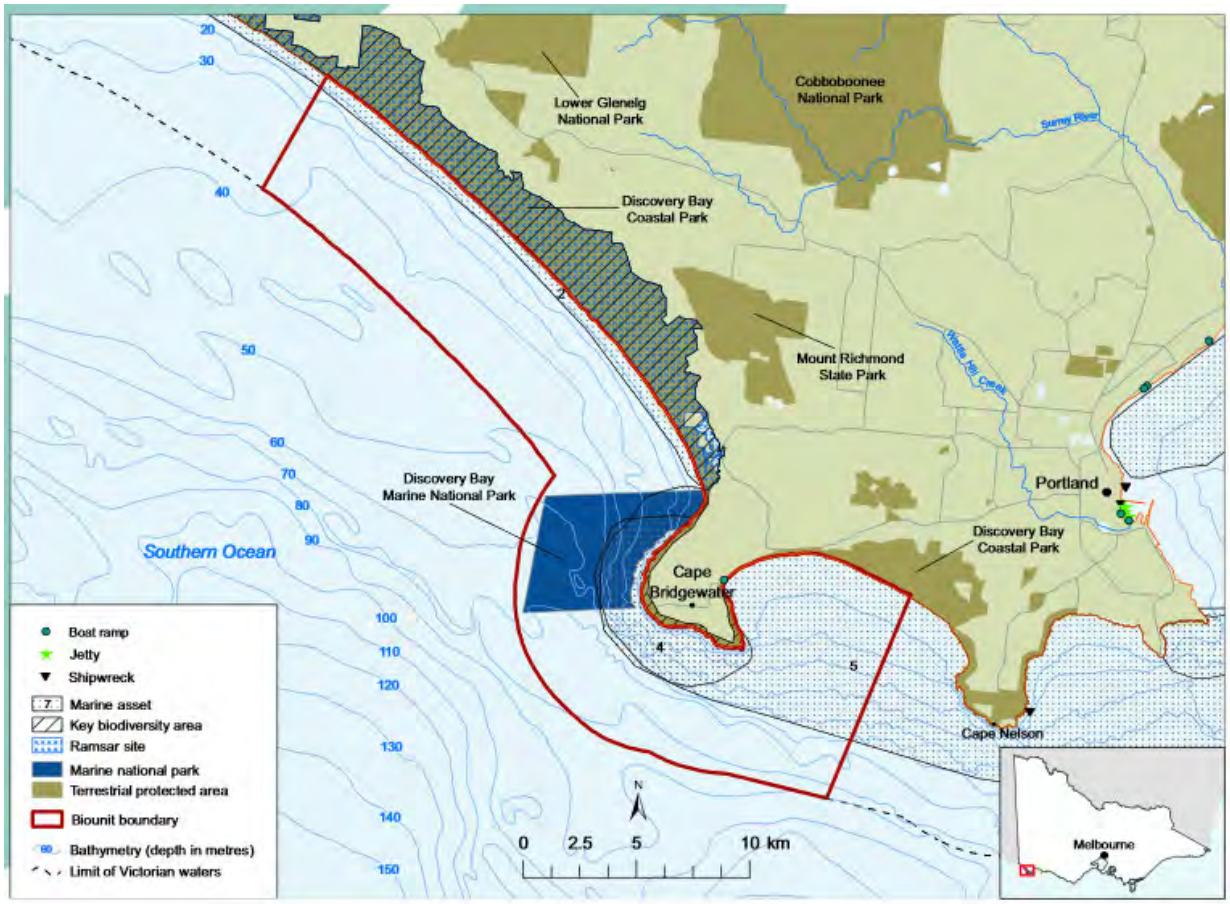


Figure 5.4 Features of the Discovery Bay biounit

5.2 Oceanography

The current generally flows in an easterly direction towards Bass Strait (Refer to **Figure 5.5**). Generally, the area has a very active wave environment with high winds. Deakin University maintain a wave and current buoy at Cape Bridgewater (Refer to **Figure 5.6**) – it reports wave heights of up to 8m in the winter months, with summer providing calmer conditions. The water temperature varies, but averages around 14ºC in winter and 16 to 17ºC in summer.

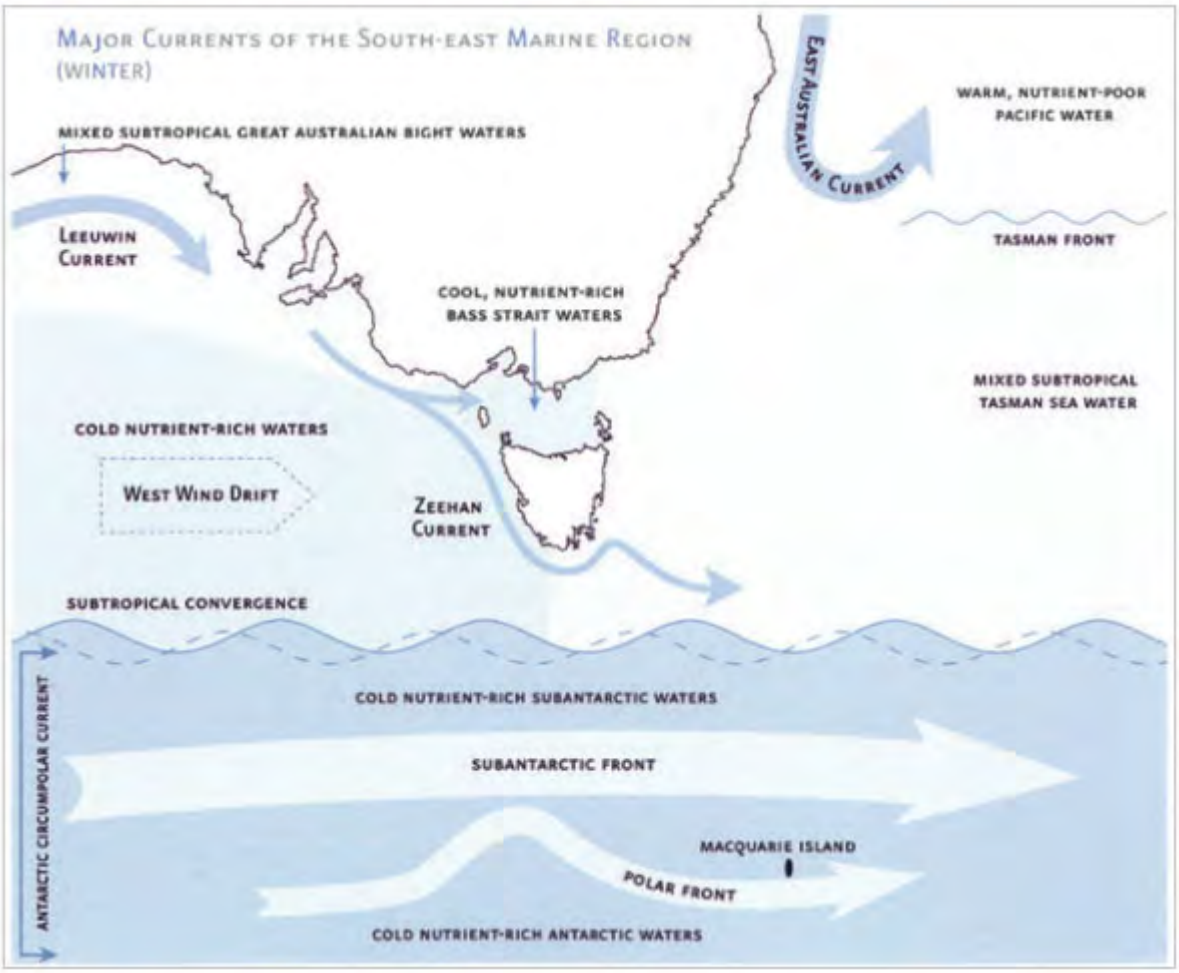


Figure 5.5 Major currents of the south-east region

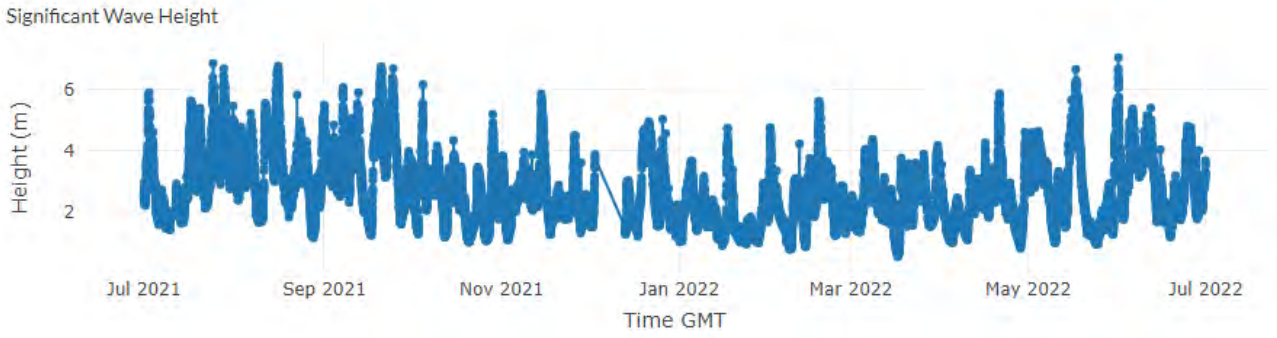


Figure 5.6 Wave height data at the Cape Bridgewater monitoring buoy between July 2021 and June 2022 (Deakin University, 2022)

Bathymetry and Surface Sediment

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 in the nearshore area as mainly being rock, with sand beyond the 60-90m depth contour.

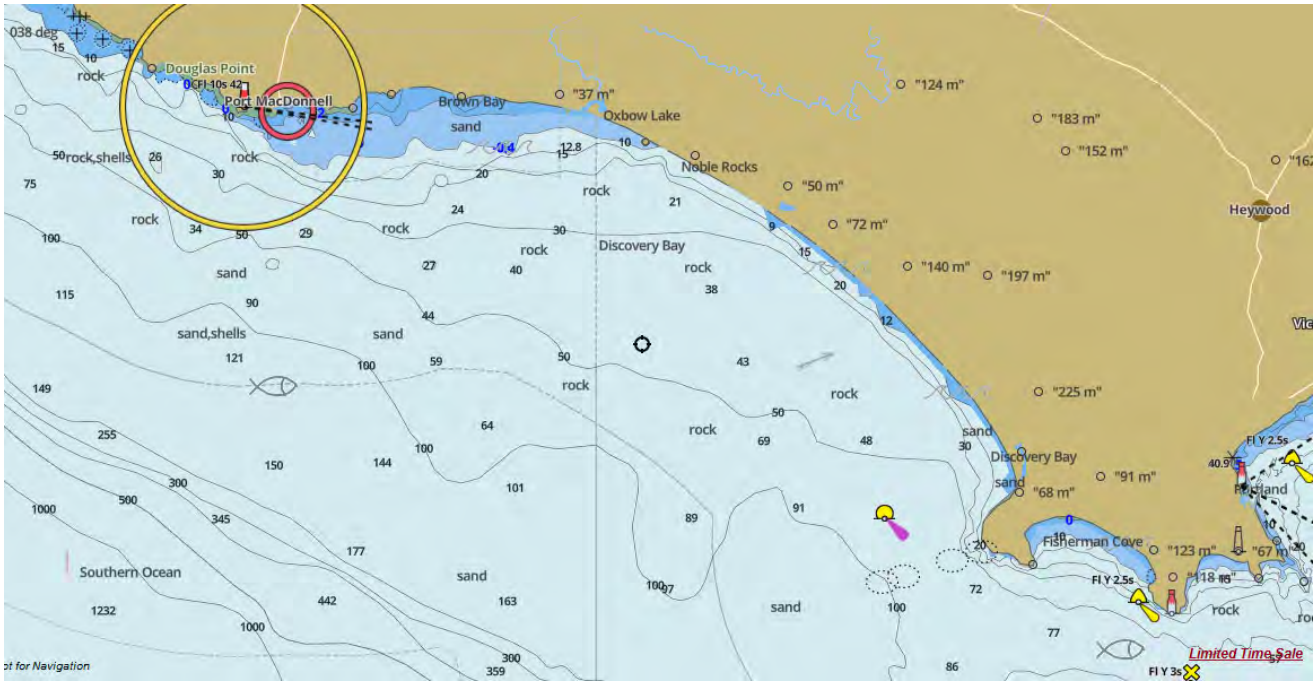


Figure 5.7 Navigational chart for Discovery Bay (GPS Nautical Charts, 2022)

5.3 Land Uses

Protected Areas

Commonwealth Marine Parks

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).

The nearest Commonwealth Marine Park is the Nelson Marine Park (approximately 170 km south 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.

State Marine Parks

The Study Area does include the Discovery Bay Marine Park (**Figure 5.8**). The subsea cabling options avoid the Marine Park and are proposed to be located to its north and south. 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).

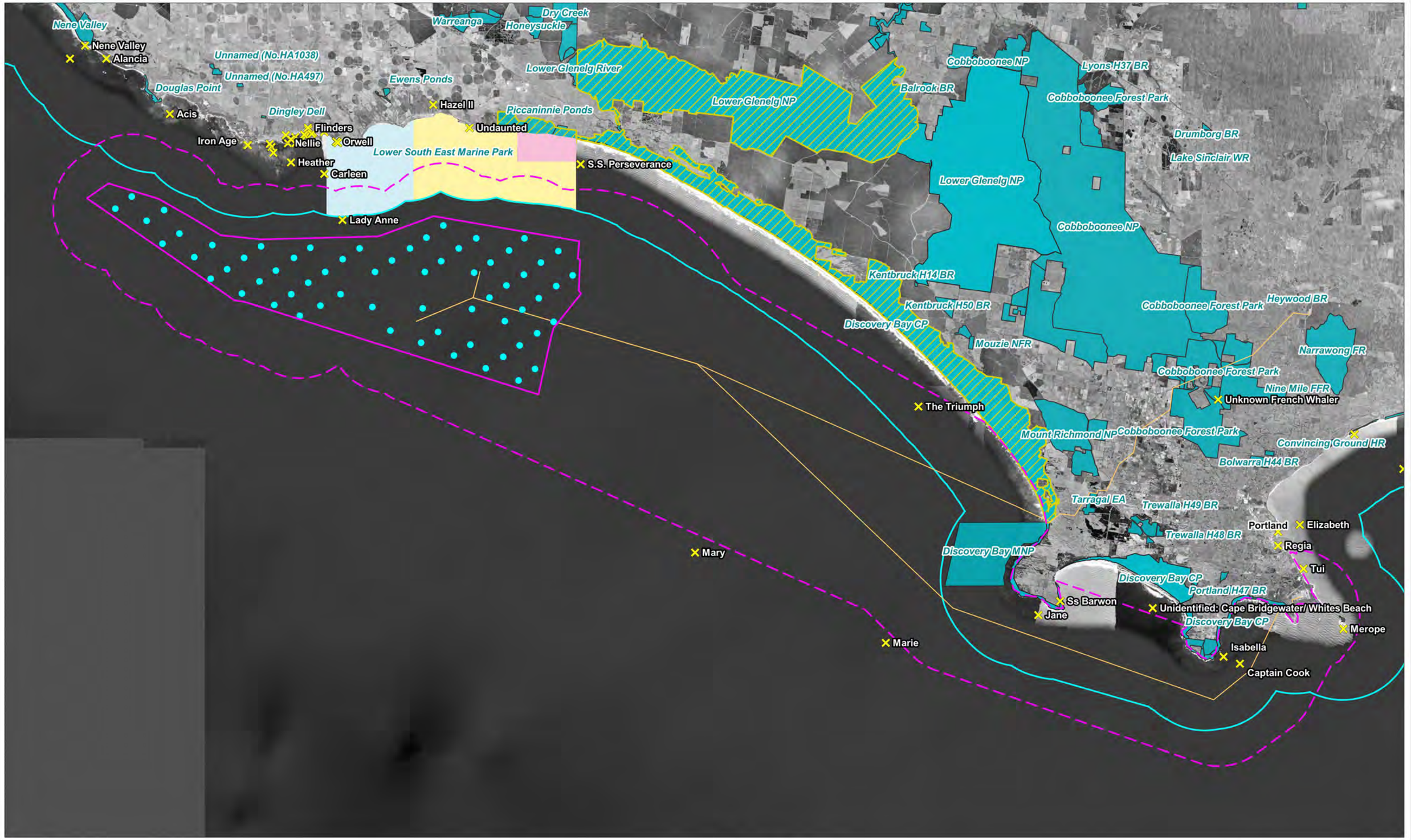
The aims for conserving the natural values of the park are:

- 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 crosses into the South Australian Lower South East Marine Park (although again, no infrastructure is planned within the MP), 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.



LEGEND

- Marine Study Area
- Project Boundary
- Connection Routes
- Turbine Layout
- Shipwrecks
- Coastal Waters Limit
- Ramsar Wetlands
- Conservation Area

Marine Park Zones

- General Managed Use Zone
- Habitat Protection Zone
- Multiple Use Zone
- Sanctuary Zone
- Special Purpose Zone

Title:

Protected Areas

Figure: 5-8

Rev: A

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Ramsar Wetlands

There are two Ramsar wetlands along the coastline bordering the Study Area, as shown in **Figure 5.8**: Glenelg Estuary and Discovery Bay Wetlands and Piccaninnie Ponds Karst Wetlands.

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 Piccaninnie Ponds Karst Wetlands contains one of the largest and deepest springs in Australia, reaching to 110m in depth. The springs is popular for diving, bushwalking and birdwatching. The site is also of spiritual value to the traditional owners. It is listed for:

- A rare example of karst wetlands, which is considered a drought refuge
- Supporting species of conservation significance including dwarf galaxias and the orange-bellied parrot. It is a habitat for 79 bird species, including 24 internationally protected species.

Whilst both wetlands are some distance from the above ground marine infrastructure (i.e. turbines), they do support a high number of wintering migratory shorebird species that potentially may migrate through the offshore environment and should therefore be further considered as part of this marine assessment.

Other Land/Sea Uses

Defence Areas

There are no known defence training areas within proximity of the project site.

Fisheries

The Bonney Coast Upwelling helps to increase the primary productivity (i.e. production of organic matter by phytoplankton) of Discovery and Bridgewater Bay to support a variety of marine habitats such as the *Heterozostera* seagrass meadows that provide an important nursery and feeding ground for a range of commercially important species. The upwelling event also supports major Commonwealth and State run fisheries in Victoria including rock lobster, bottom trawl, and squid fisheries.

There are a number of Protected Aquatic Biota (PABs) declared under the Victorian *Fisheries Act 1995* (Fisheries Act). 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 PAB under Section 72 of the Fisheries Act (known as a PAB permit).

A number of commercial fisheries exist within the Study Area or nearby surrounds, as shown in Figure 5.6. Within Commonwealth waters these include the southern and eastern Scalefish and Shark Fishery, the Southern Squid Jig Fishery, the small pelagic fishery and the Southern Tuna and Billfish Fishery.

Within Victorian state waters, there are fisheries access licenses issued under Section 38 of the Fisheries Act for western rock lobster, abalone and pipis (VEAC, 2019). 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 Bonney Coast Upwelling is identified as key rock lobster habitat (CSIRO, 2004).

The area is identified as key nursery 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 likely occasionally within the Study Area.

The 'Visit Portland' website reports that the fishing industry is one of the largest employers in the region, including indirect employment such as fish processing, marine engineering, ship building and maintenance, providoring etc. Commercial fishing directly from Portland involves fishing for sharks, abalone, crayfish and squid. MacDonnell (in South Australia) houses Australia's largest rock lobster fishing fleet.

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

There are no aquaculture leases within the Study Area.

Oil and Gas Leases or Pipeline Easements

There are no known oil or gas leases or other pipeline easements within the Study Area (NOPTA, 2022).

Geophysical Conditions

The southern continental shelf stretches some 2,000 km in a generally zonal orientation and provides a northern boundary to the southeast Indian Ocean. The southern shelf has a maximum width of 200 km in the central Great Australian Bight, which narrows to 100 m at the Bonney Coast Upwelling where a distinct increase in steepness is then observed. The continental slope and the abyssal plain (between 1,000 and 5,000 m) along the Bonney Coast, are connected by over 20 very large and steep canyons (CSIRO, 2004). CSIRO (2004) describes this continental shelf as being dominated by swells, open cool water. In the shallow shelf (nearshore), you commonly find exhumed limestone and rocky substrates that support dense mollusc, sponge, bryozoan and red algae assemblages. The middle shelf (within the Study Area) is a zone of swelling waves, characterised by mega-rippled bryozoan sands, with areas of rock. The deep shelf is heavily bioturbated, fine bioclastic sands. At the shelf edge, the nutrient-rich upwellings support extensive aphotoic, bryozoan, sponge and coral communities.

The sediments of the Bonney coast are described as mostly coarse to very coarse sand (0.5-1 mm grainsize) with strong gravel patches (grainsize >1 mm) south of the headland near Portland. Fine sand and silt (grainsizes <0.1 mm) intrusions can be noted on the continental shelf edge between Port MacDonnell and south of the Portland headland.

The CSIRO Coastal Unit also provides maps of surface sediments along the Australian coastline (**Figure 5.9**). This describes the Study Area surface sediments as being composed of sand, gravel and silt.

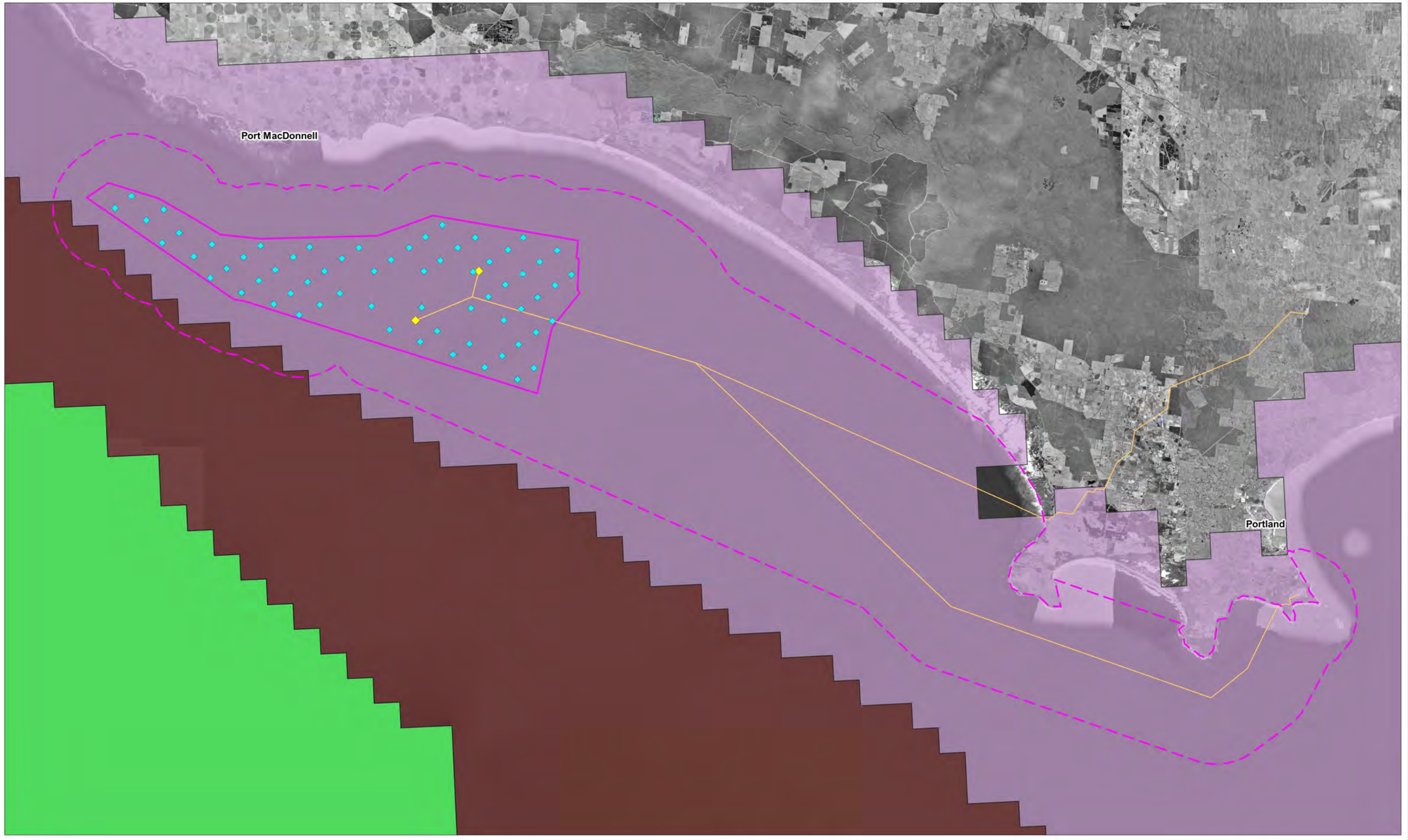
Benthic Environment and Habitats

Seamap Australia maps nearshore benthic habitats along the Australian Coast, as shown in **Figure 5.10**. Habitats within the nearshore environment are shown as seagrass (mixed reef) and undifferentiated algae / invertebrates (i.e. unknown species). Some reef is also identified as being located 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 (a group of organisms with a similar genotype) within this region include the following:

- Benthic vegetation: brown algae, bull kelp and common kelp
- Sessile invertebrates (animals without a backbone that are attached to substrates): high diversity of sponge and seawhip (a type of coral) assemblages[4].

Monk et al. (2010) reports that the region contains vertical basalt reef structures that rise some 20m from the seafloor – the tops of these structures support diverse assemblages of red algae and kelp.

[4] Assemblages are related groups of species populations that occur together in a particular habitat.



LEGEND

- Marine Study Area
- Project Boundary
- Wind Farm Layout
- Substation
- Connection Routes

Benthic Substrate

- Gravel, Sand and Silt
- Calcium Carbonate Mud
- Mud and Sand

Title:

Benthic Substrate

Figure: 5-9

Rev: A

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Port MacDonnell

Portland

LEGEND

- Marine Study Area
- Project Boundary
- Wind Farm Layout
- Substation
- Connection Routes
- Key Ecological Features
- Reefs and Shoals

Benthic Habitat (Seamap)

- Invertebrates
- Mangroves
- Mixed Algae

Title:

Benthic Habitats

Figure: **5-10**

Rev: **A**

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5.4 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 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 actions
- A water resource, in relation to coal seam gas development and large coal mining development.

A search using the Protected Matters Search Tool has identified that nationally threatened species, migratory species and commonwealth marine areas occur within the marine Study Area or immediately adjacent. These matters are further described below.

Commonwealth Marine Areas

The Commonwealth marine area commences three nautical miles from Lowest Astronomical Tide (LAT) (as defined under the *Seas and Submerged Lands Act 1973* from the coastline; also known as the Territorial Sea Baseline (TSB)). The turbines, majority of cabling and sub-stations are all within the commonwealth marine area; the transmission line connecting to the grid system is located within Victorian state waters.

The Study Area is mapped as containing a KEF – the Bonney Coast Upwelling (Refer to **Section 5.1** for further information).

The protected matters search tool for the Study Area (access in July, 2022) identified 48 listed threatened marine species as potentially occurring. This includes 33 bird, 5 fish, 5 mammals (4 whale and 1 seal species), 3 turtle and 2 shark species. **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, Nature Maps South Australia 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).

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 5.11**. Site surveys will be required to confirm the area of TEC potentially impacted. Although the TEC is mapped within the Study Area, infrastructure footprints avoid this area and its unlikely to be impacted directly by the project if present.

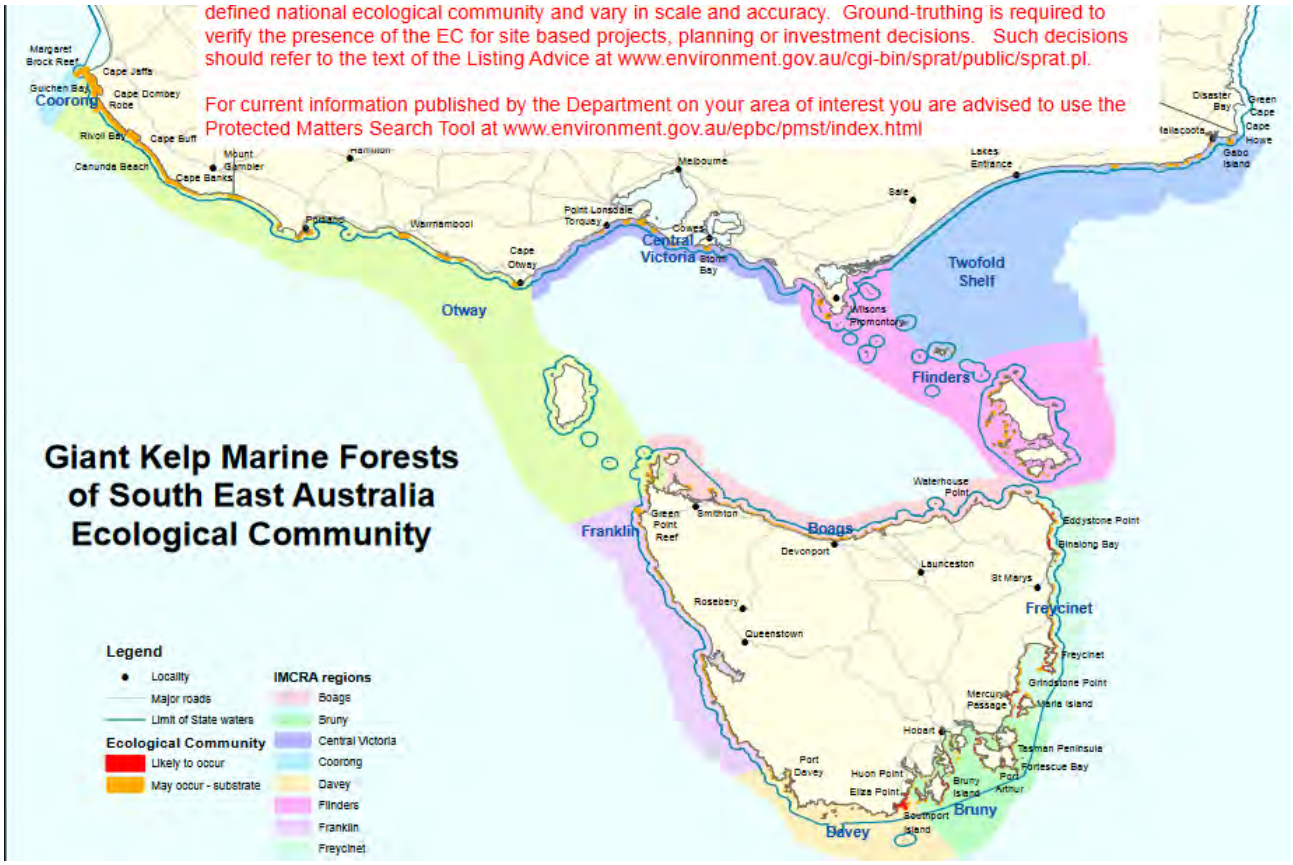


Figure 5.11 Potential extent of the Threatened Ecological Community Giant Kelp Marine Forests of South East Australia (SPRAT Database)

Biologically Important Areas

The Study Area is nominated to be a Biologically Important Area (BIA) for the following species:

- Whales: foraging habitat and high use area for pygmy blue whale (*Balaenoptera musculus brevicauda*), aggregation, migration and resting areas for southern right whale (*Eubalaena australis*)
- Seabirds (foraging only): antipodean albatross *(Diomedia exulans antipodensis*), wandering albatross (*Diomedea exulans*), wedge-tailed shearwater (*Ardenna pacifica*), common diving-petrel (*Pelecanoides urinatrix*), Buller's albatross (*Thalassarche bulleri*), Indian yellow-nosed albatross (*Thalassarche chlorohynchos bassi*), black-browed albatross (*Thalassarche melanophris*) and Campbell albatross (*Thalassarche melanophris impavida*).
- Sharks: foraging area for the white shark (*Carcharodon carcharias*)

A BIA is an indication that an area has a high level of importance for a species, either threatened or migratory under the EPBC Act.

Threatened Species

There are five EPBC-listed Critically Endangered species potentially occurring within the Study Area:

- Curlew sandpiper (*Calidris ferruginea)*
- Orange-bellied parrot (*Neophema chrysogaster)*
- Swift parrot (*Lathamus discolor*)

- Eastern Curlew (*Numenius madagascariensis*)
- Southern bent-wing Bat (*Miniopterus orianae bassanii*)

Further commentary on how these species may utilise the marine environment is provided in the following sections[5].

[5] 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

Table 5.1 Listed Threatened Species for the Southern Winds Offshore Wind Project Study Area (Area based on EPBC Protected Matters Search and other information sources described in Section 4)

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	-	Species or species habitat likely to occur within area
Apus pacificus	Fork-tailed swift	Migratory	-	Species or species habitat likely to occur within area
Ardenna grisea	Sooty shearwater	Migratory	-	Foraging, feeding or related behaviour likely to occur within area
Ardenna tenuirostris	Short-tailed shearwater	Migratory		Breeding behaviour may occur in the Study Area
Arenaria interpres	Ruddy turnstone	Migratory	Endangered	Species or species habitat known to occur in the study arae
Ardenna carneipes	Flesh-footed shearwater	Migratory	-	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus	Australasian bittern	Endangered	Critically Endangered	Species or species habitat likely to occur within area
Calidris acuminata	Sharp-tailed sandpiper	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
Calidris ferruginea	Curlew sandpiper	Critically Endangered, Migratory	Endangered	Species or species habitat likely to occur within area
Calidris melanotos	Pectoral sandpiper	Migratory	-	Species or species habitat likely to occur within area
Calidris ruficollis	Red-necked Stint	Migratory	-	Species or species habitat lknown 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)
Charadrius leschenaultii	Greater Sand Plover	Vulnerable, Migratory	Vulnerable	Species or species habitat possible to occur within area
Charadrius bicinctus	Double-banded Plover	Migratory		Species or species habitat known to occur within the Study 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
Gallinago hardwickii	Latham's snipe	Migratory	-	Species or species habitat likely to occur within area
Halobaena caerulea	Blue petrel	Vulnerable	-	Species or species habitat possible to occur within area
Hirundapus caudacutus	White-throated needletail	Vulnerable	-	Species or species habitat known to occur within area
Ixobrychus flavicollis australis	Black bittern	-	Vulnerable	Species or species habitat 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 likely to occur within area
Macronectes giganteus	Southern giant petrel	Endangered, Migratory	Endangered	Species or species habitat may to occur within area
Macronectes halli	Northern giant petrel	Vulnerable	Endangered	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)
Neophema chrysogaster	Orange-bellied parrot	Critically Endangered	Critically endangered	Species or species habitat likely to occur within area
Numenius madagascariensis	Eastern curlew	Critically Endangered, Migratory	Vulnerable	Species or species habitat may 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
Phoebetria fusca	Sooty albatross	Vulnerable, Migratory	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Pterodroma leucoptera leucoptera	Gould's petrel	Endangered	-	Foraging, feeding or related behaviour may occur within area
Pterodroma mollis	Soft-plumaged petrel	Endangered		Foraging, feeding or related behaviour may occur within area
Rostratula australis	Australian painted snipe	Endangered	Critically endangered	Species or species habitat likely to occur within area
Sternula albifrons	Little tern	Migratory	Critically endagnered	Foraging, feeding or related behaviour likely to occur within area
Sternula nereis nereis	Australian fairy tern	Vulnerable	Endangered	Foraging, feeding or related behaviour known to occur within area
Thalassarche bulleri	Buller's albatross	Vulnerable, Migratory	Endangered	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
Thalassarche cauta	Shy albatross	Endangered, Migratory	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 carteri	Indian yellow-nosed albatross	Vulnerable, Migratory	Endangered	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	Foraging, feeding or related behaviour likely to 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
Tringa nebularia	Common greenshank	Migratory	Endangered	Species or species habitat likely to occur within area
Tringa stagnatilis	Marsh sandpiper	Migratory	Endangered	Species or species habitat likely to occur within area
Whales, Dolphins and Seals				
Arctocephalus forsteri	Long-nosed fur-seal	-	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Arctocephalus pusillus	Australian fur seal			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)
Balaenoptera borealis	Sei whale	Vulnerable, Migratory	-	Foraging, feeding or related behaviour known to occur within area
Balaenoptera musculus	Blue whale	Endangered, Migratory	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 likely to occur within area
Eubalaena australis	Southern right whale	Endangered, Migratory	Endangered	Foraging, feeding or related behaviour known to occur within area
Megaptera novaeangliae	Humpback whale	Migratory	Critically endangered	Species or species habitat known occur within area
Orcinus orca	Killer whale	Migratory	-	Species or species habitat likely to occur within area
Neophoca cinerea	Australian Sea Lion	Endangered	Endangered	Species or species habitat known to occur within area
Lagenorhynchus obscurus	Dusky dolphin	Migratory	-	Species or species habitat possibly occurs within area
Physeter macrocephalus	Sperm Whale	Migratory		Species or habitat possibly occurs in the aea
Bats				
Miniopterus orianae bassanii	Southern bent-wing bat	Critically endangered	Critically Endangered	Species or species habitat known to occur in the area.
Turtles				

Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Caretta caretta	Loggerhead turtle	Endangered, Migratory	-	Foraging habitat possibly occurs within Study Area
Chelonia mydas	Green turtle	Vulnerable, Migratory	-	Foraging habitat possibly occurs within Study Area
Dermochelys coriacea	Leatherback turtle	Endangered, Migratory	Critically endangered	Foraging habitat possibly occurs within Study Area
Sharks and Fish				
Isurus oxyrinchus	Shortfin mako	Migratory	-	Species or species habitat known to occur within area
Prototroctes maraena	Australian grayling	Vulnerable	Endangered	Species or species habitat may occur
Carcharodon carcharias	White shark	Vulnerable, Migratory	Endangered	Foraging, feeding or nursery-related behaviour known to occur within area
Carcharias taurus	Grey nurse shark	-	Critically Endangered	Foraging, feeding or nursery-related behaviour potentially occurs within area
Lamna nasus	Porbeagle	Migratory	-	Species or species habitat known to occur within area
Galaxiella pusilla	Eastern dwarf galaxias	Vulnerable	Endangered	Species or species habitat possible to occur within area
Nannoperca obscuras	Yarra pygmy Perch	Vulnerable		Species or species habitat possible to occur within area
Galeorhinus galeus	School shark	Conservation Dependent		Species or species habitat likely to occur within area
Seriolella brama	Blue warehou	Conservation Dependent	=	Species or species habitat likely to occur within area
Thunnus maccoyii	Southern bluefin tuna	Conservation dependent	Threatened	Foraging, feeding or related behaviour known to occur within area

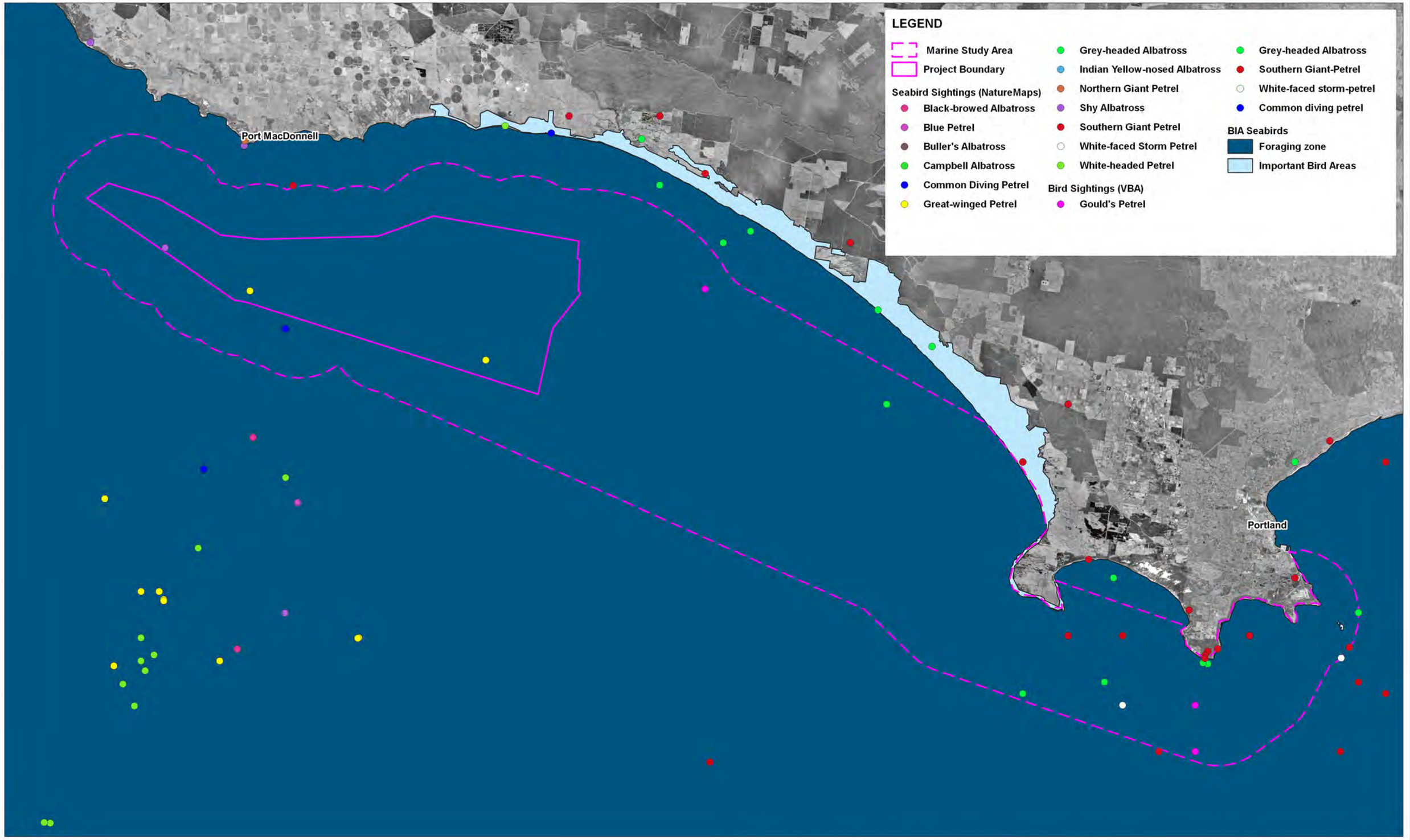
Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
Heraldia nocturna	Upside down fish	Marine	-	Species or species habitat possible to occur within area
Hippcampus abdominalis	Big bellied seahorse	Marine	-	Species or species habitat possible to occur within area
Hippocampus breviceps	Short-headed seahorse	Marine	-	Species or species habitat possible to occur within area
HIstiogamphelus briggsii	Crested pipefish	Marine	-	Species or species habitat possible to occur within area
Histiogampehlus cristatus	Rhino pipefish	Marine	-	Species or species habitat possible to occur within area
Kaupus costatus	Deepbody pipefish	Marine	-	Species or species habitat possible to occur within area
Leptiochthys fistularius	Brushtail pipefish	Marine	-	Species or species habitat possible to occur within area
Lissocampus caudalis	Australian smooth pipefish	Marine	-	Species or species habitat possible to occur within area
Lissocampus runa	Javelin pipefish	Marine	-	Species or species habitat possible to occur within area
Maroubra perserrata	Sawtooth pipefish	Marine	-	Species or species habitat possible to occur within area
Mitotichys tuckeri	Tuckers pipefish	Marine	-	Species or species habitat possible to occur within area
Notiocampus ruber	Red pipefish	Marine	-	Species or species habitat possible to occur within area
Phycodurus eques	Leafy seadragon	Marine	-	Species or species habitat possible to occur within area
Phyllopteryx taeniolatus	Common seadragon	Marine	-	Species or species habitat possible 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)
Pugnaso curtirostris	Pugnose pipefish	Marine	-	Species or species habitat possible to occur within area
Solegnathus robustus	Robust pipehorse	Marine	-	Species or species habitat possible to occur within area
Solegnathus spinosissimus	Spiny pipehorse	Marine	-	Species or species habitat possible to occur within area
Stigmatopora argus	Spotted pipefish	Marine	-	Species or species habitat possible to occur within area
Stigmatopora nigra	Wide-bodied pipefish	Marine	-	Species or species habitat possible to occur within area
Stipecampus cristatus	Ringback pipefish	Marine	-	Species or species habitat possible to occur within area
Urocampus carinirostris	Hairy pipefish	Marine	-	Species or species habitat possible to occur within area
Vanacampus margaritifer	Mother of pearl pipefish	Marine	-	Species or species habitat possible to occur within area
Vanacampus phillipi	Port Phillip pipefish	Marine	-	Species or species habitat possible to occur within area
Vanacampus peocilolaemus	Longsnout pipefish	Marine	-	Species or species habitat possible to occur within area
Marine Benthic Species				
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

Scientific Name	Common Name	EPBC Act Status (threatened or migratory species)	FFG Act Status / Victorian Advisory List	Type of presence (EPBC)
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
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
Thyone nigra	Sea-cucumber species	-	Vulnerable	Species or species habitat possibly occurs within area

Seabirds

There are several records of a number of threatened seabirds being present within the Study Area, as shown in **Figure 5.12**. The Study Area is mapped as a BIA for the antipodean albatross *(Diomedia exulans antipodensis*), wandering albatross (*Diomedea exulans*), wedge-tailed shearwater (*Ardenna pacifica*), common diving-petrel (*Pelecanoides urinatrix*), Buller's albatross (*Thalassarche bulleri*), Indian yellow-nosed albatross (*Thalassarche chlorohynchos bassi*), black-browed albatross (*Thalassarche melanophris*) and Campbell albatross (*Thalassarche melanophris impavida*).



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Seabird Sightings (Victorian Biodiversity Atlas and SA NatureMaps)

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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.

Seabirds are known to feed on fish, cephalopod and/or crustaceans within the marine environment, diving to the surface water level or just below. Butler et al. 2002 describes the Bonney Upwelling as being a significant attractant for seabirds. This potentially makes foraging seabirds vulnerable to turbine strike.

Parrots

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 around 70 birds remaining in the wild, although these are being supplemented with the release of birds raised in captivity being released (OBP Recovery Team, 2022). The orange-bellied parrot (Neophema chrysogaster) inhabits coastal and surrounding areas including saltmarshes, littoral heathlands and scrublands. The orange-bellied parrot (Critically Endangered) has been recorded regularly through the 80’s and 90’s within the Study Area (Refer to **Figure 5.14**), however the last record was in 2001 (ALA, 2021, VBA 2022) near Portland. Just across the border in South Australia, the orange-bellied parrot has been recorded more recently (several occurrences in the 2000’s) (NatureMaps, 2022) and also last year (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 5.13**.

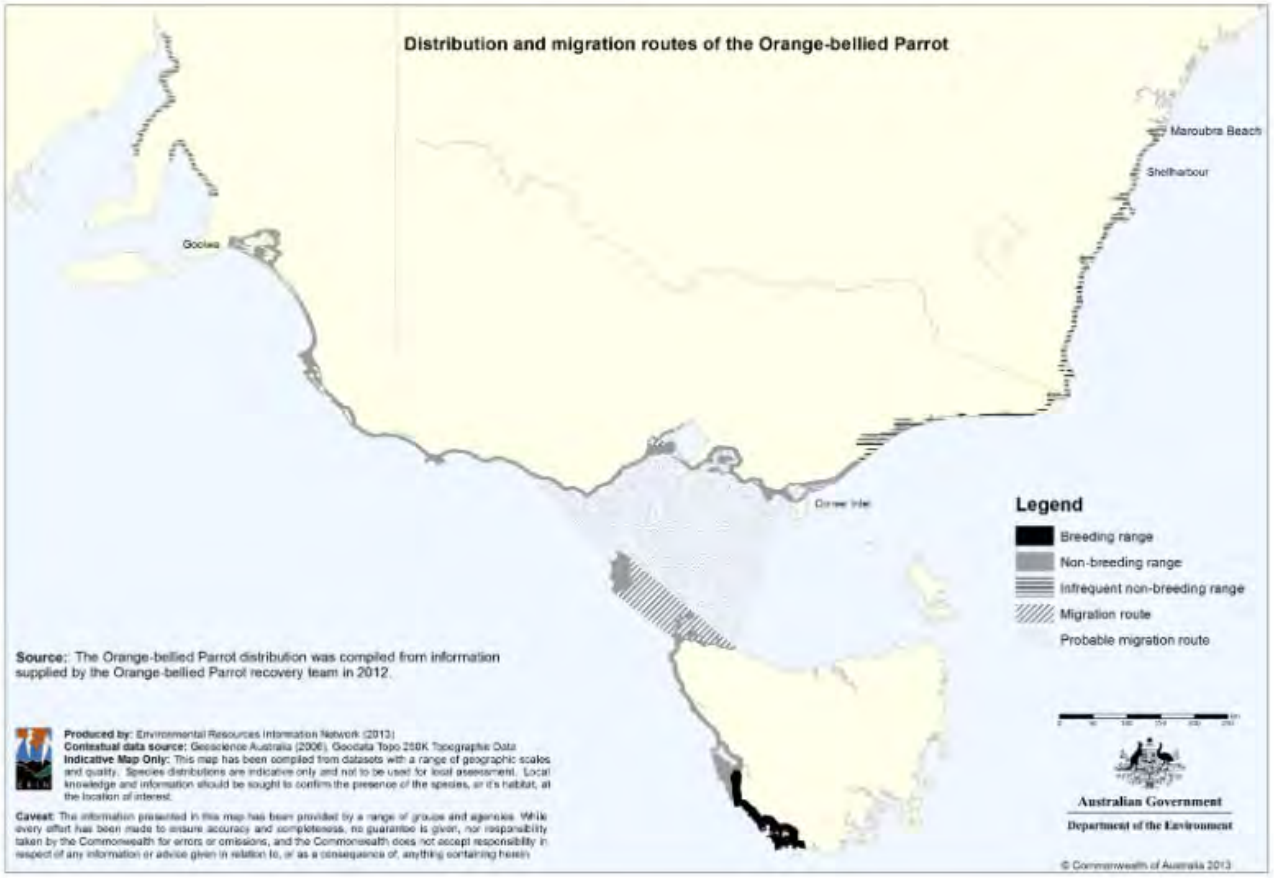

Figure 5.13 Known distribution of the orange-bellied parrot (Australian Government, 2016)

Figure 5.14 Historical distribution of the orange-bellied parrot (Victorian Biodiversity Atlas, 2021)

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 5.15** and **Figure 5.16**) 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.

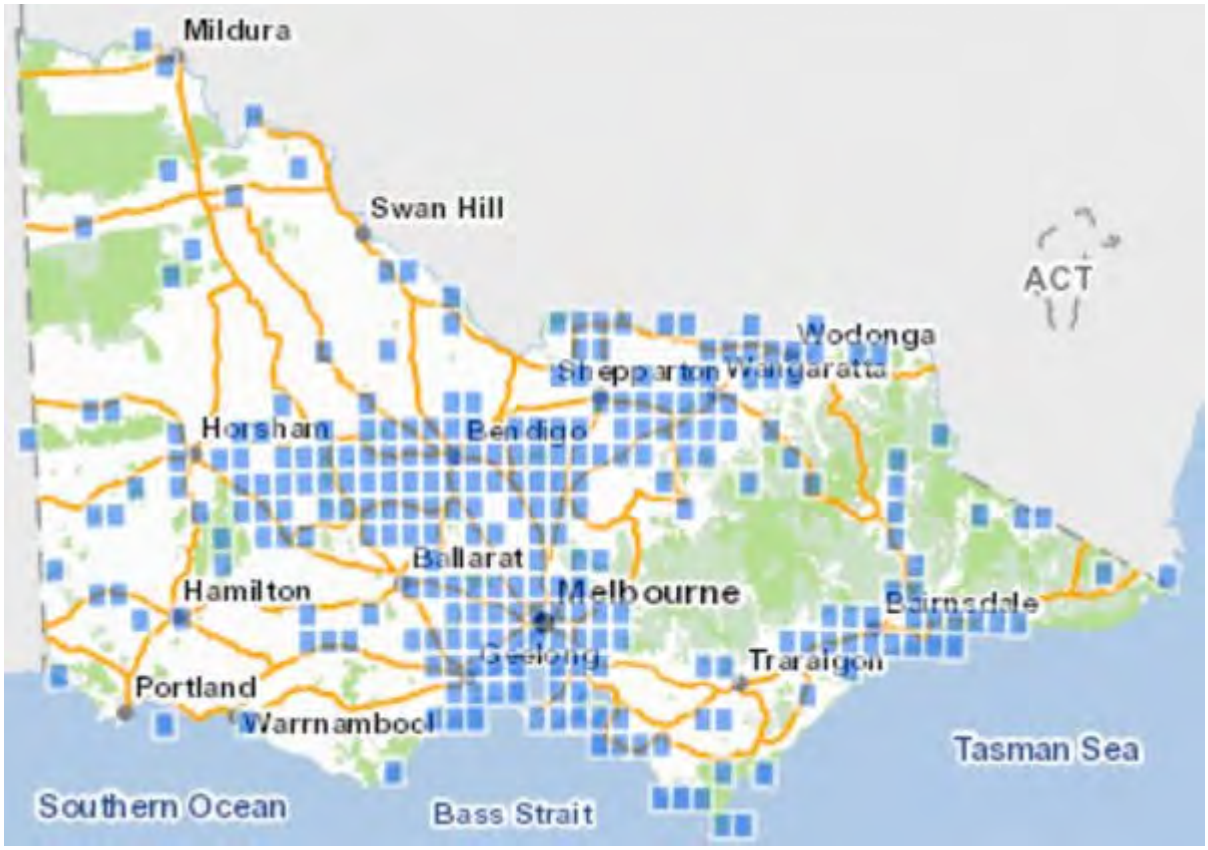

Figure 5.15 All known records of swift parrot in Victoria. (Source: Victorian Biodiversity Atlas, 2019)

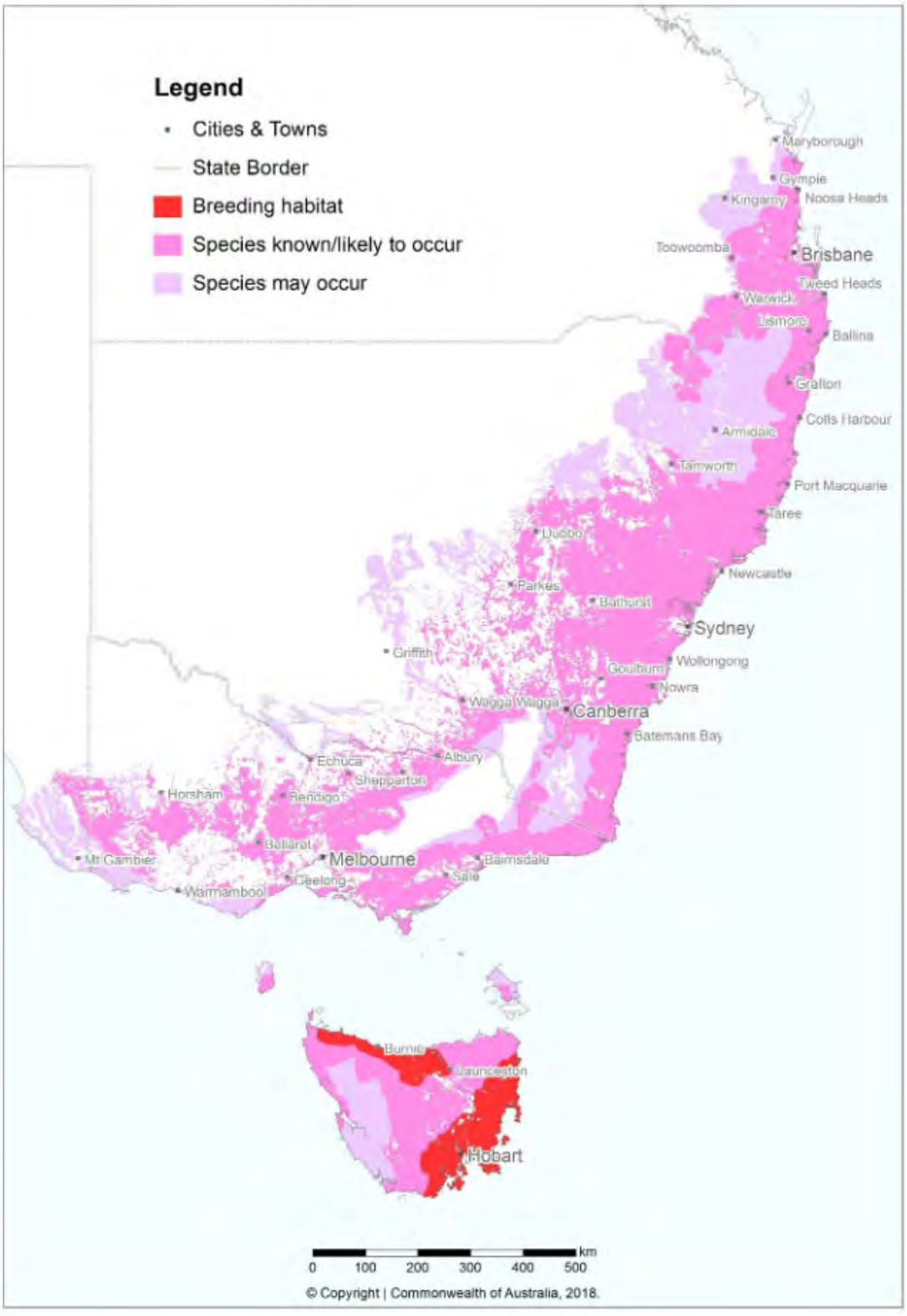

Figure 5.16 Distribution of the Swift Parrot in Australia (*Draft National Recovery plan for the Swift Parrot,* Commonwealth of Australia, 2019)

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, particularly around the nearby Ramsar wetland areas.

These species would congregate around nearshore habitats but may occasionally utilise the Study Area for foraging purposes.

Shorebirds sightings within and surrounding the Study Area are presented in **Figure 5.17**.

Port MacDonnell

Portland

LEGEND

- Marine Study Area
- Project Boundary

Birds (NatureMaps SA)

- Australasian Bittern
- Australian Painted-snipe
- Australian Pelican
- Bar-tailed Godwit
- Black-tailed Godwit
- Broad-billed Sandpiper
- Common Greenshank
- Common Sandpiper
- Curlew Sandpiper
- Double-banded Plover
- Far Eastern Curlew
- Great Knot
- Grey Plover
- Hooded Plover
- Latham's Snipe
- Lesser Sand Plover
- Little Pied Cormorant
- Marsh Sandpiper
- Orange-bellied Parrot
- Pacific Golden Plover
- Pectoral Sandpiper
- Pied Oystercatcher
- Red-capped Plover
- Red-necked Stint
- Ruddy Turnstone
- Sanderling
- Scarlet Robin
- Sharp-tailed Sandpiper
- Short-tailed Shearwater
- Sooty Oystercatcher
- Whimbrel

Bird Sightings (VBA)

- Australasian Bittern
- Australian Painted-snipe
- Curlew Sandpiper
- Eastern Curlew
- Orange-bellied Parrot
- Swift Parrot
- Important Bird Areas

Title:

Shorebird and Parrot Species Sightings

Figure: 5-17

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Cetaceans

Southern Right Whale

The southern right whale (*Eubalaena australis*), 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 5.18, DSEWPC, 2012). The area around Portland is established as a BIA for these whales, as illustrated in **Figure 5.19**.

Water depth is an important determinant of habitat suitability for the southern right whale, with the species preferentially occupying waters close to the surface (less than 10m) off the Australian coast in aggregation areas. During the summer, aggregation areas of the southern right whales typically occur in waters featuring steep bottom topography, relatively cool water temperatures water column stratification and ocean currents containing high concentration of krill species (Austin, 2021). This includes, for example, the Bonney Coast upwelling area.

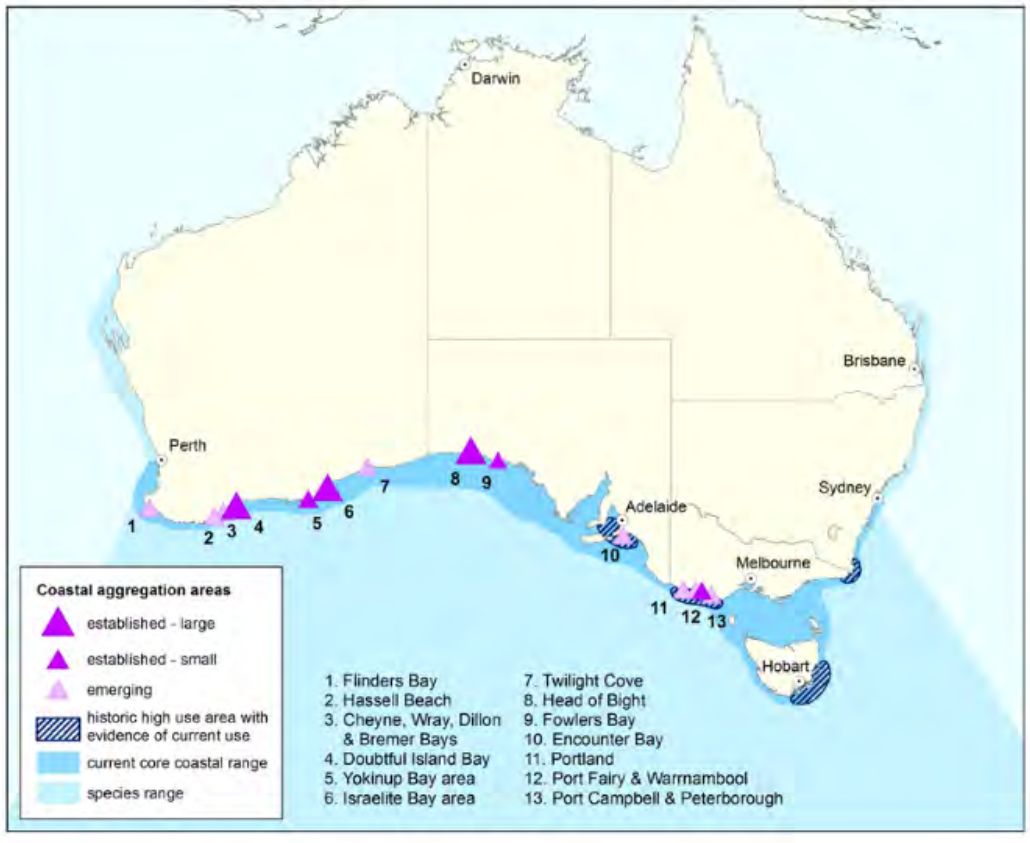
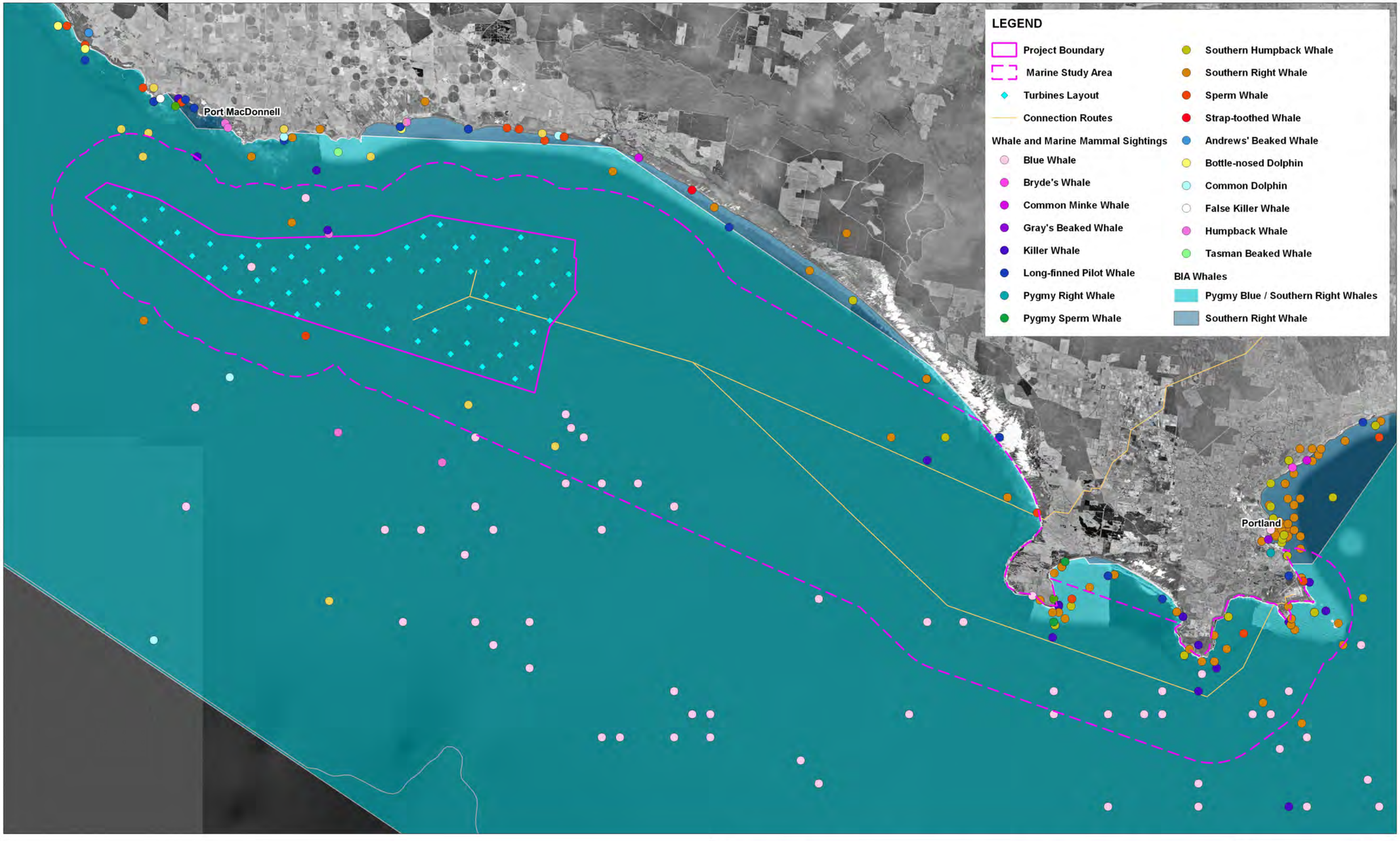


Figure 5.18 Southern Right Whales Coastal Aggregation (DSEWPC, 2012)



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Whale and Marine Mammal Sightings (Victorian Biodiversity Atlas and Australian Living Atlas)

Figure: 4-19

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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As of 2021, the Australian population of southern right whales was approximately 15,000 individuals with roughly 300 of those individuals comprising the 'eastern' sub-population (Austin, 2021). Logan's Beach located near Warrnambool in southwestern Victoria (approximately 100km from the Study Area) is identified as a key southern right whale calving ground in which females return on an annual basis from Antarctic waters to nurse and feed their young (Victoria Department of Environment Land Water and Planning, 2017). Concentrations of southern right whale sightings are high within the Logan's Beach region, particularly between the period of June-August (when cows give birth), extending until October or November (Department of Sustainability and Environment, 2004). Other additional areas in which non-calving whales regularly aggregate for short periods of time include coastal waters off Peterborough, Port Campbell, Port Fairy and Portland in Victoria.

In 2020, nine southern right whale sightings were reported in the vicinity of the Study Area (SWIFFT, 2021). 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 5.20**.

The 2021 season siting data was collected by SWIFFT from public sightings data and submitted photos. Recordings includes several cow-calf pairs near Portland (**Figure 5.21**).

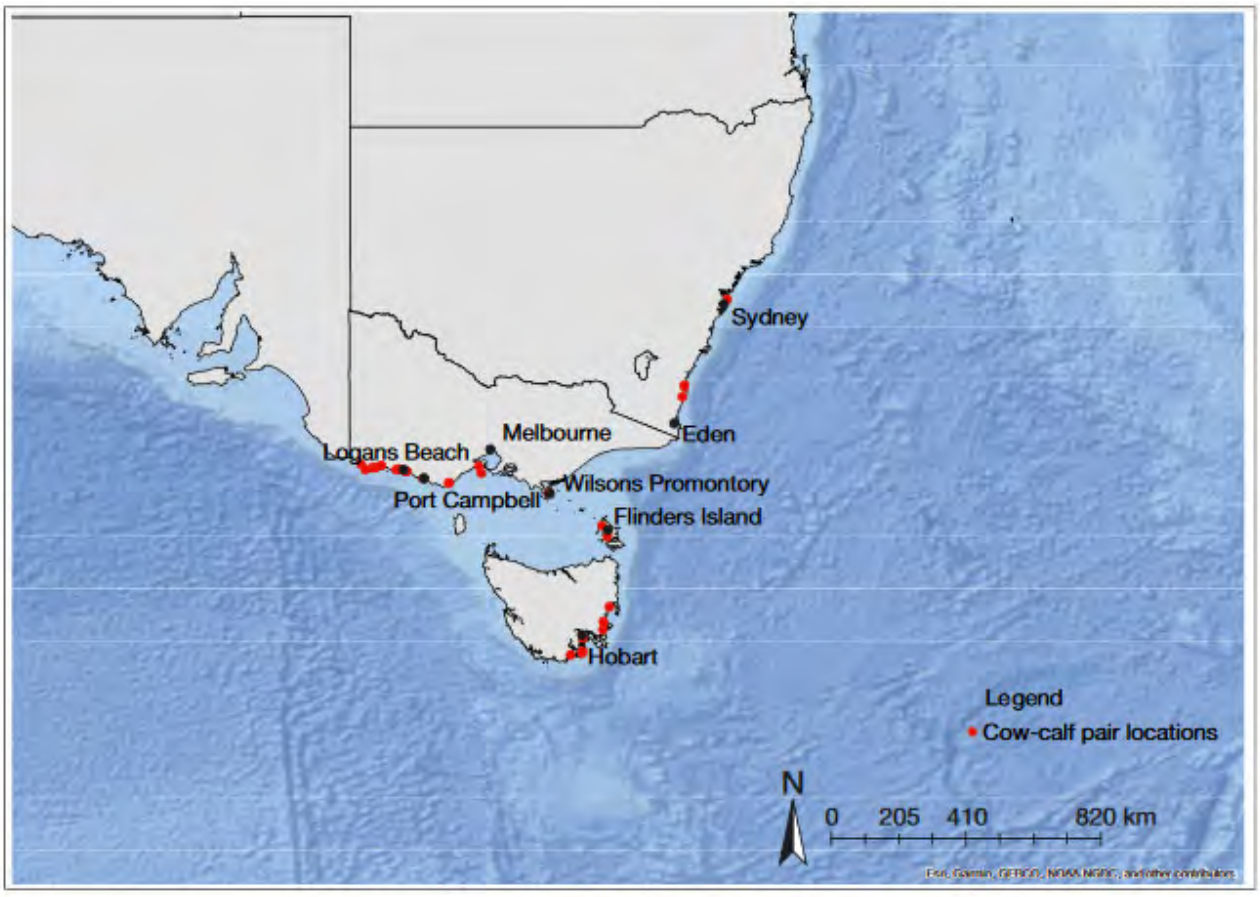

Figure 5.20 Location of mother-calf pairs identified in southeastern Australian waters between 1993-2017 (Stamation et al., 2020)

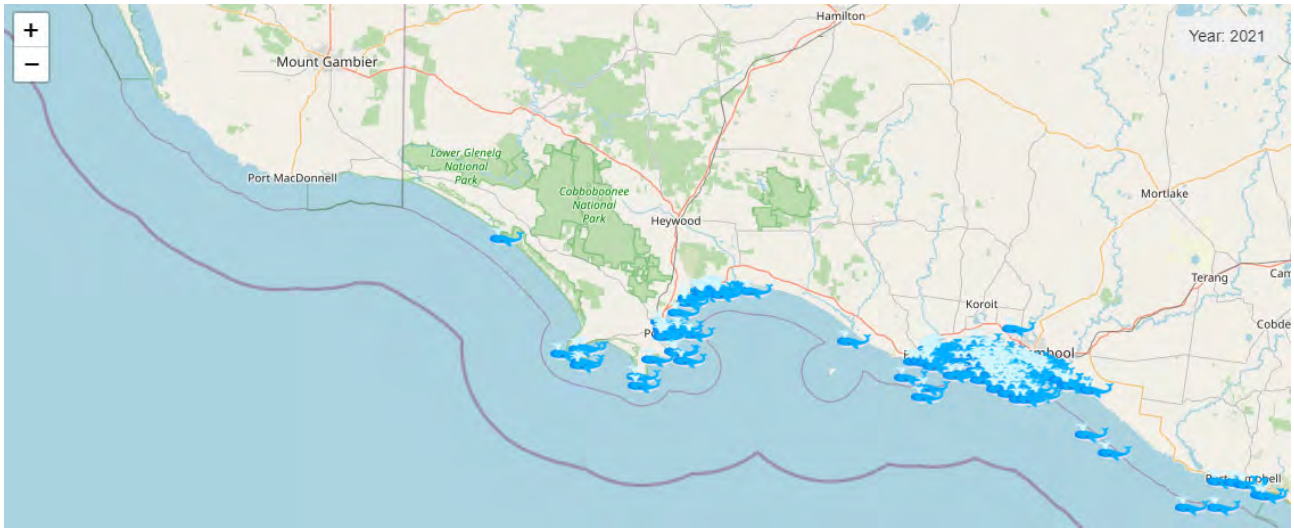

Figure 5.21 2021 southern right whale sightings (SWIFFT, 2021)

Pygmy Blue Whales

Pygmy blue whales (*Balaenoptera musculus brevicauda*), a sub species of the blue whale are regularly present in the Bonney Coast Upwelling between December and April/May, and their presence has been linked to surface swarms of coastal krill (i.e. (*Nyctiphanes australis*) that form in response to the upwelling of nutrient rich, cool water (CSIRO, 2004). The area is recognised as one of only 12 locations in the world where this species is regularly observed in high numbers (Refer to Figure 5.22). Photo-identification of pygmy blue whales at the Bonney Coast upwelling region have shown movements from this area to the Perth Canyon feeding area toward the sub-tropical convergence zone around Western Australia. This oceanic zone separates the subantarctic waters of the West Wind drift from the subtropical waters of the north (refer to **Figure 5.23**).

Tag-based tracking of pygmy blue whales at the Bonney Coast upwelling region in the vicinity of the Study Area over 2015 and 2016 is presented in **Figure 5.24**, confirming the relatively high use in the Study Area compared to surrounding waters.

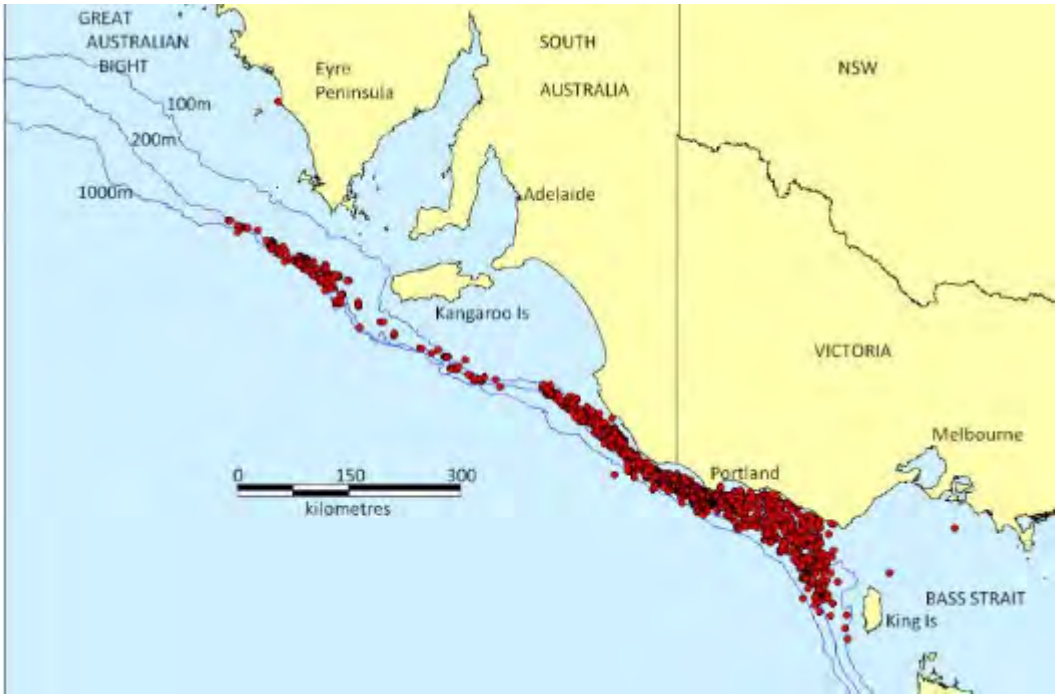

Figure 5.22 Blue Whale sightings between 1988 and 2016 (Blue Whale Study, 2016)

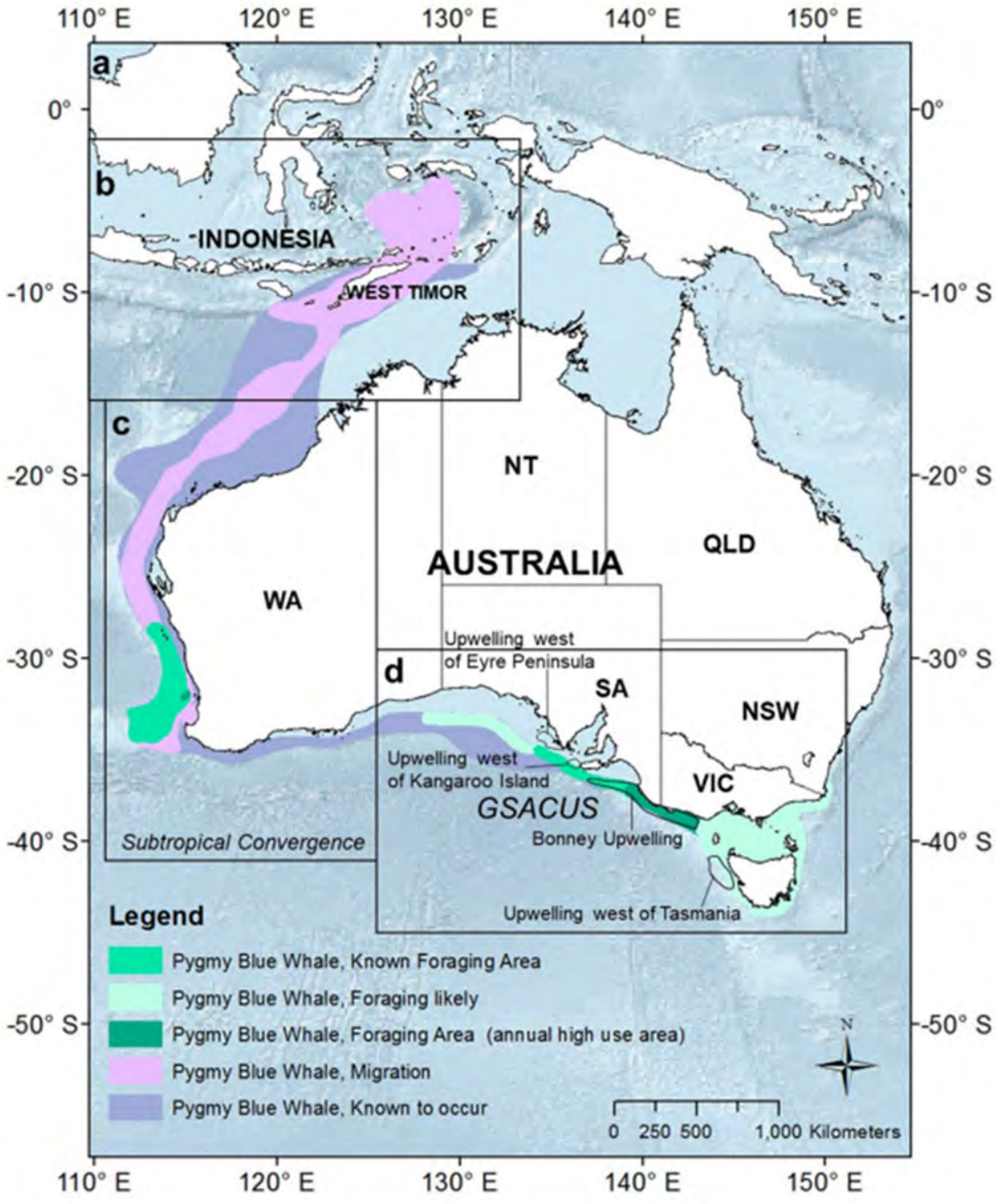

Figure 5.23 Pygmy blue whale BIAs (Möller et al. 2020)

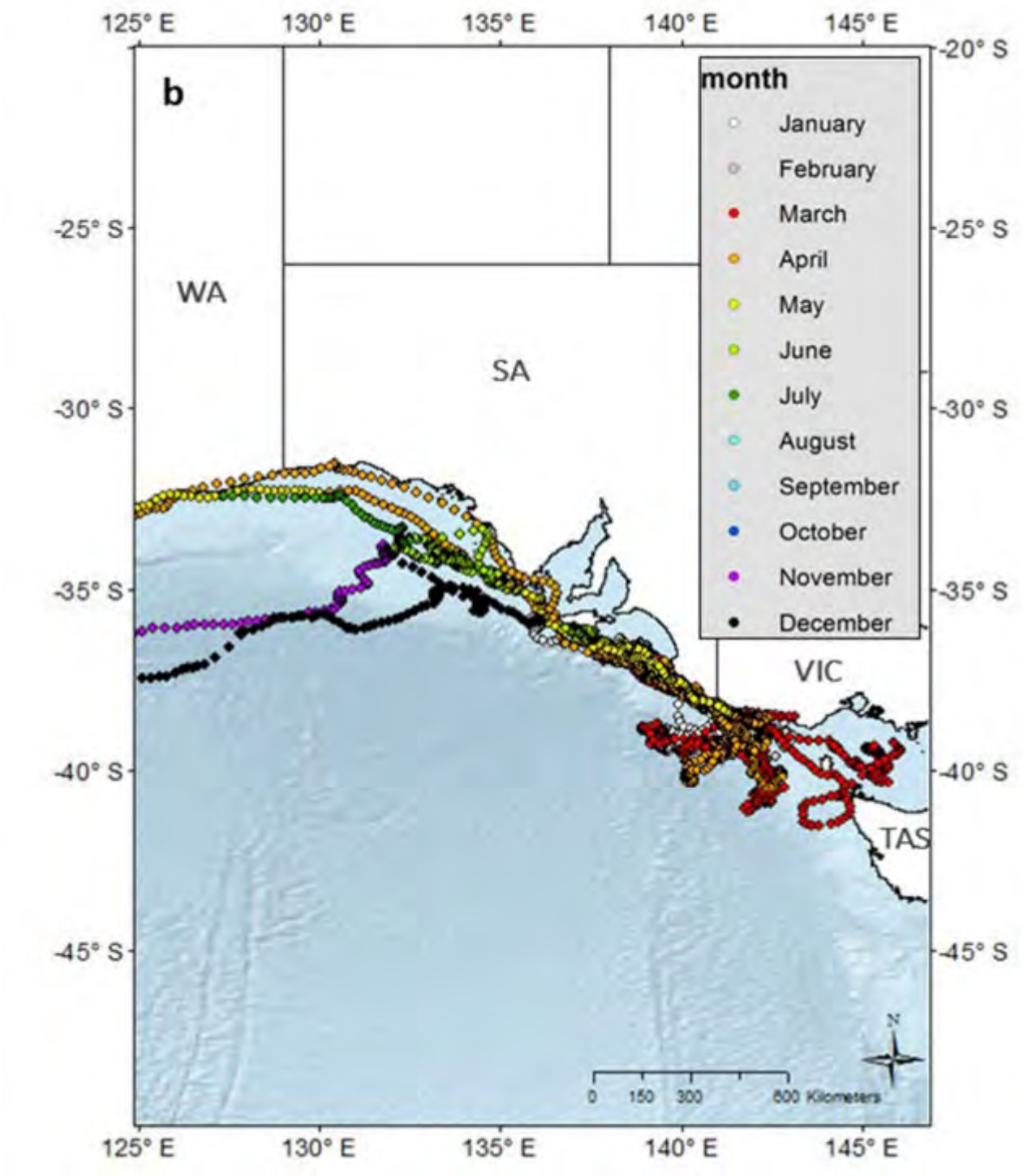

Figure 5.24 Modelled derived locations of 13 pygmy blue whales satellite tagged between 21 January 2015 and 20 March 2016 (Möller et al. 2020)

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).

Noise interference (loud noises or long exposure) is cited in the Blue Whale Conservation Plan (Australian Government, 2015) 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*'.

Other threatened whale species may occur occasionally in the Study Area (i.e. fin 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.

Turtles

Sightings of threatened turtle species along the shoreline are uncommon, although they would be using the nutrient rich waters surrounding the Study Area for feeding purposes on occasion. There are no known nesting sites in proximity to the Study Area however, with turtles nesting much further northwards (Commonwealth of Australia, 2017) The Study Area is not likely to be considered key habitat for turtles.

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 (for foraging purposes only), as illustrated in **Figure 5.25**.

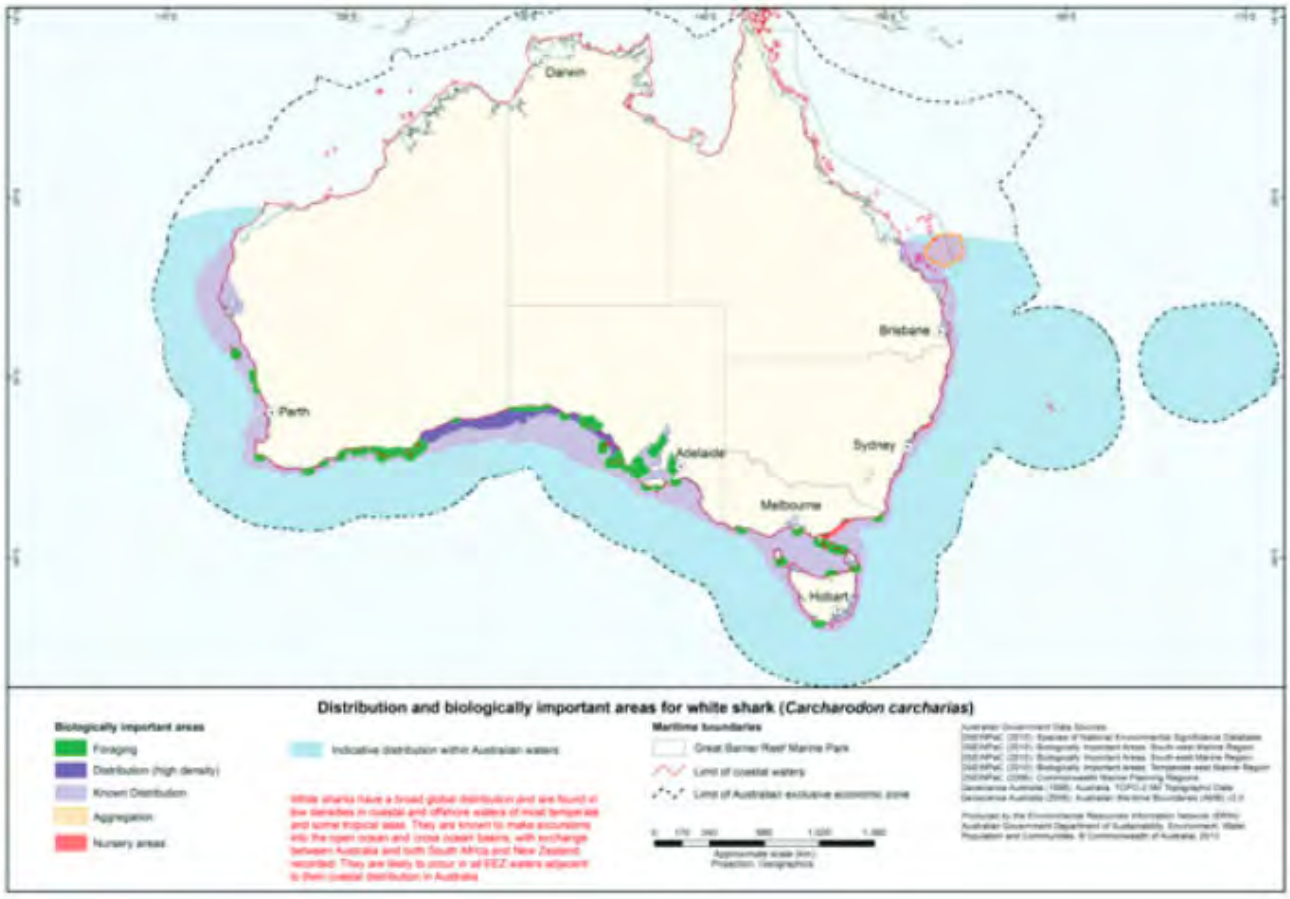

Figure 5.25 Distribution and BIAs for the white shark (Australian Government, 2013).

The Australian grayling (*Prototroctes maraena*), eastern dwarf galaxias (*Galaxiella pusilla)* and yarra pygmy perch (*Nannoperca obscura*) are threatened freshwater fish that is known to inhabit rivers and creeks in the Discovery Bay region, but it does have a marine phase for a period of time (SWIFFT, 2022), where larvae move to the sea. Little is known about the specific habitats the species occupies during its marine phase however, as very few specimens have been collected (NSW DPI, 2015).

A number of other fish and Syngnathidae species were recorded in the EPBC Protected Matters Search (and shown in **Table 5.1**) although none of them are listed as threatened or migratory species. These include pipefishes, seahorses and starfish, however these are normally associated with vegetation in sheltered or exposed reef area at a range of 0 to 50m, but most commonly at depths of between 5 and 25m. Given the lack of potential habitat near turbines, these species are not likely to occur in proximity to the wind farm, but may occur closer to shore.

Pinnipeds

There is a known colony of Australian sea lions *(Neophoca cinerea*) and long-nose fur seal (*Arcrocephalus forsteri)* at Cape Bridgewater, to the east of the Study Area, as shown in **Figure 5.26**. It is likely that individual animals forage within the Study Area and may be sensitive to physical disturbance and underwater noise or vibration.

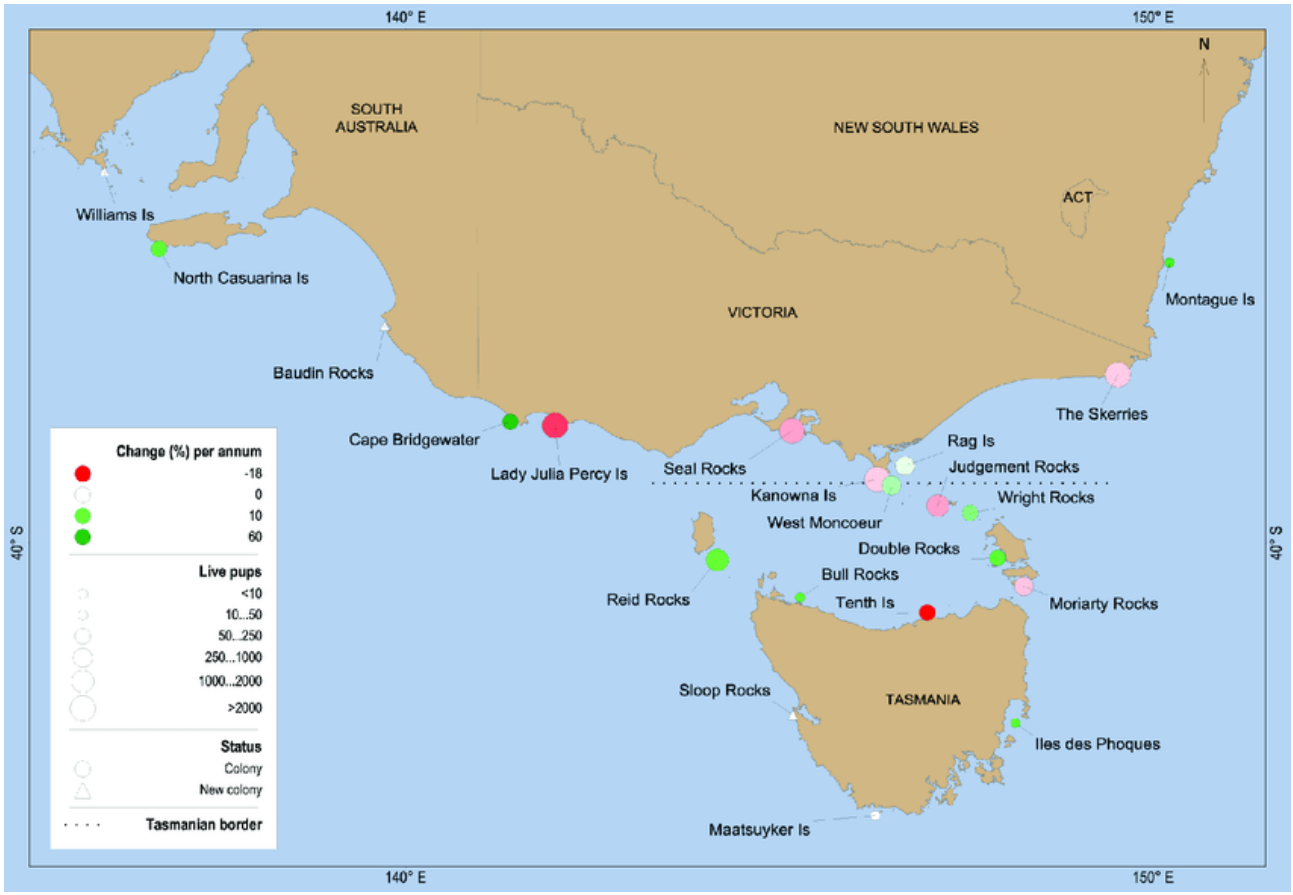

Figure 5.26 Map of Victorian Australian sea lion colonies (McIntosh et al, 2018)

The Australian fur seal (*Arctocephalus pusillus doriferus*) is also known to occur in the Study Area, although breeding is restricted to a small number of rocky islands or headlands mostly in Bass Strait. Kirkwood et al, 2010) identifies Cape Bridgewater as a haul out area for the species, as shown in **Figure 5.27**.

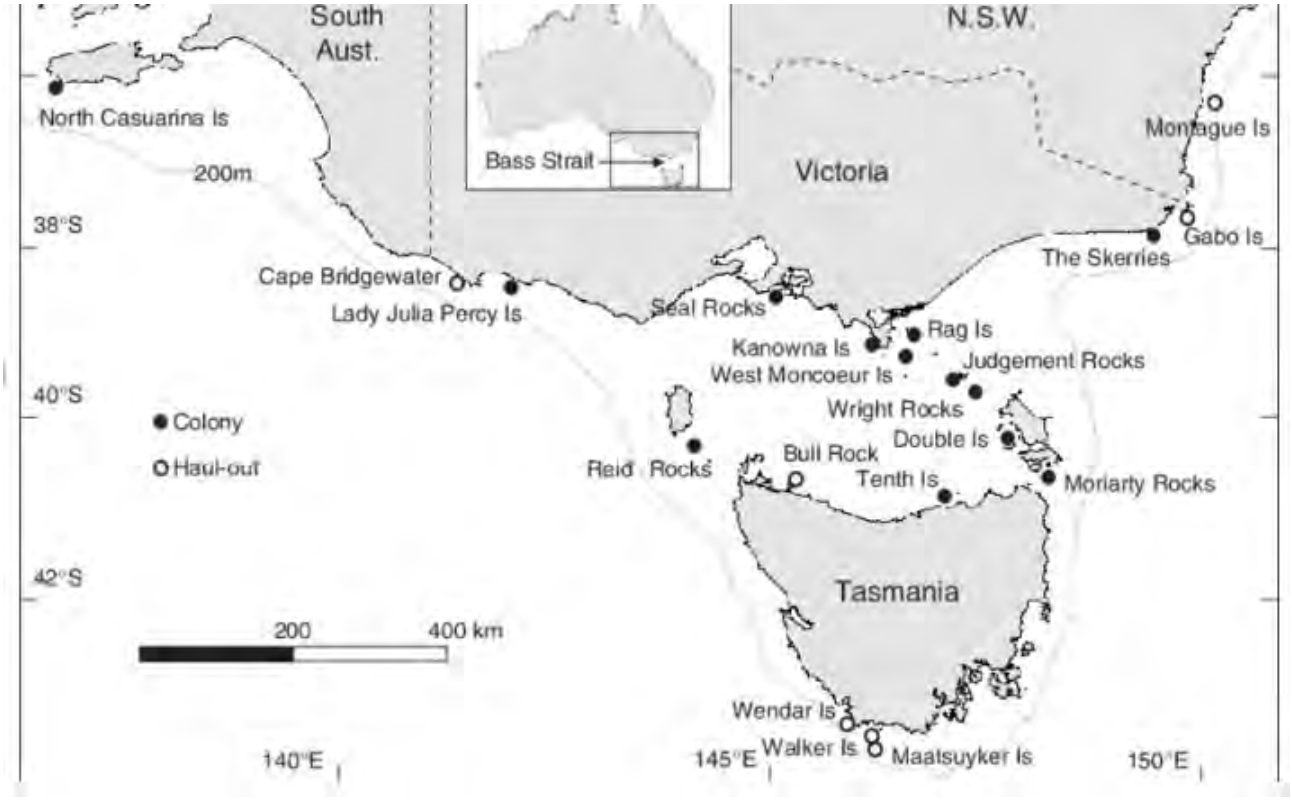

Figure 5.27 Australian fur seal breeding and haul out areas (Kirkwood et al, 2010)

Bats

The Southern bent-wing bat (*Miniopterus orianae bassanii*) is a critically endangered species that inhabits southern Victoria. There are three known 'nursery' caves' where breeding occurs, including one in close proximity to works within sea cliffs at Portland.

There is a National Recovery Team in place, who are currently undertaking research into the spatial extent of the species, their movements, threats to their survival and conservation measures. The Recovery Plan (National Recovery Team, 2021) does list wind farms as being a potential threat to survival of the species; the team is currently researching the flight height of the species and whether turbines pose a significant strike threat.

Current research (Van harten, 2020) has identified that individuals can fly up to 70km in a night either to travel to another cave or to forage. Examinations of individuals has identified that their food resources largely consist of moths that are heavily associated with agricultural areas or other terrestrial habitats. For this reason, it is assumed that individuals are unlikely to travel over water and in the direction of offshore wind turbines. Further consultation will be required with the Recovery Team to confirm this assumption.

Migratory Species

Table 5.1 lists species that are considered Migratory under the EPBC Act. There are an additional 12 migratory bird species, four whale species (humpback, killer, pygmy right and sperm whales), the dusky dolphin and two fish species that are listed as Migratory but are not considered threatened. These are described briefly below, based on species information in the SPRAT database (Commonwealth of Australia, 2022).

- Humpback whale (*Megaptera novaeangliae*) – the Study Area is not considered core habitat for this species; it is not an identified breeding, feeding or resting area. Whilst the species may occasionally visit the Study Area, visitation is infrequent
- Killer whale (*orcinus orca*) – killer whales are observed in all states of Australia, but more frequently south of 60^{o}; there are no known key localities for the species in continental Australian waters. If found, they are most likely along the continental slope, in deeper waters
- Pygmy right whale (*caperea marginta*) – these whales are uncommon in Australian waters, but can be seen in upwellings, such as the Bonney Upwelling
- Sperm whale (*Physeter macrocephalus*) – these whales are found in all Australian waters, but mostly in deeper waters around subantartic islands. Sightings of the species close to land are rare.
- Dusky dolphin (*Lagenorhynchus obscurus*) – this species occurs across southern Australia, however sightings are rare. If observed, they tend to be in large pods, in waters less than 20 m in depth.
- Mako shark (*Isurus oxyrinchus*) – Mako sharks are prized recreational fish, however their movements along the Victorian coastline are not well known.
- Porbeagle (*Lamna nasus*)– inhabits oceanic waters around the edge of the continental shelf, moving occasionally into coastal waters.

5.5 State Matters

Within the marine environment, state matters would relate to laying of the main transmission cable that links the turbines to the grid only. Therefore, the description of state matters is confined to the cabling alignment and potential matters related to its construction and operation. As per **Section 3**, the cabling will most likely be installed at depth by plough or a trencher, which causes minimum disturbance to the seabed and minimises impacts to water quality. Particularly around Cape Bridgewater, the substrate is rocky, therefore some cable protection is more likely close to shore.

Coastal Processes

The *Marine and Coastal Act 2018* (MaCA) 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 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.

5.6 Other

Visual amenity

At present, there are no visible structures on the horizon when looking out to sea from the coastline. Because of the relative low urban development within the region, the night sky also remains uninterrupted.

The wind turbines will potentially be visible from the coastline during daylight hours and also to recreational boat users within the region. Generally, the towers do blend into the distant horizon, however they will also be visible at night due to navigational lighting requirements. Night lighting can be disturbing for marine fauna and also migrating birds; this is further discussed in **Section 6.12**.

Recreational Use

There are a few locations along the Discovery Bay Coastal Park that are accessible by 4WD and are popular for hiking trails (e.g. Great South West walking track) and recreational camping. These areas include Lake Monibeong, White Beach, Cape Bridgewater. Cape Bridgewater is a popular destination for whale watching, visiting seal colonies and general bushwalking activity. Surfing and diving are also popular activities around the headland. There are two recreational boat ramps, one at Portland and one at Nelson which support several whale watching and fishing charters. The naturalness and wildlife of the area are a unique drawcard for many visitors to the region.

Indigenous Cultural 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 are a 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 traditional owners will assist in identifying any specific values relevant to the Study Area, and how these may be protected. In particular, they are likely to have an interest in the disturbance of the sea bed and any potential cultural heritage items it may contain.

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 numerous shipwrecks around Cape Bridgewater, as shown in **Figure 5.8**.

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. This will particularly be a concern for any cabling activity around Cape Bridgewater.

Navigational Hazards

The 2021 vessel tracking information for the region (Refer to **Figure 5.28**) shows the main shipping channel from the Port of Melbourne to the Adelaide Port (also known as Port Adelaide) within proximity to the Study Area with between 35, 000 to 200,000 vessel movements per year (Marine Traffic, 2022). Further consultation with the major shipping ports and Harbor Masters will be required to understand if the offshore wind turbines represent a navigational hazard for larger container vessels.

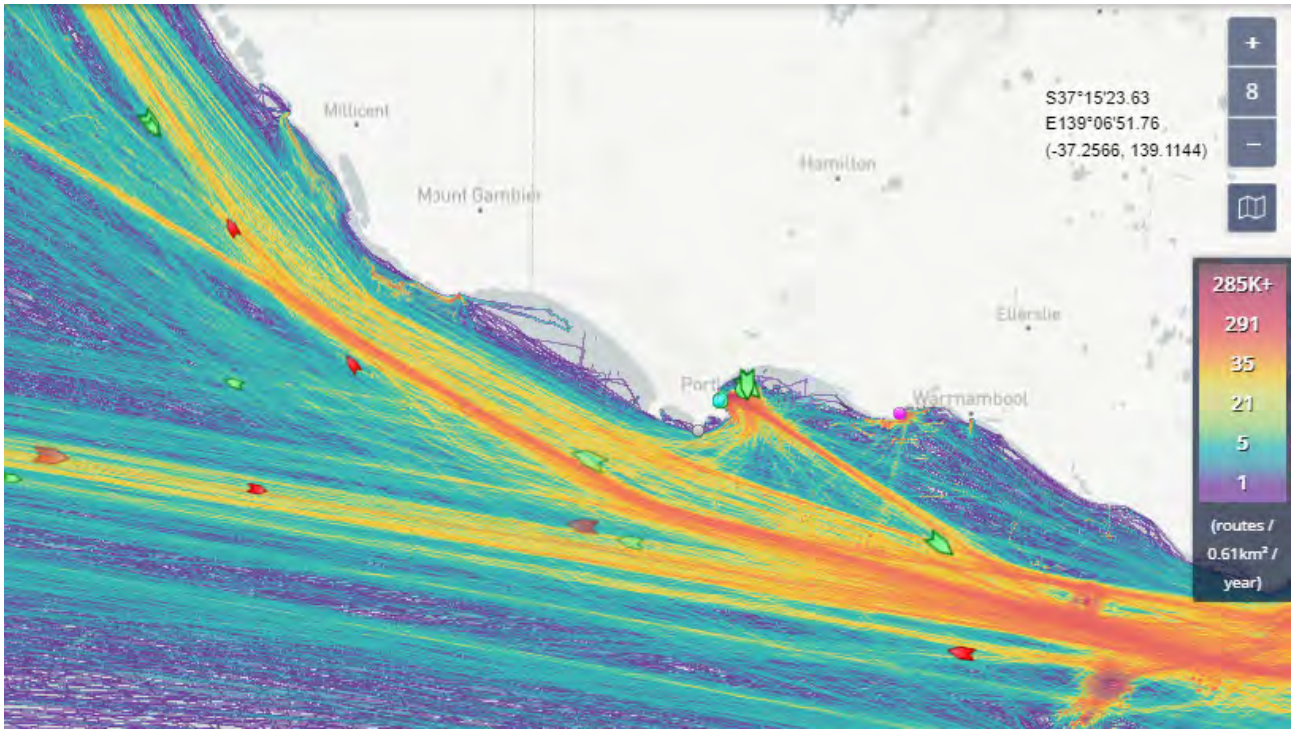

Figure 5.28 Vessel tracking data for 2022 (Marine Traffic, 2022)

5.7 Summary of Baseline Issues

Table 5.2 Summary of values for the Study Area

Attribute	Relevance	Victoria
Marine Park	State	The Study Area encompasses the Discovery Bay Marine Park (Victoria) and Lower South East Marine Park (South Australia). There are no commonwealth marine parks near the Study Area.
Ramsar Wetland	MNES	The Study Area is within the vicinity of the Glenelg Estuary and Discovery Bay and Piccaninni Ponds Karst Ramsar Wetlands
Other Protected Areas	State	There are a number of small Coastal Parks along the foreshore within proximity of the Study Area
Commonwealth Waters	MNES	Commonwealth waters outside site but in Study Area. Bonney Coast Upwelling listed as a Key Ecological Feature of Commonwealth Marine area.
Key Ecological Features	MNES	The Bonney Coast Upwelling occurs within the Study Area and is key attractant for a number of marine fauna, particularly whale and seabird species.
Habitat Types	MNES and State	Nearshore sections of the site and sections of study comprised of low profile reef, seagrass meadows and subtidal sands, with sands more likely further offshore.
Threatened Ecological Communities	MNES	Endangered Giant Kelp Marine Forests of South East Australia may occur in nearshore areas of the Study Area, but unlikely to be impacted by turbines. Its possible cabling might impact kelp forests however, particularly around Cape Bridgewater.
Threatened and Migratory Species	MNES, State	BIA: • Whales: foraging habitat and high use area for pygmy blue whale (*Balaenoptera musculus brevicauda*), aggregation, migration and resting areas for southern right whale (*Eubalaena australis*) • Seabirds (foraging only): antipodean albatross *(Diomedia exulans antipodensis*), wandering albatross (*Diomedea exulans*), wedge-tailed shearwater (*Ardenna pacifica*), common diving-petrel (*Pelecanoides urinatrix*), Buller's albatross (*Thalassarche bulleri*), Indian yellow-nosed albatross (*Thalassarche chlorohynchos bassi*), black-browed albatross (*Thalassarche melanophris*) and Campbell albatross (*Thalassarche melanophris impavida*).

Attribute	Relevance	Victoria
		• Sharks: foraging area for the white shark (*Carcharodon carcharias*) 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, as detailed in **Table 5.1**).
Coastal and Marine Amenity and recreational values	State	The Study Area supports a number of coastal values, including biodiversity, coastal processes, public benefits and coastal landscapes. Its 'naturalness' is a value in itself, with limited development along this section of coastline. It is unlikely that offshore recreational use is high due to the lack of reef, rock, kelp or seagrass habitat that would attract fishers or divers.
Navigational Hazards	Nil	The Study Area is in close proximity to the main container vessel navigational channel between Melbourne and Adelaide.
Important Fisheries Habitat or Function	State & Commonwealth	There are a number of fisheries within the Study Area – it is known as an important nursery area for abalone and rock lobsters in particular.
Indigenous& non-indigenous Cultural Heritage	State & Commonwealth	The Study Area has a long history of use by first nations people with strong links to sea country; further consultation on cultural values of the Study Area will be required. There are several identified shipwrecks within the Study Area.

6 Potential Impacts

A general description of potential impacts, risks and mitigation measures is provided below. Section 7 provides a more detailed risk assessment against Commonwealth and State significance criteria.

6.1 Sensitive Habitat Loss – Construction/Operation

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 does potentially support kelp forests, seagrass and rocky reefs, particularly in nearshore environments, but potentially in deeper water also. Activities that may directly impact habitat disturbance are piling activity, installation of inter-turbine cabling and laying of the main transmission cable. Because of the potential to encounter rock, some cabling may be laid along the seabed and require protection; this may create permanent habitat loss in some locations, although the extent is unknown at this time. Further detailed benthic habitat mapping is required to fully understand the potential for habitat loss.

Burying cabling will likely assist in habitat recovery.

6.2 Pile Driving – Construction/Decommissioning

Pile driving (and to a lesser extent trenching) generates intense pulses of noise and vibration 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.). Marine mammals use sound for foraging, orientation and communication and are therefore susceptible to man-made noise. Currently the Study Area, whilst experiencing some container vessel traffic would still be considered a low-noise environment in comparison to higher volume shipping areas.

The Study Area supports potential foraging habitat for a range of threatened/migratory marine species, including cetaceans (whales/dolphin species), pinnipeds, sharks and marine turtles; in particular, the site is a BIA for the blue whale (present in summer months), southern right whale (present in winter months) and white shark, with the area mapped as a high use foraging area for the blue whale in particular. Pile driving is considered an intense noise source, that is likely to disrupt marine mammal behaviour (Madsen et al, 2006), at distances of some kilometres.

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, piling methodology, medium into which piling occurs, duration/timing of works, application of mitigation strategies). 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).

Mitigation measures to reduce impacts include ‘soft’ starts, seasonal construction windows (vary depending on species), safety zones/lookout, pingers etc. (e.g. SA DPTI 2012).

6.3 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 and potentially avoidance of the area immediately surrounding a turbine. 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). Most offshore wind farms

within whale migration or feeding pathways are relatively new, and there are no long- term studies that confirm whether they are likely to avoid areas with operating turbines. It can be dependent on a range of cumulative impacts from increased shipping, fishing, oil and gas projects etc.

In 2020, the US National Marine Fisheries Service reviewed the potential impacts of the 800 MW Vineyard Wind Offshore Wind Project (with maximum turbine size of 14MW) on the Northern right whale (National Marine Fisheries Service, 2020). The extensive study did conclude that operational noise would be similar to ambient levels a ‘short’ distance from each turbine.

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 each fauna species (Vella et al., 2001; Madsen et al., 2006). Further work will be required to characterise background and project generated noise, and potential impacts to fauna from operational noise or vibration.

6.4 Turbidity – Construction/Decommissioning

Numerical modelling will be required to assess turbidity generated by construction and decommissioning activities. Pile driving or dredging to install cabling is expected to generate short-term and localised sediment plumes, depending on the amount of fine material present. The substrate within the Project Area varies but does contain some mud and silt material. It is likely that the plumes would dissipate rapidly in the high energy environment and would be unlikely to impact on adjacent light sensitive habitats or impede fauna vision for any length of time.

6.5 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.

6.6 6 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. It is known that a number of whale species utilise the Study Area for either foraging, nursing or migration activity. 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 speed vessels. Further details will be required to determine vessel traffic intensities, but it would be higher during the construction and decommissioning stages than operations.

Potential mitigation measures include for example, seasonal windows to avoid peak periods for whales, go slow procedures, the use of trained spotters etc.

6.7 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.).

6.8 Spills – Construction/Operation/Decommissioning

Vessels, turbines and substation facilities will 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.

6.9 Bird Strike and Avoidance of Rotors – Operation

The Study Area provides known feeding areas for seabirds. The Study Area is also potentially traversed by migratory bird species utilising nearby Ramsar wetlands. 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 (i.e. at 2.5 km to 6 km above ground), Birds ascend relatively quickly (reach maximum flight height within 2-3 km of take off/landing (Brett Lane & Associates, 2017) 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). Given the distance of the Study Area from shore it is considered unlikely that migratory shorebirds would be at risk from death or injury from turbine strike.

- 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. Smaller species such as prions and storm-petrels may also be at risk. If feeding offshore, they would potentially be within the range for death or damage for turbine strike.

- 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 within close proximity to the Study Area. 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.

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, bird ‘alarms’, use of different coloured blades, location relative to any important areas etc.).

6.10 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 laid on the seafloor or buried (and burial depth).

6.11 Hydrodynamic and Oceanographic 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). Numerical modelling will be required to assess hydrodynamic impacts to seafloor habitats and coastal geomorphological processes.

The downward wind pressure from turbine blades can also potentially impact on the surface mixed layer of the ocean, altering vertical mixing (which can influence primary productivity i.e. chlorophyl) or local wave patterns. This in turn can subtly alter food chain dynamics in close proximity to turbines (Uoret etc al, 2022 and Farr et al, 2021).

6.12 Light Pollution

Vision is a critical cue for wildlife, including seabird 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.

6.13 Artificial Reef Creation and Fishing Exclusion – Operation

The turbine bases 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 wind farm would lead to localised increase in fish biomass in the Study Area. The increased fish biomass could attract predators to the area (pinnipeds, sharks, dolphins). 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.) and the food web which could be disadvantageous to larger predator fauna.

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 500 m per pylon. During operations, there is likely to be a small exclusion area around the base of each wind tower (approximately 50 m per pylon), otherwise public access will be maintained. This should allow recreational, commercial fishing and cultural access to the Study Area to largely remain open after construction.

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. There are a number of known shipwrecks or other items of marine cultural heritage significance known within the Study Area. Any such items should be picked up during initial benthic habitat and bathymetry mapping using sonar equipment.

6.16 Navigational Hazards

Provided turbines are appropriately marked and lit, they should not create a navigational hazard, although some further discussion with shipping companies and ports will be required given the proximity of the site to the shipping channel between Melbourne and Adelaide. If cabling is not buried, this could create an entanglement risk for recreational or fishing vessels.

7 Preliminary MNES Impact Significance Assessment

Under the EPBC Act, a significant 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 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, but are unlikely to be flying at a similar height to turbines. 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.	Potentially 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.	Potentially Significant
Seabirds	The Study Area is mapped as an area of Biological Importance for a number of species, who forage within the area, particularly during upwelling events. These species are known to forage within the Study Area and adjacent marine environments. 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 a population. Further research into the occupancy area of the species, and the risk of bird strike is required.	Potentially significant
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. 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. Wind turbines have the potential to modify, destroy, remove or isolate the availability of habitat as a result of bird strike.	Potentially significant

Species	Potential Impacts	Potential Significance of Impact
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, however they are mostly found in more northernly waters and do not nest in southern Australia. The Study Area is not mapped as BIA for turtle species.	Not Significant
Australian Sea Lion *(Arctocephalus tropicalis)*	Cape Bridgewater is a known nursery area for this species and they are likely to forage within the Study Area. Potential impacts include underwater noise and loss of habitat.	Potentially 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)). Any works that occur near the nursery cave (i.e. cabling) may be considered disruptive potentially.	Potentially Significant

7.2 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 7.2** 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, Indian yellow-nosed Albatross, Fairy prion, campbell albatross, sooty 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, their use of the area is not well studied. It is noted that these species are attracted to the Bonney Upwelling, potentially attracting a higher number of seabirds. Potential impacts to seabirds are bird strike and artificial light.	Potentially Significant
Shorebird species (bar-tailed godwit, Australian fairy tern, eastern hooded plover, greater sand 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 largely)

Species	Potential Impacts	Potential Significance of Impact
Whale species (sie, fin)	Whilst these species occasionally utilise the Study Area, it is not identified as a BIA or an area supporting an important population. The Bonney Coast Upwelling may attract a higher number of individuals however. Potential impacts to whales include underwater noise or artificial light.	Potentially 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 important population of the species.	Not Significant
Sharks (white shark)	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
Fish (Australian grayling, eastern dwarf galaxias, Yarra Pgymy Perch)	Whilst these species do have a marine phase, it is unlikely they travel a distance out to sea that stretches as far as turbines.	Not Significant

7.3 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 7.3 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

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; It is expected that shorebirds would fly above turbine height, however further research is required. Potential impacts to shorebirds include bird strike or artificial light.	Potentially Significant
Whale and dolphin species	The Study Area is likely to be within the migratory pathway of Humpback Whales who may avoid the area. It is not a known aggregation or resting area however. Other whale and dolphin migratory species would be only transient visitors. Potential impacts include underwater noise and artificial light.	Potentially significant
Fish (porbeagle, shortfin mako)	The porbeagle and shortfin mako primarily inhabit oceanic waters, occasionally moving into coastal waters. The Study Area may support these species, but is unlikely to represent an ecologically significant proportion of the population of these species.	Not significant

7.4 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 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.

There is the potential for indirect impacts to marine 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, and localised. Because of the importance of the Bonney Coast Upwelling to a number of threatened species however there is potential for a significant impact on commonwealth marine areas, although the extent of impact is difficult to assess at present without further investigation.

8 Next Steps

Following acceptance of the referral by the Commonwealth and the Victorian Government, the proponent will commence further detailed investigations, to inform an Environmental Effects Statement or EIS. This review will be undertaken in accordance with a scoping document or other requirements provided by the Victorian Environmental Protection Authority and Commonwealth Government.

These marine field 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, sharks and marine mammals.
- Seabird, migratory parrot and shorebird surveys – the study is a BIA for a number of seabird species and a possible migratory pathway for migrating parrots and shorebirds.
- Benthic habitat assessment – to characterise benthic habitats (e.g. hard substrates/reef areas) 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.

In addition to field work, other additional studies that will be required as a minimum include:

- Underwater noise modelling to determine the area of impact from piling activity or turbine operations
- Metocean modelling to inform the design process
- Bird strike modelling to understand flight heights of species and the likelihood of turbine interaction
- Water quality modelling to determine the zones of impact for turbid plumes

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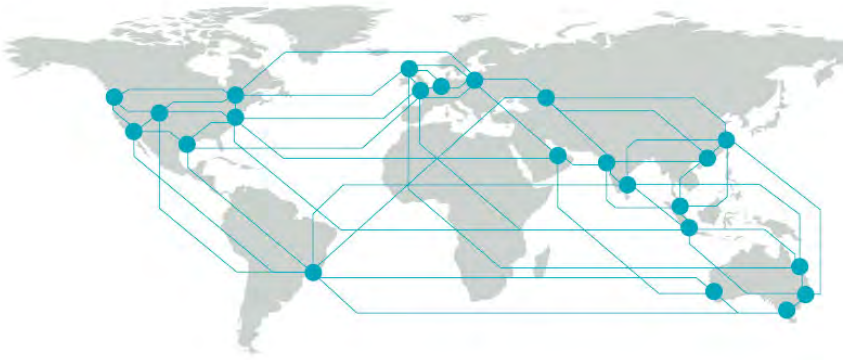

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