Tetra Tech Coffey Pty Ltd

Marinus Link

Preliminary Marine Ecology and Resource Use Desktop Assessment Study

TR 178/1
31 August 2021

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V0.5	Revised draft report to reflect changed project description	25/05/2021	David Balloch	Kim Heberling Travis Wood Erin Pears	Erin Pears
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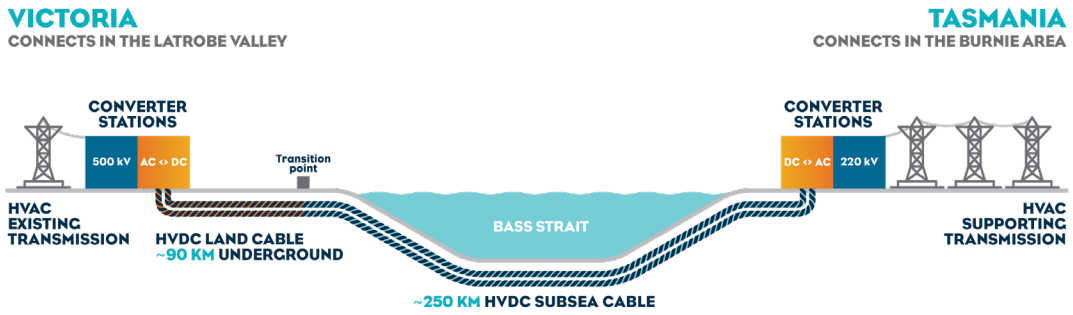
1. Introduction

This section will provides an overview of the project background and objectives.

1.1. Background

Marinus Link Pty Ltd (MLPL) is a proposing to build a high voltage direct current (HVDC) interconnector between Tasmania and Victoria that will be installed across Bass Strait. The HVDC interconnector will link the high voltage alternating current (HVAC) Tasmanian and Victorian electricity grids enabling energy transfer between the regions in the National Electricity Market (NEM). The major components of the interconnector are shown schematically in Figure 1 and a more detailed description of the interconnector is described in Section 2.



Source: Coffey (2018a)

Figure 1: Major components of the proposed Marinus Link

Figure 2 shows the proposed interconnector route across Bass Strait from Heybridge in Tasmania to Waratah Bay in Victoria.

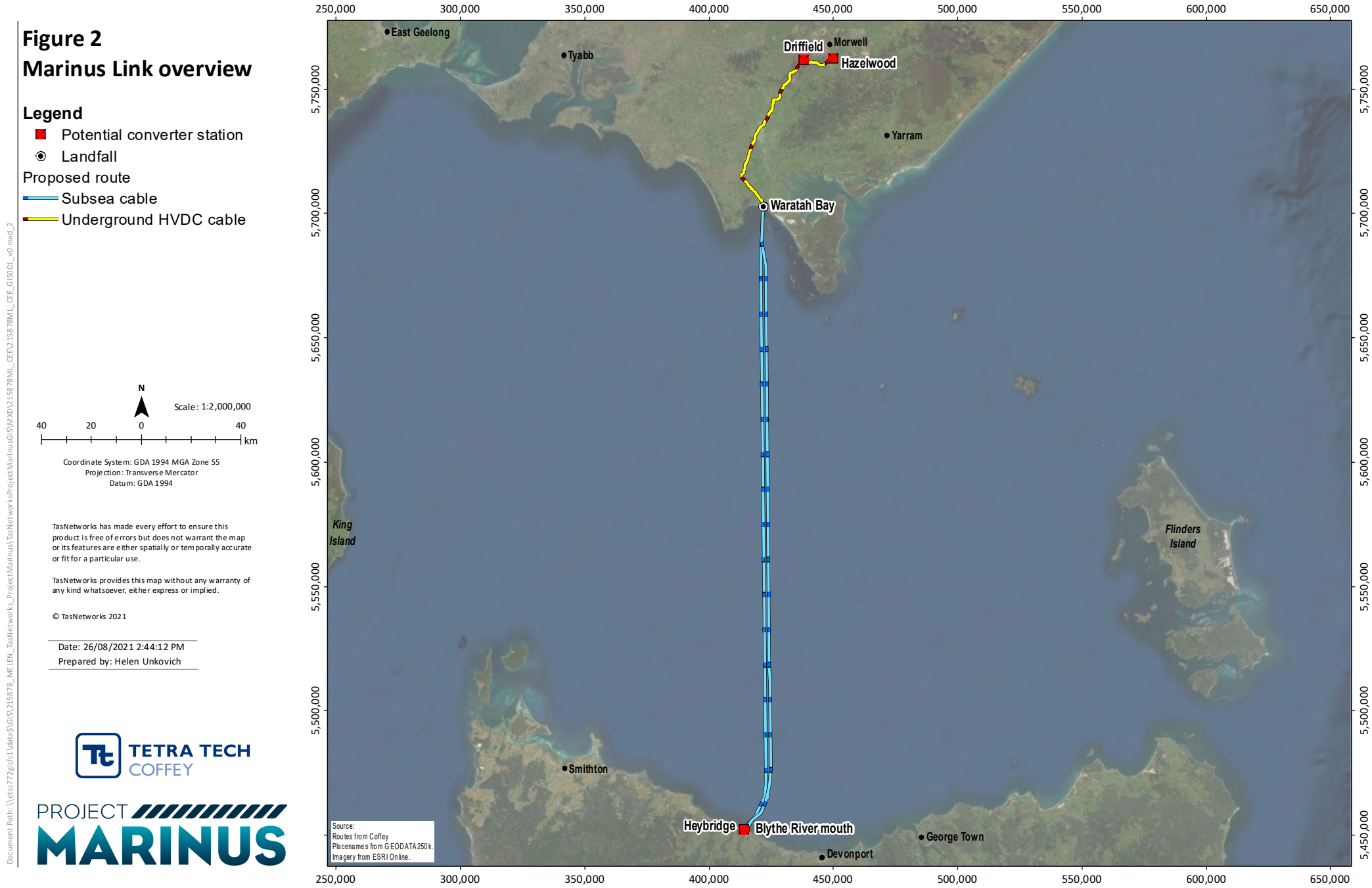
Tetra Tech Coffey Pty Ltd ('Tetra Tech Coffey') engaged EnviroGulf Consulting ('EGC') to undertake a desktop assessment of the environmental and resource use issues and potential effects of the marine component (i.e., Bass Strait) of the proposal. This report presents the preliminary findings of the desktop assessment study.

1.1.1. Objectives

The objectives of this marine ecology and resource use desktop assessment study are to:

- Identify marine environmental sensitivities that may be impacted by construction of the subsea cable.
- Identify constraints and requirements for potential realignments for the subsea cable route.
- Propose high-level management measures for identified impacts.
- Identify additional studies that should be implemented to address information gaps.
- Provide information that will inform further impact assessment and referrals under Tasmanian, Victorian and Commonwealth legislation.

Figure 2
Marinus Link overview



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PROJECT MARINUS

This report describes the marine component of the interconnector route within Bass Strait and has been prepared to provide an overview of key potential marine ecology and resource use issues, in particular:

- Description of HVDC interconnector proposed by MLPL.
- The existing marine environment of Bass Strait.
- Potential issues requiring management.
- Potential impacts on marine habitats, flora, and fauna.
- Potential impacts on marine resource use, including commercial and recreational fisheries.

The report presents an overview of the interconnector technology and configuration, the preferred route across Bass Strait, key environmental and marine resource use issues and impacts, and general mitigation and management measures to reduce potential impacts.

1.1.2. Exclusions

This report does not include the following aspects, which are being performed by other subconsultants to Tetra Tech Coffey under separate scopes of work:

- Sensitivity issues relating to the Tasmanian and Victorian nearshore seabed habitats, which are being undertaken by CEE Pty Ltd.
- Sensitivity issues relating to maritime archaeology, which are being undertaken by Cosmos Archaeology Pty Ltd.
- Onshore terrestrial ecology and resource use issues and potential effects of the installation and operation of the underground sections of the interconnector, which are being undertaken by Tetra Tech Coffey and its terrestrial subconsultants.

2. Project description

This section provides a brief project description,

2.1. Need for the project

Tasmania is a participant in the National Electricity Market (NEM). Energy trading between Tasmania and other mainland states and territories in the NEM is made possible by Basslink, a 600 megawatt (MW) high voltage direct current (HVDC) interconnector between George Town in Tasmania and Loy Yang in Victoria. Available capacity on the interconnector is highly utilised to export renewable generation and import low cost baseload power.

Tasmania has significant renewable energy resource potential, particularly hydroelectric power and wind energy. The potential size of the resource exceeds both the Tasmanian demand and the capacity of Basslink. The growth in renewable generation in mainland states and territories participating in the NEM, coupled with the retiring of baseload coal-fired generators, is reducing the availability of dispatchable generation. Tasmania's existing and potential renewable resources are a valuable source of dispatchable generation that could benefit electricity supply in the NEM. Marinus Link will allow for the continued trading, transmission and distribution of electricity within the NEM.

2.2. Marinus Link HVDC Interconnector

MLPL is proposing to construct a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to be known as Marinus Link. It will stretch from Tasmania, across the Bass Strait to Victoria, up to and including the converter station(s) in each of the states as shown in Figure 2.

In Tasmania, a converter station will be located at Heybridge near Burnie at a 10-ha site on the corner of Bass Highway and Minna Road. The converter station will facilitate the connection of Marinus Link to the Tasmanian transmission network at 220 kilovolt (kV) alternating current. Converter stations comprise transformers, switchgear, closed stormwater runoff systems with oil inceptors, a control room and a large building containing the HVAC/HVDC converter technology.

There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across the Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is horizontal directional drilling (HDD) to about 1 km offshore where the cables would then be trenched, where geotechnical conditions permit. If geotechnical conditions are not favourable, open trenching or a hybrid method comprising short HDD and trenching will be used to construct the crossings.

Approximately 250 kilometres (km) of subsea HVDC cable is required to cross Bass Strait. The preferred technology for Marinus Link is two 750 megawatt (MW) symmetrical monopoles using ±320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole will comprise two identical size power cables and a fibre-optic communications cable in a bundled configuration. The bundled cables will be laid at a distance of up to approximately 2 km apart.

In Victoria, a single shore crossing will be located at Waratah Bay with underground cable for approximately 90 km to the converter station site near the Hazelwood area in the Latrobe Valley. The route crosses the Waratah Bay–Shallow Inlet Coastal Reserve. From the land-sea joint the land cable will run northwest to the Tarwin River valley which it follows north to the Strzelecki Ranges. The route crosses the ranges between Dumbalk and Mirboo North before descending to the Latrobe Valley where it turns northeast to Hazelwood. There are two potential converter stations sites, one in the Driffield area adjacent to existing forestry plantations, and one adjacent to the Hazelwood Terminal Station.

Land cables will be laid 0.5 m apart in trenches with a nominal width of 2 m and minimum depth of 1.5 m. Where the symmetrical monopoles are to be accommodated in separate trenches, the trenches will be at least 1 m apart and up to 3.5 m apart depending on the easement configuration. The land cables will be directly laid in the trenches or installed in conduits in the trenches. A linear strip up to 20 m wide will be disturbed in laying the land cables. Temporary access and temporary laydown areas will be required. Where possible existing roads and tracks will be used for access, for example, farm access tracks or plantation forestry tracks.

Land cables will be installed in ducts under sealed roads using horizontal boring and in ducts under major watercourses using HDD, where geotechnical conditions permit. A larger area (up to 1 ha either side of the feature) is required to construct road and watercourse crossings using HDD.

2.3. Preferred route across Bass Strait

A detailed analysis of route options has been completed (Coffey, 2018b, 2019). The most favourable route identified is from the Heybridge converter station in Tasmania, across Bass Strait to landfall in

northern Waratah Bay in Victoria, and thence underground to the Hazelwood converter station. Figure 2 shows the preferred route of the Marinus Link of which the Bass Strait section is the focus of the present desktop study.

3. Existing Marine Environment

This section provides a description of the existing marine environment.

3.1. Marine physical environment

3.1.1. Oceanography

Approximately 240 km wide and with an average depth of 60 metres, Bass Strait features a number of islands, deep ocean drop-offs at its margins and a meeting point of currents created by the merging of the Pacific Ocean and Southern Ocean. The region of Bass Strait is characterised as oceanic, with weak nearshore tidal currents, complex large-scale ocean currents, high wave climate and a wide range in water temperature (NSR, 2001).

Currents and Wave Climate

Bass Strait is influenced by three very different water masses: northern Bass Strait, south Tasman Sea and East Australia Current (Fandry et al., 1985; Gibbs et al., 1986). In winter, surface water from the Great Australian Bight moves eastwards through Bass Strait, transforming under the prevailing atmospheric conditions into the locally formed Bass Strait water, which reaches a temperature minimum near Flinders Island. A northward flow at the eastern shelf break of Bass Strait carries Bass Strait water and, from east of Tasmania, sub-Antarctic surface water towards the coast of Victoria. The low-salinity water in eastern Bass Strait and westwards along the north Tasmanian coast during November may indicate penetration of sub-Antarctic surface water (Gibbs et al., 1999). The strength of each of these water masses influences in Bass Strait is in turn influenced by seasonal and regional wind patterns. Overall, the effects of these water masses may influence Bass Strait water quality (e.g., temperature, nutrients and phytoplankton).

Bass Strait is a high-energy environment, and storms are frequent. In central Bass Strait, the wave climate is dominated by westerly and southwesterly swells propagating through the western entrance. The median significant wave height can range from 1 to 2 m in the northern and central parts of Bass Strait and to about 1 m in the southern part (NSR, 2001). Wave climate in shallow waters can induce near-seabed orbital velocities, which can initiate bed sediment transport and resuspension of fine-grained seabed sediments. Significant differences in sea state intensity can exist in Bass Strait during large storms with wind and waves from the southeast, with maximum significant wave heights during large storms reaching 9.7 m (Silbert et al, 1980).

Bathymetry

In general, the average depth of Bass Strait is around 60 m with a maximum depth of 155 m. Water depths within 10 km of the Tasmanian and Victorian nearshore interconnector landfalls were measured by CEE (2021).

In nearshore Tasmania, the seabed sloped at a slowly decreasing gradient from the coastline to the 40 m depth contour. Sharp changes in depth occurred at intervals from the coastline to 3 km offshore

that indicate the presence of high relief reef habitat. Beyond 32 m depth and 3.5 km offshore the profile is relatively smooth and flat, reaching 40 m depth at approximately 6.5 km offshore.

In the Victorian nearshore within Waratah Bay, the water depth at 560 m from shore was 7 m and increased to 42 m at 7.7 km from the shore. The depth profile shows an initial steep increase in depth from 6 m to 15 m over the first 500 to 600 m of the section (gradient 1:70), followed by gently-sloping, flat seabed from 15 m to 25 m over approximately 4 km (gradient of 1 in 400), a longshore trough 5.8 to 5.9 km offshore followed by a relatively steep increase in depth from 30 m to 42 m over the last offshore 1000 m of the section (gradient of 1 in 80).

3.1.2. Water quality

This section provides a brief overview of existing water quality in Bass Strait including the project's area of influence[1] (including nearshore Tasmania and Victoria). Surface water and deep-water profiling measurements of water quality within the project area across Bass Strait will be measured during the baseline sampling program. The following summaries are based on Gibbs et al. (1986) and Gibbs et al. (1999).

Surface water temperature

Based on measurements taken during research cruises in 1980 within Bass Strait, Gibbs et al. (1986) observed that in summer (January), surface water temperatures show a gradual increase from south-west to north-east within Bass Strait. In early winter (June), surface water temperatures showed little variation in the east-west direction through Bass Strait. Average seasonal variation of water temperatures of Bass Strait is 16.3°C in summer (January) to 13.2°C in winter (July).

Surface water salinity

Surface salinity across central Bass Strait from Waratah Bay to Heybridge nearshore shows an average summer (January) and winter (June) salinities of around 35.4 ppt with occasional localised nearshore lower salinities that are associated with freshwater inputs from rivers when in flood.

Surface water salinities can vary due to the interaction of east-moving Bass Strait Water with warm saline water to the north east and cold, low salinity (sub-Antarctic) water from the south east.

Nutrient concentrations

Typical nutrient concentrations routinely measured in near surface waters across central Bass Strait include nitrogen-based nutrients (e.g., ammonia, nitrate plus nitrite), silicate and phosphorus (total and inorganic reactive phosphate). Measured nutrient concentrations are summarised below.

[1] Under water quality, the project's area of influence would relate to the distance that suspended sediment plumes from cable installation (e.g., wet jetting or ploughing) would reach and would be typically less than one kilometre. In contrast, the project area of influence for underwater noise would be typically up to 3 km or more.

Ammonia and combined nitrate and nitrite

Average seasonal variation of near-surface water ammonia concentrations of Bass Strait ranged from 0.12 µg/L in summer (January) to 0.32 µg/L in winter (July), and combined nitrate and nitrite concentrations of Bass Strait ranged from 0.15 µg/L in summer (January) to 1.1 µg/L in winter (July).

Silicate

Average seasonal variation of near-surface water silicate concentrations of Bass Strait ranged from 0.55 µg/L in summer (January) to 0.27 µg/L in winter (July).

Phosphorus and phosphate

Average seasonal variation of near-surface water total phosphorus concentrations of Bass Strait ranged from 0.28 µg/L in summer (January) to 0.39 µg/L in winter (July), where inorganic reactive phosphate concentrations ranged from 0.14 µg/L in summer (January) to 0.27 µg/L in winter (July),

Chlorophyll *a*

Chlorophyll *a* is a commonly used indicator of phytoplankton abundance and biomass in the marine environment, an effective measure of trophic status and potential indicator of maximum photosynthetic rate. Average seasonal variation of near-surface water chlorophyll *a* concentration of Bass Strait ranged from 0.16 µg/L in summer (January) to 0.20 µg/L in winter (July).

Total organic carbon

Average seasonal variation of near-surface water total phosphate concentration of Bass Strait ranged from 1.6 mg/L in summer (January) to 0.6 mg/L in winter (July). Total organic carbon did not show any consistent geographical pattern; however, its seasonal variation indicated the reverse of the nutrient case, with the highest concentrations being observed in summer and the lowest in winter.

3.1.3. Seabed composition and bedforms

Offshore seabed sediment grain size varies in relation to current velocity, with fine materials (silt and clay) in the central basin of Bass Strait and coarser sands around the coastal margins, where wave and current action is stronger (AMOG, 2000; Li et al., 2011a, b and c).

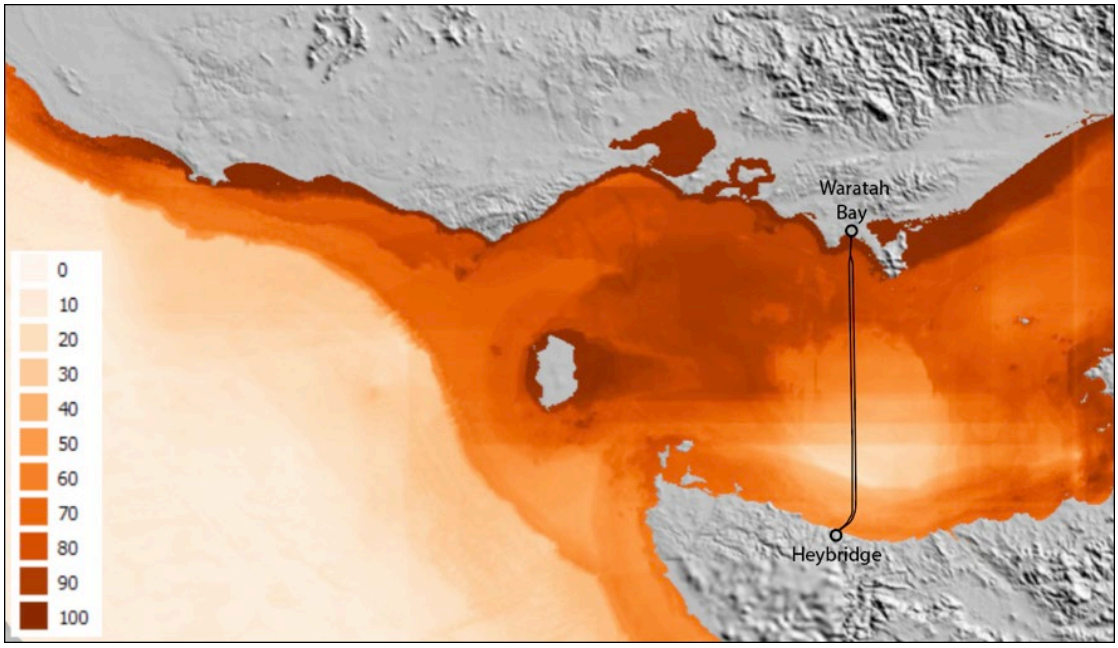
The Victorian nearshore is anticipated to comprises mainly coarse and fine sands along the interconnector route within Waratah Bay however, the seabed will be subject to pre-construction geophysical surveys and geotechnical in situ sampling with measurements to map (swath bathymetry) and characterise the size grading of the seabed sediments. In the Tasmania nearshore, both soft seabed sediments and hard seabed (bedrock, submerged platforms and reefs) are known to be present from the CEE 2019 survey (CEE, 2021). This will be investigated in more detail during the geophysical surveys and geotechnical investigations.

The seabed of the central Bass Strait is anticipated to be predominantly fine sands and coarse to very coarse silts based on previous sampling (NSR, 2001; Li et al., 2011a).

Figure 3 gives the percentage distribution of sand in Bass Strait, which shows higher percentages of sand near the Victorian nearshore and adjoining offshore seabed along favourable interconnector route corridor.

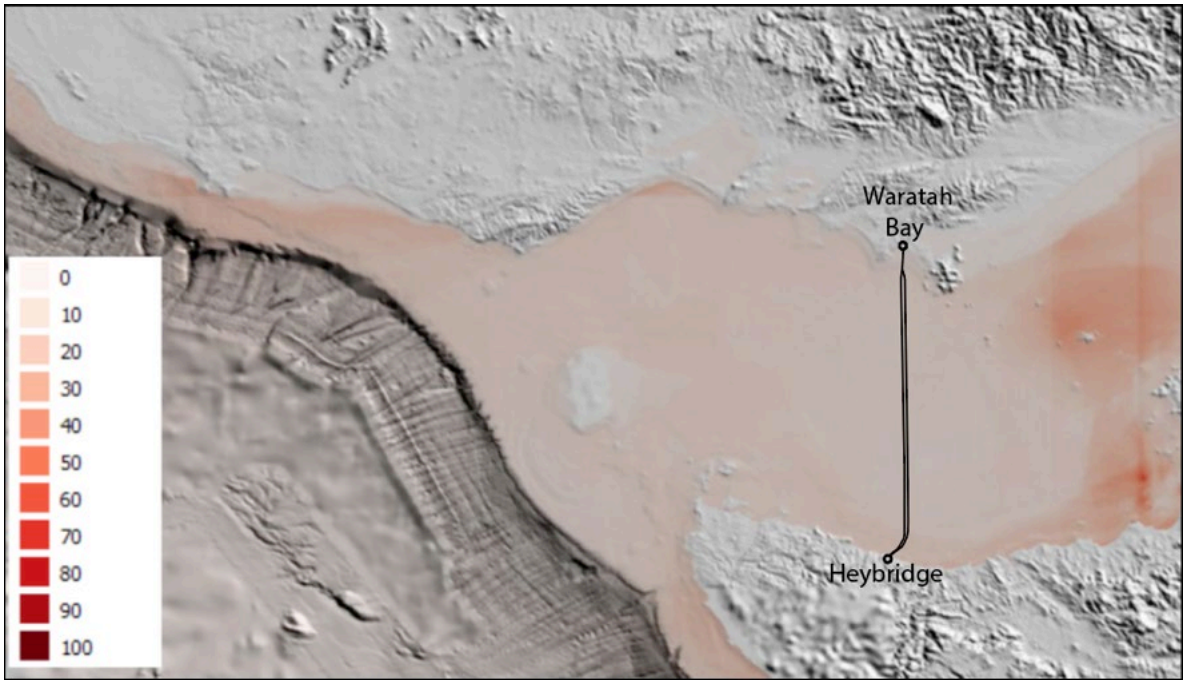
Figure 4 gives the distribution of gravels across Bass Strait, which shows a general uniformity in percentage of gravels (between 0 and 10%).

Figure 5 shows the percentage distribution of mud in Bass Strait, which shows fine-grained sediments (e.g., very coarse to coarse silts and clays) in the southern section of the central basin of Bass Strait. This represents an area in which the Marinus interconnector may be laid on the seabed and allowed to self-bury.



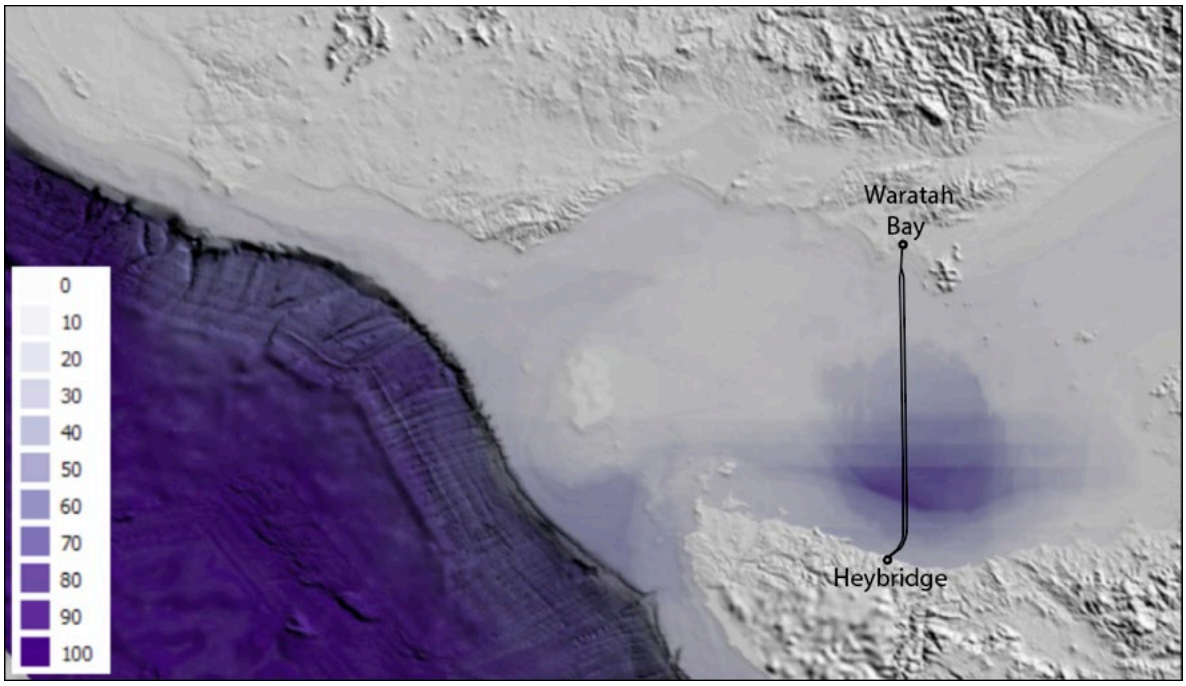
Source: Li et al. (2011a).

Figure 3: Bass Strait - percentage sands



Source: Li et al. (2011b)

Figure 4: Bass Strait - percentage gravels



Source: Li et al. (2011c)

Figure 5: Bass Strait - percentage muds

Project preconstruction geophysical surveys will check for the presence seabed unevenness such as bedforms with undulating sand waves or areas of seabed erosion, which could potentially cause free spanning of the Marinus interconnector's bundled cables and expose them to anchor or trawling gear hook-ups.

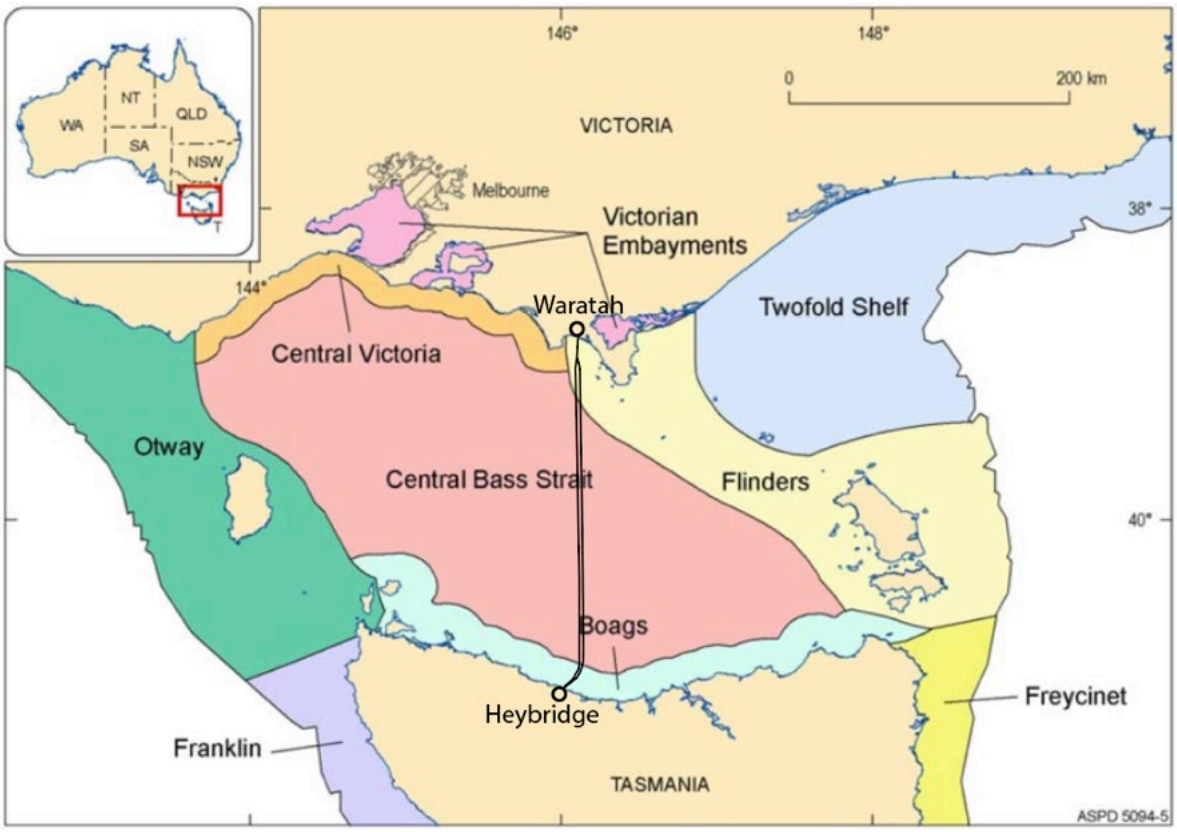
3.2. Marine Biological Environment

An overview of the project's marine biological environment is provided in this section.

3.2.1. Bioregional Setting

The Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0) is a spatial framework for classifying Australia's marine environment into bioregions that make sense ecologically and are at a scale useful for regional planning. Under the current IMCRA v4.0, bioregionalisation is based on a synthesis of a) divergent state-based analyses of coastal waters, combined with b) an offshore analysis of oceanographic/ geomorphological surrogates and a single (but extensive) marine biological dataset (demersal fish). However, a future IMCRA 5.0 is likely to alter the areas of bioregions of Bass Strait (O'Hara et al., 2016) given that the Central Victorian and Boags (northern Tasmania) bioregions are currently restricted to the artificial three-nautical mile limits of each state, being separated by an equally artificial Central Bass Strait bioregion.

While the proposed interconnector route corridor across Bass Strait will lie wholly within the Bass Strait Shelf Province of the South-east Marine Region, the interconnector route corridor from Tasmania to Victoria passes through three bioregions namely, the Boags, Central Bass Strait and Flinders bioregions. Figure 6 shows the bioregions of Bass Strait that will be crossed by the proposed Marinus Link .



Source: DEH (2006). Marinus Link subsea interconnector is shown as black bold line(s).

Figure 6: Bioregions of Bass Strait crossed by the proposed Marinus Link

3.2.2. Conservation and marine protected areas

This section provides descriptions of the marine conservation areas established by the Commonwealth, Victorian and Tasmanian governments and within the project's potential area of influence.

A review of conservation and marine protected areas and lists of species of conservation value is summarised below for the Tasmanian and Victorian nearshore environments and Commonwealth waters of Bass Strait within the project area of potential influence.

Tasmania nearshore

In Tasmania, there are no marine protected areas within vicinity of the proposed interconnector routes. The nearest national parks with coastlines on Bass Strait are Narawntapu National Park and Rocky Cape National Park (PWTS, 2019). The former is located between Port Sorell and West Head and lies 45 km east of the proposed interconnector landfall and the latter is located between Rocky Cape and Walkers Cove and lies 38 km to the west of the interconnector landfall near Heybridge. These two national parks are of interest from an aesthetic viewpoint and include natural beaches and sea caves, as well as onshore Aboriginal cultural heritage sires. Fish and recreation are permitted along the shoreline. The shorelines of these two national parks lie well outside the influence of the Marinus Link project.

Victorian nearshore

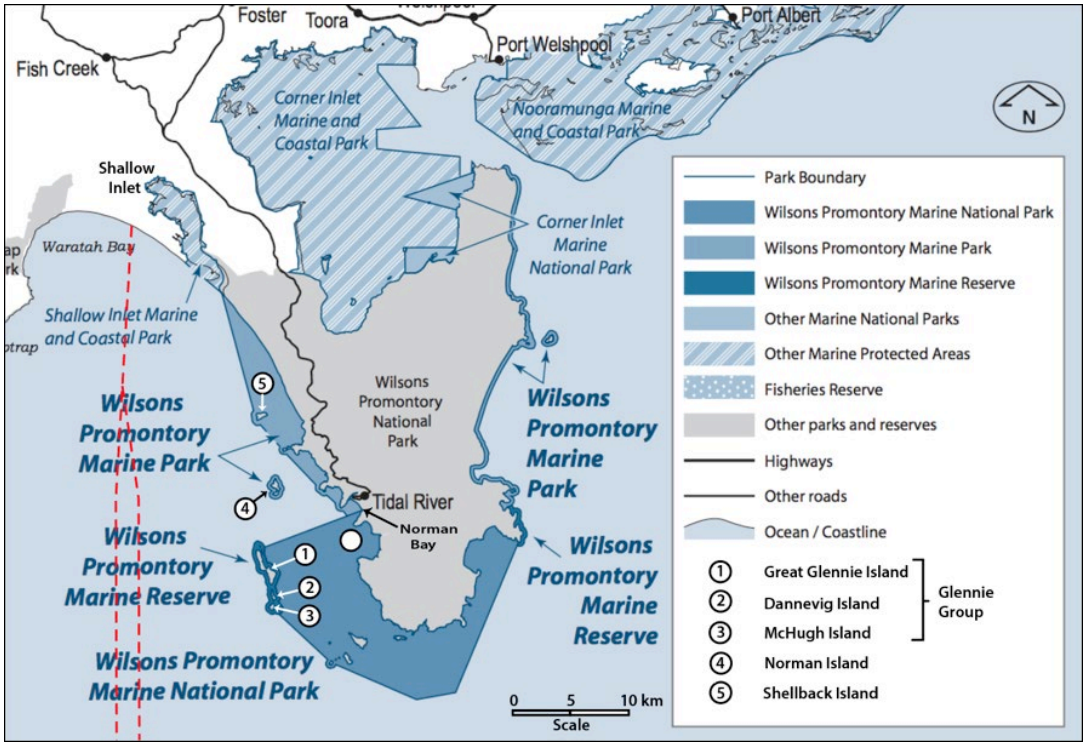
In Victoria the nearest marine national park to the most favoured interconnector route corridor is Wilsons Promontory Marine National Park, which is located at the southern tip of Wilsons Promontory about 15 km east of the interconnector route. Figure 7 shows the interconnector route corridor (red dashed line) in relation to the Wilsons Promontory Marine National Park, Marine Park and Marine Reserve.

Within Waratah Bay, the northwestern boundary of this marine national park terminates between the northern tip of Great Glennie Island to the mainland within Norman Bay of Wilsons Promontory. To the west of the island chain formed by the Glennie Group (i.e., Great Glennie, Dannevig and McHugh islands), the nearshore zone is an area where fishing and abalone collection is allowed; however, fishing to the east of the Glennie Group is forbidden (Parks Victoria, 2006). The marine park also extends from Norman Bay via Shellback Island to a point located at the southern end of the entrance to Shallow Bay Inlet Marine and Coastal Park and within which fishing is permitted.

The northern tip of Wilsons Promontory Marine Park is located about 9 km from the single alignment of the proposed interconnector alignment within Waratah Bay. Further south, Great Glennie Island within Wilsons Promontory Marine Reserve is approximately 10 km from the eastern alignment of the proposed interconnector.

Bass Strait Commonwealth marine reserves

There are no Commonwealth marine reserves in the vicinity of the proposed interconnector route corridor across Bass Strait. The nearest Commonwealth marine reserves are the Beagle Marine Park located about 30 km east of the interconnector route corridor and the Boags Rock Marine Park located at about 78 km to the west of the route corridor.



Source: Adapted from Parks Victoria (2006). Red-dashed line(s) is the proposed interconnector route corridor.

Figure 7: Interconnector route corridor in relation to conservation areas

3.2.3. Marine habitats and ecological communities

This section presents an overview and brief descriptions of key marine habitats and ecological communities of Bass Strait including the Tasmanian and Victorian nearshore environments at the proposed landfalls of the Marine Link cables. Key information and data were collated from the nearshore marine benthic characterisation study carried out for the Marinus Link Project (CEE, 2021) and other Bass Strait investigations and studies (e.g., Basslink EIS (NSR, 2002)).

Additional information and data sources include online searches of the Victorian and Tasmanian State biodiversity or natural values databases, with the summary reports presented in appendices of the present report:

- Appendix D – Victorian Biodiversity Atlas – Species Summary List for Waratah Bay.
- Appendix E – Tasmania Natural Values Atlas Report for nearshore Burnie/Heybridge.

Marine habitats

The key marine habitats of the project area include the seabed and overlying water column, which are briefly described below.

Soft Seabed Habitats

Some seabed habitats of the nearshore habitats of Victoria and Tasmania comprise unconsolidated seabed sediments (e.g., sands, silts, and shell grit) as do those of the central basin of Bass Strait (e.g., fine sands and coarse silts) that generally did not constrain the selection of the preferred interconnector routing corridor (refer to CEE (2021)) for more detailed descriptions of seabed habitat characteristics in the nearshore marine waters). In addition, there are areas of unconsolidated hard substrates (cobble) at the Tasmanian and Victorian route options have a range of invertebrate and macroalgae cover. In depths less than 20 m the cobble substrate is periodically mobilised by storm waves, resulting in attached biological assemblages that are ephemeral or relatively young (generally 1 year or less).

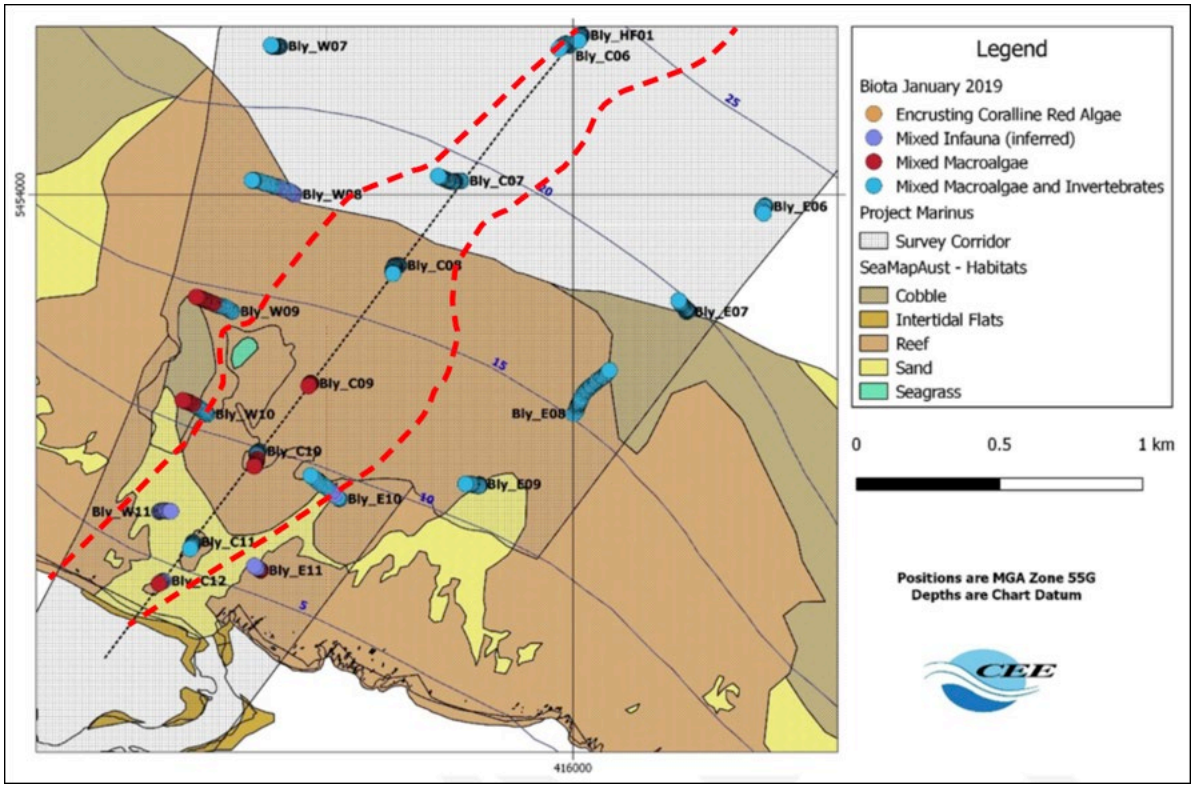
Soft seabed sediment habitats tend to have sparse and less dense populations of benthic flora and fauna and infauna. Soft substrates in shallow water at the Tasmanian sites tended not to have visible biota but are known to contain a range of infauna species, whereas in Waratah Bay Tasmanian eelgrass (*Zostera tasmanica*) formed a sparse cover in the fine sandy seabed (CEE, 2021).

In the deeper waters of Bass Strait, soft seabed sediments between 65 and 75 m water depth within an arc of southern Bass Strait are also known to provide habitat suitable for mesophotic coral-sponge communities or ‘sponge beds’ (Butler et al., 2002). Soft silty-sand seabed areas offshore of both Victoria and Tasmania also provide habitat suitable to commercially important scallops (see Section 3.4.2).

Hard seabed habitats

Hard seabed habitats are found mainly within the Tasmanian nearshore and comprise rocky platforms and low- and high-profile rocky reefs that provide vertical structural diversity. Hard substrates in deeper water with lower light availability tend to be dominated by invertebrates (sponges, ascidians, scallops) with a range of macroalgae that are adapted to low light conditions including encrusting coralline red algae (forming rhodoliths in some cases), brown algae (e.g., Caulerpa spp.) and foliose red algae (Rhodophyta). A range of fish and invertebrate species is associated with these habitats.

CEE (2021) noted that the hard seabed in nearshore Tasmania comprises exposed reef, boulder, and cobbles. Figure 8 shows the seabed types at the Heybridge (Blythe River mouth) nearshore in Tasmania and the preferred HVDC cable alignments to landfall. In Figure 8, the proposed nearshore alignments of the HVDC cables are shown as red dashed lines. The western approach deviates around an area of seagrass, and both the western and eastern approaches take advantage of sandy paleochannels in the nearshore environment.



Source: CEE (2021). Red dashed lines denote western and eastern HVDC cable routes in nearshore Tasmania.

Figure 8: Hard and soft seabed in the nearshore approach to Heybridge

However, hard seabed habitats are more structurally diverse and offer a range of microhabitats that are colonised by a larger diversity and abundance of benthic flora, benthic and epibenthic macroinvertebrates, and benthic and epibenthic fish. The Tasmanian nearshore rocky platform and reefs provide habitat for benthic algae and other marine plants, which are a preferred habitat of EPBC Act listed pipefishes, sea dragons and seahorses.

Water column habitats

The water column of the Tasmanian and Victorian nearshore environments and Bass Strait lies within the epipelagic zone (waters less than 200 m deep). The euphotic zone is the upper water layer where most photosynthesis by phytoplankton occurs, and is therefore, the zone of primary productivity.

Profiling measurements of photosynthetically active radiation (PAR) in the upper waters are used to estimate the base of the euphotic zone, which is defined as the depth where sunlight irradiance has diminished to 1% of levels found at the sea surface.

The euphotic zone also has a high secondary productivity based on zooplankton and micronekton. In the shallow nearshore and offshore waters of Bass Strait, the water column flora is comprised mainly of phytoplankton. Epipelagic fauna includes zooplankton, and micronekton (e.g., euphausiids,

chaetognaths and small-bodied cephalopods, and larval stages of invertebrates and fish), macroinvertebrates (e.g., jellyfish, comb jellies (ctenophores), salps, arrow squid and calamari) and vertebrates (e.g., fish, sea turtles and marine mammals such as whales, dolphins and seals).

Marine flora

The large brown kelps typical of cooler waters and hard seabeds in the South-East Bioregion are anticipated to be mostly absent from the interconnector route corridor across Bass Strait, where the seabed comprises a homogeneous composition of unconsolidated sediments. Soft sediments lack the hard substrate required for kelp holdfasts and other benthic algae to settle and establish populations, while mobile bed forms of coarser material are too active to be colonised. The penetration of the water column by photosynthetically active radiation (PAR) for photosynthesis becomes a limiting factor for algae and seagrasses in the deeper waters of Bass Strait.

The principal marine flora is phytoplankton present in the water column of Bass Strait and which pose no constraints in interconnector routing options across the strait or during project construction (installation) or operations.

Marine fauna

Brief descriptions of key marine fauna in Bass Strait are given below and the conservation status of key marine fauna is given in Section 3.3.3.

Whales

Baleen whales (Mysticeti) are known to occur or may be present from time to time in the offshore waters of Bass Strait, including southern right, humpback, blue, sei and fin whales. Southern right whales (*Eubalaena australis*) frequent the waters of Bass Strait and coasts of Victoria and Tasmania during winter and spring to calve in the coastal shallow areas, the most well-known is near Warrnambool in Victoria. Small numbers of humpback whales (*Megaptera novaeangliae*) regularly enter Bass Strait and some pass through on their seasonal migrations to and from breeding grounds in tropical waters in eastern Australia in autumn and spring (NSR, 2001).

Other migratory baleen and toothed whale species occasionally enter the strait, including blue whale (*Balaenoptera musculus*), minke whale (*B. acutorostrata*), sperm whale (*Physeter macrocephalus*), false killer whale (*Pseudorca* crassidens) and long-finned pilot whale (*Globicephala melas*). The pygmy right whale (*Caperea marginata*) and killer whale (*Orcinus orca*) are commonly recorded, but mainly in the warmer months. Other oceanic species, such as pygmy sperm whales (*Kogia breviceps*), strap-toothed whales (*Mesoplodon layardii*) and Gray's beaked whales (*Mesoplodon grayi*), are occasionally encountered in Bass Strait (Warneke, 1995).

Dolphins

Relatively common species identified within Bass Strait are bottlenose dolphins (*Tursiops truncatus*) and common dolphins (*Delphinus delphis*). Less common Risso's dolphins (*Grampus griseus*) and Fraser's dolphins (*Lagenodelphis hosei*) are known only as vagrants from tropical waters. The bottlenose dolphin is found in abundance all year round and in areas adjacent to centres of human population and activity, where interactions tend to occur (Warneke, 1995).

Pinnipeds (seals)

All known breeding colonies of the Australian fur seal (*Arctocephalus pusillus*) are located on islands in Bass Strait. The leopard seal (*Hydrurga leptonyx*) is an ice-breeding Antarctic seal that is a frequent visitor mainly in the winter months to the coasts and islands of Bass Strait. In addition, the crab-eater seal (*Lobodon carcinophaga*) is known from the region by only five records, all from Victoria (Warneke, 1995).

Sea turtles

Four species of marine turtle are known to occur in Victorian and Tasmanian waters of Bass Strait. Three of these occur only as rare vagrants, outside their usual range: loggerhead (*Caretta caretta*), green (*Chelonia mydas*) and olive ridley (*Lepidochelys olivacea*) turtles. The leatherback turtle (*Dermochelys coriacea*) is a regular though rare visitor to Bass Strait and is mostly a pelagic species and, away from its breeding grounds, is rarely found inshore (Environment Australia, 2003).

Marine invertebrates

The marine benthic invertebrate fauna of Bass Strait has a high diversity, with several polychaete families, pycnogonids, pericarid crustaceans, opisthobranch molluscs, bryozoans and brachiopods being the most abundant groups. Crustaceans and polychaete worms dominate the infaunal communities of soft seabed sediments, many of which are unknown species (NSR, 2001).

In the offshore soft seabed sediments of southern Bass Strait, a variety of mesophotic corals and sponges (‘sponge beds’) are present in offshore waters within the 65 to 75-m depth range.). The sponge beds have been described (Butler et al., 2002) and their biodiversity and conservation values are currently being evaluated. The proposed interconnector cannot avoid passing through this sponge bed zone; however, their characterisation through seabed sampling and towed video surveys will be a part of the baseline studies to inform the environmental impact assessment being prepared for the project.

Some areas of silty-sand seabed in both nearshore Victoria and Tasmania and further offshore, support commercially important scallops (see Section 3.3.2); however, these areas are to the east of Wilson Promontory in Victoria, the Curtis Group and Hogan Group of islands in central Bass Strait, and the Tamar River mouth in Tasmania, which indicates little potential interaction with the proposed interconnector corridor across Bass Strait.

Marine fish

It is estimated that there are over 500 species of fish found in the waters of Bass Strait, including species of importance to commercial and recreational fisheries. Table 1 presents a summary of major pelagic and demersal species in Bass Strait.

Table 1: Major species of marine fish in Bass Strait

Habitat	Major species	Distribution
Pelagic nearshore	Pilchards (*Sardinops neopilchardus*)	Embayments and coastal waters.
	Anchovies (*Engraulis australis*)	Embayments and coastal waters.
	Sandy sprat (*Hyperlophus vittatus*)	Embayments and coastal waters.
	Southern garfish (*Hyporhamphus melanochir*)	Embayments and coastal waters. Move into deeper water as adults.

	Silver trevally (*Pseudocaranx dentex*) Blue warehou (*Seriolella brama*) Australian salmon (*Arripis* spp.)	Depth 10 to 180 m; often over reefs. Embayments and coastal waters.
Demersal nearshore	Tiger flathead (*Platycephalus richardsoni*) Sand flathead (*Platycephalus bassensis*) School whiting (*Sillago bassensis*) King George whiting (*Sillaginodes punctatus*) Snapper (*Pagrus auratus*) Gummy shark (*Mustelus antarcticus*)	Coastal and central Bass Strait. Coastal and central Bass Strait. Shallow inshore waters. Shallow inshore waters. Coastal to continental shelf. Coastal to continental shelf.
Demersal mid-shelf	School shark (*Galeorhinus galeus*) Saw shark (*Pristiphorus* spp.) Elephant shark (*Callorhynchus milii*)	Coastal to continental shelf. Coastal to continental shelf. Coastal to continental shelf.

Source: NSR (2001); BRS (1998).

In the Victorian nearshore soft sediment (sandy) seabed habitats support a variety of bottom living fish, such as flatfish and flounders (Platycephalidae), whereas at the reef habitats (where present) marine fish may be permanent residents ('reef-attached' species) or as transients moving seasonally along the reef system ('reef-associated' species). The most common reef fish are gummy shark, trevally, sand flathead, spiny gurnard, snapper, salmon and stingaree. Snapper and gummy shark are most sought after by commercial and recreational fishermen working from boats, and salmon is fished from the shore. Snappers migrate southwestwards along the reef system from October to April, feeding on reef invertebrates, mainly bivalve molluscs and echinoderms.

In nearshore Tasmania, subtidal rocky platforms and reefs are likely to support a wide diversity of marine fish of a similar matrix as the Victorian nearshore reefs summarised above. Barrett and Edgar (2000) investigated reef fish communities at various sites on the Tasmanian north coast and Bass Strait islands and recorded a total of 69 species. Marine fish species found in northern Tasmania include reef fish that are permanent residents of coastal communities, migratory species that move between marine and freshwater in estuarine environments and offshore species that are transient visitors to inshore breeding and nursery habitats (Aquenal, 2002). Given the proximity of the nearshore Tasmanian interconnector route options to river mouths, the principal migratory and/or diadromous[2] fish species potentially affected by the project include anadromous[3] species (e.g., short-headed lamprey (*Mordacia mordax*), pouched lamprey (*Geotria australis*) and Australian salmon (*Arripis trutta*)), and catadromous[4] species (e.g., short-finned eel (*Anguilla australis*) and long-finned eel (*A. reinhardtii*)). A similar diadromous species matrix is found along the Victorian coast.

3.3. Matters of National Environmental Significance

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), actions that have, or are likely to have, a significant impact on a matter of national environmental significance (MNES) require approval from the Australian Government Minister for the Environment (the Minister). The presence of Commonwealth EPBC Act matters of national importance within Project areas was assessed using the EPBC Act Protected Matters Search Tool (PMST)

[2] Diadromous fish spends a portion of its life cycle partially in fresh water and partially in salt water.
[3] Anadromous fish, born in fresh water, spends most of its life in the sea and returns to fresh water to spawn.
[4] Catadromous fish, born in the sea, spends most of its life in fresh water and returns to the sea to spawn.

(DoAWE2021a, 2021b). PMST reports were generated for the following areas along the proposed Marinus interconnector route:

- Appendix A – Waratah Bay in Victoria
- Appendix B – Central Bass Strait in Commonwealth waters
- Appendix C – Nearshore Heybridge in Tasmania

The above appendices of the present report provide full details of listed threatened ecological communities, listed threatened flora and fauna, listed migratory species, listed marine species, whales and cetaceans and critical habitats. EPBC Act Protected Matters Reports were generated from searches of the DoAWE online database of MNES. Table 2 presents a summary of MNES and other matters protected by the EPBC Act.

3.3.1. Wetlands of international importance (Ramsar)

In terms of wetlands of international importance listed under the EPBC Act, the nearest Ramsar site is the Corner Inlet Marine and Coastal Park, which is located 11 km from the interconnector route in Victorian nearshore waters. This Ramsar site is located on the eastern side of Wilsons Promontory in Victoria and, as such, the land isthmus forms a natural physical barrier between the proposed interconnector route approach to landfall in Waratah Bay and this Ramsar site. Overall, this Ramsar site is most unlikely to be influenced by any marine construction or operational activities proposed in Waratah Bay.

Table 2: EPBC Act Protect Matters Search Tool (PMST) Report Results

	MNES at three points along the interconnector route*		
Category	**Waratah Bay**	**Central Bass Strait**	**Heybridge nearshore**
Matters of National Environmental Significance:			
World Heritage Properties	NONE	NONE	NONE
National Heritage Places	NONE	NONE	NONE
Wetlands of International Importance	1	NONE	NONE
Great Barrier Reef Marine Park	N/A	N/A	N/A
Commonwealth Marine Area	1	1	1
Listed Threatened Ecological Communities	3	NONE	4
Listed Threatened Species	68	35	60
Listed Migratory Species	61	36	41
Other Matters Protected by the EPBC Act:			
Listed Marine Species	99	45	69
Whales and Other Cetaceans	13	14	14
Critical Habitats	NONE	NONE	NONE
Australian Marine Parks	NONE	NONE	NONE
Extra Information:			
State and Territory Reserves	2	NONE	14
Invasive Species	37	NONE	29

Nationally Important Wetlands	1	NONE	NONE
Key Ecological Features (Marine)	NONE	NONE	NONE

Source: Waratah Bay (DoAWE, 2021a); Central Bass Strait (DoAWE, 2021b); Heybridge nearshore (DoAWE, 2021c). Maps of the three points and their buffer zones (i.e., search areas) are shown in Appendices A, B and C for Waratah Bay, Central Bass Strait and Heybridge Nearshore, respectively.

3.3.2. Listed threatened ecological communities

In terms of EPBC Act PMST listed threatened ecological communities, there are two communities within the project's marine area of influence. These are the Giant Kelp Marine Forests of South East Australia and Subtropical and Temperate Coastal Saltmarshes, which are summarised below.

Giant Kelp Marine Forests of South East Australia

The Giant Kelp Marine Forests of South East Australia community is listed as Endangered (EN) under the EPBC Act. In Tasmania, patches of the giant kelp ecological community are predominantly found in sheltered embayments associated with rocky reefs on the south and east coasts. The northern coasts of Tasmania shelve gradually into Bass Strait and are classified as sheltered open or moderately exposed coastal habitats (Edgar et al., 1995). However, this northern coastline, along with being predominantly sandy substrata at depths greater than eight metres below sea level, is not typically exposed to sufficient water motion to support the development of the giant kelp forest community. This is confirmed by Edyvane (2003) who noted that while patches of giant kelp have been recorded on the north coast of Tasmania in the past, they are no longer likely to occur. Notwithstanding, baseline marine biological surveys of the proposed interconnector routes within the Tasmanian in nearshore at Heybridge will determine if giant kelp plant communities are present in the Project area within Bass Strait.

Subtropical and Temperate Coastal Saltmarshes

The Subtropical and Temperate Coastal Saltmarsh ecological community is listed as Vulnerable (VU) under the EPBC Act and consists mainly of salt-tolerant vegetation (halophytes) including grasses, herbs, sedges, rushes and shrubs, which are found in tidally influenced, sheltered embayments and estuaries. Only temperate saltmarshes are expected to be present in the cooler Victorian and Tasmanian coastal environments of Bass Strait.

Based on the atlas of coastal saltmarsh wetlands in the Cradle Coast Natural Resource Management (NRM) region of Tasmania (Prahalad and Helman, 2016), coastal saltmarshes in the vicinity of the HVDC cable landfalls include the Blythe-Cam-Inglis Rivers Coastal Complex with individual saltmarshes forming the Blythe River Cluster located within the Blythe River estuary. The dominant saltmarsh vegetation consists mostly grassy saltmarsh dominated by *Juncus*, *Austrostipa* and *Gahnia*, with one small patch of creeping brookweed (*Samolus repens*). The nearest patch of saltmarsh is the Blythe River Complex, which is located about 500 m south of the HVDC cable shore crossings. The saltmarshes of the Blythe River estuary are unlikely to be affected by marine construction or operations.

In Victoria, temperate saltmarsh is mainly found in the Corner Inlet and Nooramunga Marine and Coastal Parks (Corner Inlet Ramsar site), which lie to the east of Wilsons Promontory (Boon et al., 2015) and therefore well outside of the subsea interconnector route in Waratah Bay.

3.3.3. Marine Species of Conservation Significance in Bass Strait

For the purposes of this report, a focus has been placed on marine species of conservation significance that includes species within the EPBC Act's categories of Listed Threatened Species, Listed Marine Species and Listed Migratory Species, and which may be sensitive to the proposed construction, installation, operation or decommissioning of Marinus Link. In addition, the biodiversity atlas of Victoria (DoELWP, 2019) and the Tasmanian Natural Values Atlas (DPIPWE, 2019a) were consulted for additional information, the findings of which are presented in Appendix D and Appendix E, respectively, of the present report.

Cetaceans

Table 3 provides a list of cetaceans of conservation significance that includes species within the EPBC Act's categories of Listed Threatened Species, Listed Marine Species and Listed Migratory Species, and which may be sensitive to the proposed construction, installation, or operation of the Marinus Link. In Table 3, there are five listed threatened species of whale, two of which are endangered (the blue whale and southern right whale).

Blue whales found in Australian and Antarctic waters include two subspecies: the Antarctic or 'true' blue whale (*Balaenoptera musculus intermedia*) and the pygmy blue whale (*Balaenoptera musculus brevicauda*) (DoE, 2015; McCauley et al., 2018).

Table 3: List of cetaceans of conservation significance in Bass Strait and the project area

Scientific name	Common name	EPBC	IUCN	Migratory	Presence
EPBC Act Threatened cetaceans:					
Balaenoptera borealis	Sei whale	VU	EN	Yes	FO
Balaenoptera musculus	Blue whale	EN	EN	Yes	LO
Balaenoptera physalus	Fin whale	VU	EN	Yes	FO
Eubalaena australis	Southern right whale	EN	LC	Yes	KO
Megaptera novaeangliae	Humpback whale	VU	LC	Yes	KO
EPBC Act Listed species:					
Caperea marginata	Pygmy right whale	–	LC	Yes	FO
Balaenoptera acutorostrata	Minke whale	–	LC	No	MO
Orcinus orca	Killer whale	–	DD	Yes	LO
Pseudorca crassidens[#]	False killer whale	_	NT	No	LO
Delphinus delphis	Common dolphin	–	LC	No	MO
Globicephala macrorhynchus[#]	Short-finned pilot whale	–	LC	No	MO
Grampus griseus	Risso's dolphin	–	LC	No	MO
Lagenorhynchus obscurus	Dusky dolphin	–	LC	Yes	MO
***Tursiops truncatus* s. str.**	Bottlenose dolphin	–	LC	No	MO

Tursiops aduncus*	Indo-Pacific bottlenose dolphin	–	NT	No	LO

Notes: * Potentially present in Victorian waters only. # Potentially present in Tasmanian waters only. Conservation status according to Commonwealth EPBC Act; otherwise, the status is according to International Union for the Conservation of Nature's Red List of Threatened Species (IUCN, 2019). Codes: EN= Endangered, VU=Vulnerable, NT=Near Threatened, LC=Least Concern and DD=Data Deficient. FO = Foraging, feeding or related behaviour likely to occur in Bass Strait. N/A=Not Applicable.

The migratory baleen whales in Table 3 are listed under the Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention) to which Australia is a party with accession on 1st September 1991. Australia's obligations include protecting migratory whales, conserving, or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them.

Pinnipeds

All pinnipeds (seals and sea lions) in Australian waters are Listed Marine Species under the EPBC Act. Eared seals (Otariidae) comprise fur seals and sea lions, whereas earless seals (Phocidae) include the southern elephant seal, which occasionally is found on Tasmanian shorelines. Table 4 lists pinnipeds of conservation significance that are known to occur or may occur in the Project's area of influence and wider southwestern Bass Strait.

Australian fur seals

The principal pinniped species present in the vicinity of the Marinus interconnector route is the Australian fur seal (*Arctocephalus pusillus doriferus*). There are ten established breeding colonies of the Australian Fur-seal, which are restricted to islands in the Bass Strait; six occurring off the coast of Victoria and four off the coast of Tasmania (Kirkwood et al., 2010; Warneke 1995).

An important breeding site that forms a significant colony of Australian Fur Seals is Kanowna Island, which had a breeding colony of around 15,000 fur seals in 2010 (Kirkwood et al., 2010), which has increased compared to the population of between 5,600 and 7,200 individuals observed in 2000 (Arnould and Littnan (2000). While Kanowna Island is located about 18 km from the nearest section of proposed Marinus interconnector route in nearshore Victoria. However, fur seal foraging areas include the waters surrounding many of islands to the west of Wilson Promontory to the southeast of Waratah Bay, which are closer to the interconnector route (between 8 and 10 km distance).

Table 4: List of pinnipeds of conservation significance in Bass Strait

Scientific name	Common name	EPBC	IUCN	Mode	Presence
Otariidae (eared seals):					
Arctocephalus pusillus doriferus	Australian fur seal	VU	EN	Breed	MO
Arctocephalus forsteri	Long-nosed fur seal	–	EN	Breed	MO
Arctocephalus tropicalis	Sub-Antarctic seal	VU	LC	Visitor	NL
Neophoca cinerea	Australian sea lion	VU	EN	Visitor	NL

Phocidae (earless seals):					
Mirounga leonina	Southern elephant seal	–	VU	Visitor	NL
Hydrurga leptonyx	Leopard seal	–	LC	Visitor	NL

Notes: EPBC is EPBC Act; IUCN is International Union for Conservation of Nature. Codes: MO = Species or species habitat may occur. NL – Not likely to occur; EN – Endangered; VU – Vulnerable; LC – Least Concern. Dash (–) denotes conservation status not categorised.

The Australian fur seal is also the most common seal in Tasmanian waters and breeds between October and January on small islands (e.g., Tenth Island) and isolated rocks (e.g., Reid Rocks, Judgement rocks and Moriarty Rocks). The nearest breeding colony at Tenth island is approximately 75 km east of the interconnector route in nearshore Tasmania. The distribution of Australian fur seal sightings in the Tasmanian Natural Values Atlas (DPIPWE, 2019) shows few sightings along the coast near Heybridge, with most coastal sightings observed westwards of Burnie.

Long-nosed fur seal

The long-nosed seal (*Arctocephalus forsteri*) is a Listed Marine Species under the EPBC Act, and its conservation status is not classified, though it is classified as endangered by the IUCN (2021). The EPBC Act PMST (Appendices A, B and C of this report) indicates that this species or its habitat may occur in Bass Strait and nearshore Victoria.

This otariid species is rare in Tasmanian waters of Bass Strait and is mainly found along the south and east coasts of Tasmania, as well as the coast of South Australia. However, in Victoria, long-nosed fur seal breeding is known to occur at Kanowna Island near Wilsons Promontory and Bass Strait (Arnould and Littnan, 2000). While the breeding area of long-nosed fur seals on Kanowna Island is located about 16 km east of the proposed interconnector route, the foraging area of the long-nosed fur seal may be intersected by the interconnector routes.

Sea Turtles

Sea turtles of the families Cheloniidae and Dermochelyidae are known to visit and forage in Bass Strait. Table 5 lists three sea turtle species that are known to occur in Bass Strait and within the project's area of influence.

Table 5: Pinniped species of conservation significance in Bass Strait and the Project area

Scientific name	Common name	EPBC	IUCN	Migratory	Mode	Presence
Caretta caretta	Loggerhead turtle	EN	VU	Yes	Visitor	FO
Chelonia mydas	Green turtle	VU	EN	Yes	Visitor	FO
Dermochelys coriacea	Leatherback turtle	EN	VU	Yes	Visitor	FO

Codes: FO = Species or species habitat may occur. EN = Endangered; VU = Vulnerable; FO = Foraging, feeding or related behaviour likely to occur in Bass Strait. Dash (–) denotes conservation status not categorised.

The leatherback turtle (Dermochelys coriacea) with 78 observations in Tasmanian waters of Bass Strait (DPIPWE, 2019). The second most observed turtle in Tasmanian waters was the loggerhead turtle (*Caretta caretta*) with a total of 13 observations (DPIPWE, 2019). A similar pattern exists for Victorian waters of Bass Strait in that leatherback turtle sightings are higher than loggerhead turtle sightings.

In terms of other sea turtles in Bass Strait waters, the critically endangered hawksbill turtle (*Eretmochelys imbricata*) has not been observed in Tasmanian waters (DPIPWE, 2019), but has been sighted near Wilson Promontory in Victoria (DoELWP, 2019). In addition, the olive ridley turtle (*Lepidochelys olivacea*) has been observed in Victorian waters within Bass Strait at Geelong (Port Philip Bay) and southwest of Melbourne (DoELWP, 2019).

Marine fish

Table 6 lists EPBC Act PMST marine fish of conservation significance, which are known or likely to occur or may occur in Bass Strait and the project's area of influence.

Australian grayling

The Australian grayling (*Prototroctes maraena*) is listed as vulnerable and migratory under the EPBC Act. Australian graylings are a diadromous species, migrating between rivers, estuaries, and coastal seas, so rely on free access to a range of freshwater, estuarine and marine habitats for their survival (Backhouse et al., 2008).

Larvae and juveniles inhabit estuaries and coastal seas, and there appears to be an obligatory marine stage (Crook et al., 2006), although their precise habitat requirements are not known. In the rivers, the larvae drift or are swept downstream during April to May each year, whereas upstream migration of juvenile grayling occurs about six months later during October to December each year (Crook et al., 2006).

Table 6: Marine fish of conservation significance in Bass Strait and Project area

Scientific name	Common name	EPBC	IUCN	Migratory	Presence
Listed threatened and migratory fish species:					
Prototroctes maraena	Australian grayling	VU	NR	Yes	LO
Carcharodon carcharias	Great white shark	VU	CR	Yes	KO
Lamna nasus	Porbeagle	–	VU	Yes	MO
Isurus oxyrinchus	Shortfin mako	–	EN	Yes	LO
Listed marine fish species:					
29 species of Syngnathidae (e.g., pipefish, seadragons and seahorses)	(see Appendices A, B and C for details	–	LC/DD	No	MO

Notes: CR=Critically Endangered, EN= Endangered, VU=Vulnerable, NT=Near Threatened, LC=Least Concern and DD=Data Deficient. EPBC Act MNES codes: FO = Foraging, feeding or related behaviour likely to occur; LO = Species or species habitat likely to occur; MO = Species or species habitat may occur; KO = Species or species habitat known to occur. Dash (–) denotes not classified.

Great White Shark

The great white shark (*Carcharodon carcharias*) is listed as vulnerable and migratory under the EPBC Act. Great white sharks eat a variety of prey, including fish, other sharks and rays, marine mammals, squid and crustaceans (DEWHA, 2009a). Juvenile white sharks feed on finfish, rays and other sharks and shift to include marine mammals when they reach approximately 3.4 m long (Estrada et al., 2006). The presence of breeding areas, haulouts, and foraging Australian fur seals near the project area (e.g., Kanowna Island and islands along the west coast of Wilsons Promontory) indicates that

great white sharks are likely to be occasionally present in offshore Bass Strait, as well as the nearshore waters of Tasmania and Victoria but more so in the latter.

Porbeagle

The porbeagle or mackerel shark (*Lamna nasus*) is listed as a migratory marine species under the EPBC Act. The EPBC Act PMST (Appendices A, B and C) indicates that the porbeagles or their habitat is likely to occur in western Bass Strait.

The porbeagle is an opportunistic hunter that preys mainly on bony fishes and cephalopods throughout the water column, including the seabed. Porbeagles are distributed widely in cold and temperate marine waters. In Tasmania, inspection of the Tasmanian Natural Values Atlas (DPIPWE, 2019) did not reveal any observations. However, in the Atlas of Living Australia (CSIRO, 2021), the nearest observation of a porbeagle is off the northwestern coast of Tasmania over deep water of the outer continental shelf, which is about 190 km west of the Project area. Notwithstanding, porbeagle make occasional forays to inshore waters and may occur in Bass Strait including the interconnector route.

Shortfin Mako Shark

The shortfin mako (*Isurus oxyrinchus*) was listed as a migratory species under Part 13 of the EPBC Act on 29 January 2010, which was a legal requirement following the inclusion of this species in Appendix II of the Convention of Migratory Species (an international agreement to which Australia is a signatory).

The shortfin mako is a large pelagic shark that has a relatively streamlined, slender body and a long-pointed snout, and primarily occurs in offshore and oceanic waters (DoE, 2014). The diet of the shortfin mako comprises mainly fish including other sharks and cephalopods such as squid (Last and Stevens, 2009). Adult mako sharks may feed on larger prey such as billfish and small cetaceans (White et al., 2006).

The shortfin mako is highly migratory and can travel large distances, migrating from Australian waters to areas well beyond the Australian Exclusive Economic Zone (Rogers et al., 2009). Rogers and Bailleul (2015) deployed satellite tags on eight shortfin makos (range 120– 270 cm, total length) at locations off the Victorian coast at Portland (southwest Victoria), Phillips Island (central Bass Strait) and Lakes Entrance (Gippsland in eastern Bass Strait) between December 2012 and July 2013.

Syngnathidae

In Table 6, Listed Marine Species include up to 29 species of syngnathids (pipefishes, seadragons, and seahorses) are not shown individually but may be referred to in the EPBC Act PMSTs for the Victorian nearshore at Waratah Bay (Appendix A), central Bass Strait (Appendix B) and the Tasmanian nearshore at Heybridge (Appendix C). Their conservations status is mostly classified as of Least Concern (LC) under the IUCN (2021)

In general, knowledge of syngnathids across southern Australia including Bass Strait is limited due to the cryptic behaviour of many species, limited research, and few surveys. Syngnathids use a wide variety of habitats that range from seagrass and macroalgae, reefs and broken bottom habitats.

Syngnathids mainly avoid predation by camouflage (e.g., mimicking seagrass or macroalgae) or by sheltering in caves or crevices, or by their hard bony rings, plates and spines. Their predator avoidance strategies have resulted in diverse body forms.

In the Victorian nearshore in Waratah Bay, the sandy seabed has a sparse distribution of seagrasses and macroalgae and is unlikely to be suitable habitat for many syngnathid species. However, the Tasmanian nearshore at Heybridge as patches of seagrass and dense covers of macroalgae on the rock platforms and reefs, where syngnathid species diversity may be expected to be higher.

Marine birds

All seabirds are protected as Listed Marine Species under Section 248 of the EPBC Act. This section concentrates on those seabirds (e.g., the Little Penguin, albatrosses and petrels) that may be expected to cover the open waters of Bass Strait including the interconnector route. Various other terrestrial birds of conservation significance are associated with wetlands and shoreline (e.g., feeding and wading birds) will be addressed within the onshore terrestrial environment baseline studies and, therefore, are not addressed in this report.

Albatrosses and Petrels

The EPBC Act PMSTs (Appendix A, B and C of this report) lists 21 species of albatrosses and petrels (19 albatrosses and two giant petrels) that are known or likely to occur in the project's area of influence. Table 7 lists pelagic seabirds and little penguins potentially occurring in Bass Strait and the project area.

The EPBC Act classifies four seabirds that are endangered: Northern Royal Albatross (*Diomedea sanfordi*), Southern Giant Petrel (*Macronectes giganteus*), Gould's Petrel (*Pterodroma leucoptera leucoptera*) and the Grey-headed Albatross (*Thalassarche chrysostoma*). These and other listed species will only interact with the project during its construction phase when the bundled HVDC cables are laid across Bass Strait and the Victorian and Tasmanian nearshore zones via HDD when marine construction vessels are present.

Table 7: Marine seabirds of conservation significance in Bass Strait and Project area

Scientific name	Common name	EPBC	IUCN	Migratory	Presence
Albatrosses and petrels:					
Diomedea antipodensis	Antipodean Albatross	VU	EN	Yes	FO
Diomedea antipodensis gibsoni	Gibson's Albatross	VU	EN	Yes	FO
Diomedea epomophora	Southern Royal Albatross	VU	VU	Yes	FO
Diomedea exulans	Wandering Albatross	VU	VU	Yes	FO
Diomedea sanfordi	Northern Royal Albatross	EN	EN	Yes	FO
Fregetta grallaria grallaria	White-bellied Storm- Petrel	VU	LC	No	LO
Halobaena caerulea	Blue Petrel	VU	LC	No	LO
Macronectes giganteus	Southern Giant Petrel	EN	LC	Yes	FO
Phoebetria fusca	Sooty Albatross	VU	EN	Yes	LO
Phoebetria palpebrata	Light-mantled Albatross	–	NT	Yes	FO*

Pterodroma leucoptera leucoptera	Gould's Petrel	EN	VU	No	MO
Pterodroma mollis	Soft-plumaged Petrel	VU	LC	Yes	MO
Macronectes halli	Northern Giant Petrel	VU	LC	Yes	MO
Thalassarche bulleri	Buller's Albatross	VU	NT	Yes	MO
Thalassarche bulleri platei	Northern Buller's Albatross	VU	NT	Yes	MO
Thalassarche cauta cauta	Shy Albatross	VU	NT	Yes	FO
Thalassarche chrysostoma	Grey-headed Albatross	EN	EN	Yes	MO
Thalassarche impavida	Campbell Albatross	VU	VU	Yes	FO
Thalassarche melanophris	Black-browed Albatross	VU	LC	Yes	FO
Thalassarche salvini	Salvin's Albatross	VU	VU	Yes	FO
Thalassarche steadi	White-capped Albatross	VU	NT	Yes	FO
Penguins:					
Eudyptula minor	Little Penguin	–	LC	No	KO

Notes: EPBC is the EPBC Act; IUCN is the International Union for Conservation of Nature Conservation codes: EN=Endangered; VU=Vulnerable; LC=Least Concern; NT=Near Threatened and a dash (–) denotes not listed. EPBC Act PMST species occurrence in area: FO = Foraging, feeding or related behaviour likely to occur; LO = Species or species habitat likely to occur; MO = Species or species habitat may occur; KO = Species or species habitat known to occur; NL – Not likely to occur.

Little Penguins

The Little Penguin (*Eudyptula minor*) does not have a conservation status code under the EPBC Act but is a Listed Marine Species. The IUCN (2021) lists the conservation status of the Little Penguin as Least Concern (LC).

Little penguins feed on smaller fish species (e.g., herrings, anchovies, garfish) and squid (Finger et al., 2016). In northern Tasmania, little penguin breeding sites are located at Penguin, Parsonage Point at Burnie, and Lillico Beach just west of Devonport. In the Victorian nearshore at Waratah Bay are around Kanowna Island and other islands off the west coast of Wilsons Promontory, which are also the main nearshore foraging areas.

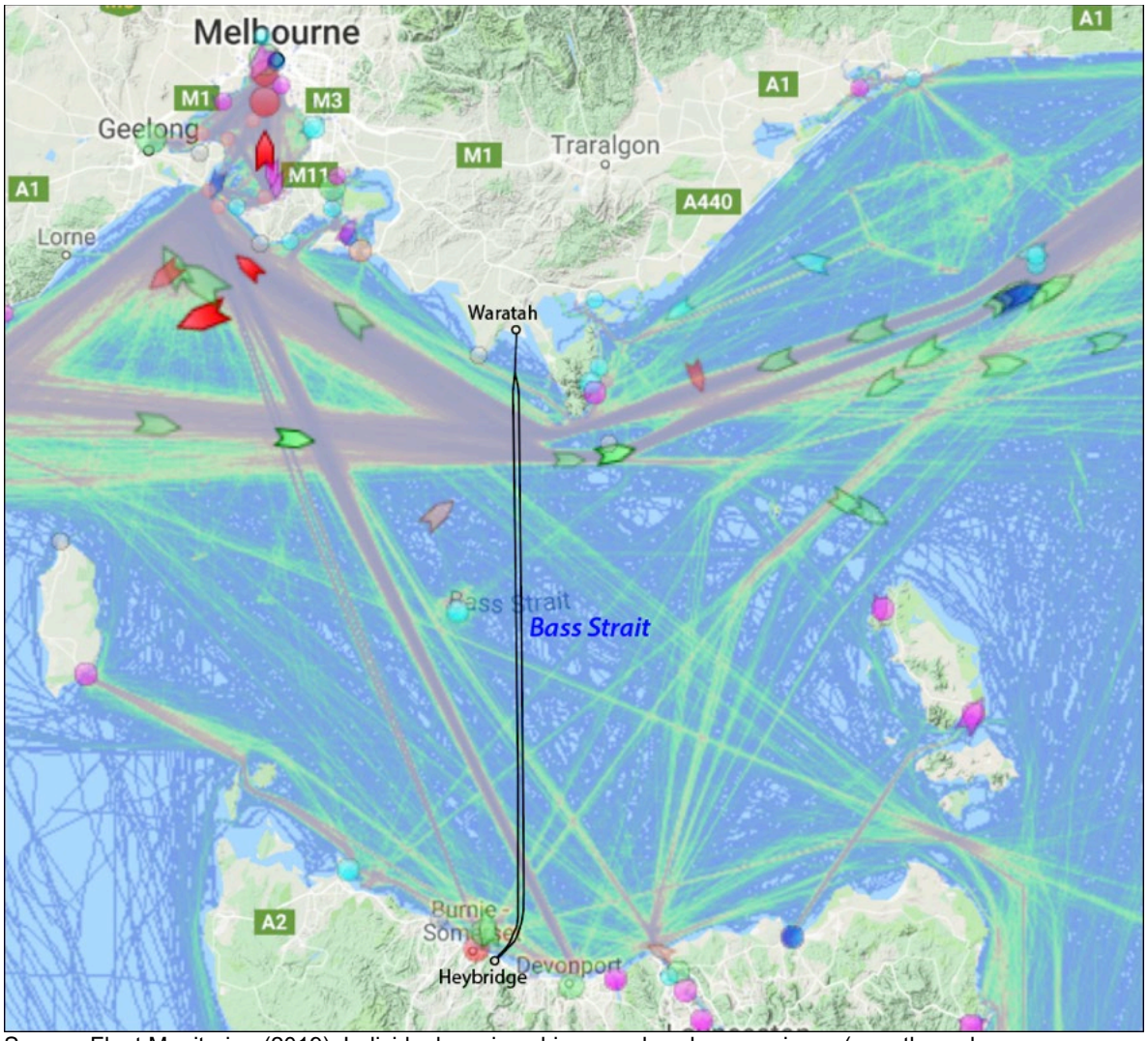
3.4. Existing marine resource use

This section describes existing marine resource uses within and around the interconnector routes.

3.4.1. Marine traffic and navigation

Figure 9 shows a cumulative snapshot of shipping traffic density in Bass Strait taken on 25 March 2019. An updated version of this snapshot is not presented as marine traffic density and port calls were significantly less during 2020 to 2021, owing to a reduction in coastal and international marine traffic during the COVID-19 pandemic. In Figure 9, the main east-west shipping lanes and coastal shipping routes are clearly shown (red) in relation to the provisional interconnector corridor across

Bass Strait. The preferred interconnector route will cross the main east-west shipping lanes to the southwest of Wilsons Promontory, as well as the Melbourne to Devonport shipping lane. In addition, the interconnector route will cross over a number of minor coastal shipping routes (shown in green) between Melbourne and Burnie and Launceston in northern Tasmania.



Source: Fleet Monitoring (2019). Individual moving ships are also shown as icons (e.g., the red, green, orange and purple arrows). This is a product of the snapshot (i.e., a screen capture) taken on 25 March 2019 and could not be removed from the figure). The light blue dot in the middle of Bass Strait is the Yolla Platform.

Figure 9: Annual cumulative shipping traffic density in Bass Strait

3.4.2. Commercial fisheries

A brief review of the commercial fisheries of Bass Strait includes the following list:

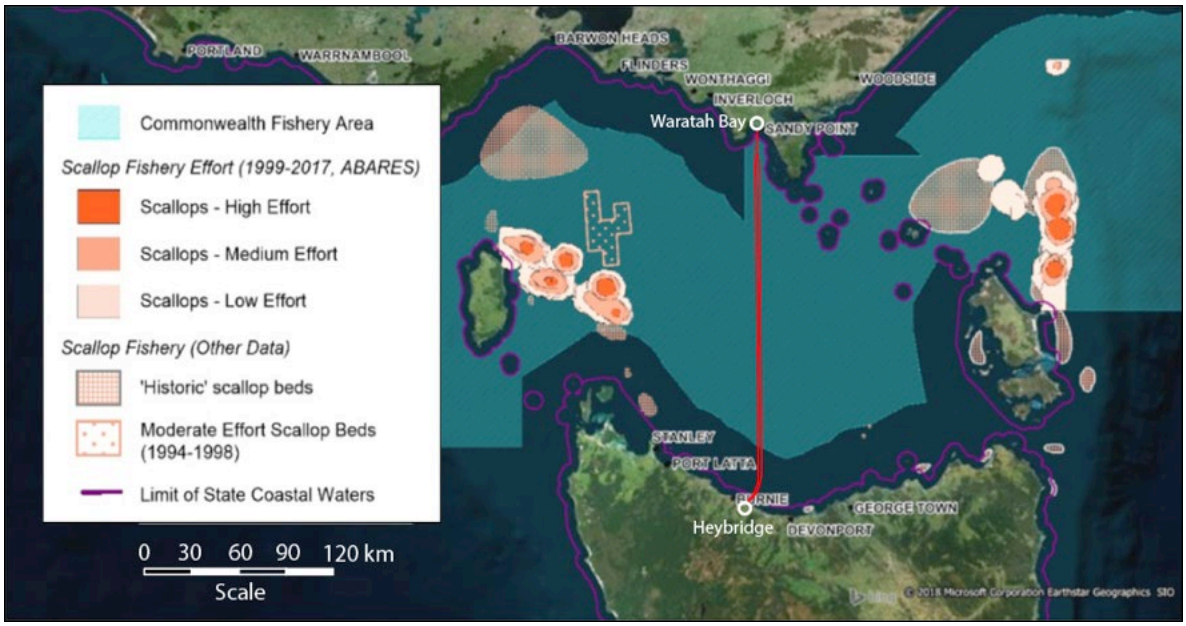
- South East trawl fishery
- Southern shark fishery
- South East non-trawl fishery
- Southern bluefin tuna fishery
- Eastern skipjack tuna fishery
- Small pelagics fishery

- Victorian purse seine fishery and inshore trawl fishery
- Southern squid jig fishery
- Bass Strait scallop fishery
- Rock lobster fishery
- Abalone fishery

Scallop fishing, shark gillnet fishing and trawl fishing use gear that is set or towed along the seafloor and, therefore, have the most risk of physical interaction with the interconnector once installed and in operation. These three fisheries are briefly described below.

Bass Strait and Central Zone Scallop Fishery

Commercial fishing for Commercial Scallops (*Pecten fumatus*), and to a lesser extent Doughboy Scallops (*Mimachlamys asperrima*), in Bass Strait is managed under three jurisdictions. Victoria and Tasmania manage zones out to 20 nm off their respective coastlines, and the Australian Fisheries Management Authority (AFMA) manages the Bass Strait Central Zone Scallop Fishery. Currently, there are 11 active licences in the Bass Strait Central Zone Scallop Fishery (AFMA, 2019) and in the 2018 season the catch limits were 3,876 t for Commercial Scallops and 100 t for Doughboy Scallops. Most scallop fishing grounds are focussed on the eastern and western regions of Bass Strait, with very few areas in the central basin of Bass Strait where the proposed interconnector routing corridor is proposed. Figure 10 shows the scallop fishery management zones.



Sources: ABARES (2019), Entura (2011) and Greilach et al (1993)

Figure 10: Bass Strait scallop fishery areas

Scallops are harvested by collection in dredges (or 'harvesters') that are towed across the seabed. The harvesters are comprised of steel mesh cages, up to 4.4 m wide and 450 mm high, which are mounted on skids and weigh up to 500 kg. The mouth of the harvester is fitted with a tooth-bar, which has tines designed to penetrate up to 15 cm into the seabed, depending on coarseness and undulations of the seabed.

Scallops are characteristically highly variable in distribution and abundance from year to year, and newly recruited scallop beds may not always survive the two- to three-year growth period to meet

commercial potential. The opening of scallop grounds to fishing is based on information from surveys of abundance, size and condition of scallop beds as agreed between industry representatives and scallop fishery managers. Typically, the fishery is closed over the summer months when condition and market value is poorest.

Historically, the majority of scallop fishing activity in the Victorian zone has occurred in the eastern waters of the state, with most vessels launching from the ports of Lakes Entrance and Welshpool (SIV, 2019). In the Central Zone and Tasmanian Zone, the main areas of the fishery have been around the islands of eastern and western Bass Strait, with beds appearing sporadically along the north coast. The deeper parts of central Bass Strait have not been productive areas for scallops, but over the nearshore crossing areas, it is possible that beds could develop during the operating life of the interconnector.

Southern shark fishery

The Shark Gillnet and Shark Hook sectors (SGSHS) of the Southern and Eastern Scalefish and Shark Fishery (AFMA, 2019b) extend south from New South Wales to the Victoria border, around Tasmania, and west to the South Australian and Western Australian border. The SGSHS includes the waters around Tasmania, to the extent of the Australian Fishing Zone (AFZ). All targeted shark fishing is prohibited inside Victorian coastal waters, which is inside the three nautical mile limit from the Victorian shore.

Shark fishing in Tasmanian Coastal Waters and South Australian Coastal Waters is managed as part of the SESSF. Coastal waters permit holders for South Australia or Tasmania are allowed to fish out to three nautical miles from the Baseline (as defined in the Seas and Submerged Lands (Territorial Sea Baseline) Proclamation 2006). Coastal Waters permits do not allow fishing in the internal waters of Tasmania or South Australia. Most fishing occurs in waters adjacent to the coastline and throughout Bass Strait.

Figure 11 shows the principal gillnetting fishing areas of Bass Strait based on fishing effort. The fishery is managed using a combination of input controls (gear restrictions and closed areas) and output controls (individual transferable quotas and limits on the proportion of school shark to gummy shark catch). The SGSHS use gillnets and longline set on the seafloor to target gummy shark (*Mustelus antarcticus*). School shark (*Galeorhinus galeus*), elephantfish (*Callorhinchus milii*) and sawsharks (*Pristiophorus cirratus* and *P. nudipinnis*) are by-products from the gummy shark fishery. After the nets or lines are set, the vessel often lies at anchor before starting the sequence of retrieval of the fishing gear.

The southern shark fishery is managed by a combination of licensing, size limits and quotas. Shark operators from many ports in Victoria and Tasmania fish over a wide area of Bass Strait.

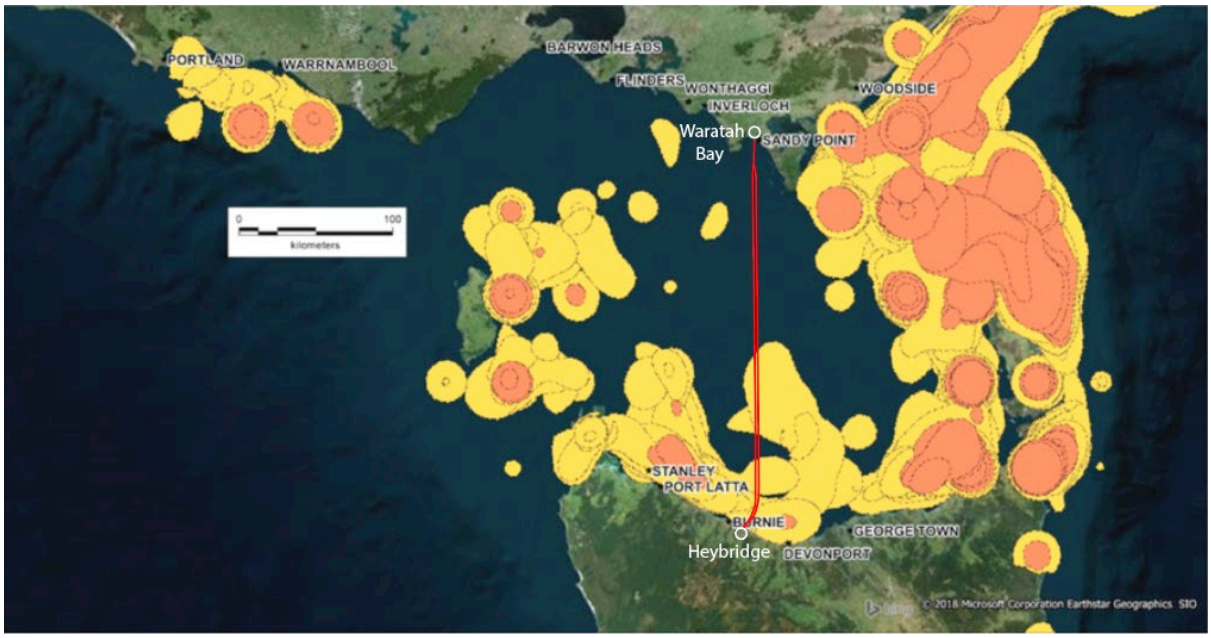
South East trawl fishery

The Commonwealth sector of the South East trawl fishery covers the area of the AFZ extending southward from Barrenjoey Headland (north of Sydney) around the New South Wales, Victorian and Tasmanian coastlines to Cape Jervis in South Australia.

The South East trawl fishery includes a wide range of trawl methods and targets a similarly wide range of species over water depths ranging from a few metres to over 1,200 m.

In the fishery (AFMA, 2019b; ABARES, 2019) there are (as at 2018):

- 57 trawl statutory fishing rights



Source: ABARES (2019). High effort is orange and medium effort is yellow.

Figure 11: Bass Strait shark gillnet fishery effort

- 37 scalefish hook statutory fishing rights
- 61 shark gillnet statutory fishing rights
- 13 shark hook statutory fishing rights.

Trawling in the region of the cable is likely to be mainly along the central part of the Victorian coast, by Danish seining and otter trawling for school whiting (*Silago* spp.), with flathead and a variety of other species also caught.

3.4.3. Recreational fishing

This section provides a brief description of recreational fishing in the project area.

Nearshore Tasmania recreational fishing

The preferred interconnector route corridor options within nearshore Tasmania are located along a stretch coastline with population centres (e.g., Burnie, Somerset, Penguin and Heywood). Therefore, recreational fishing activities may be expected to include nearshore areas close to these population centres and interconnector routes.

Nearshore Victoria recreational fishing

Most nearshore recreational fishing is located to the east of Wilsons Promontory in Corner Inlet that has easy access via population centres at Port Franklin and Port Welshpool. In nearshore Victoria, there are very few population centres along the coast of Waratah Bay, where the interconnector landfall is proposed, and hence recreational fishing is therefore expected to be infrequent.

Offshore recreational fishing

The offshore waters of Bass Strait (240-km wide with an average depth of 60 m) feature a number of islands, deep ocean drop-offs and a meeting point of currents created by the merging of the Pacific Ocean and Southern Ocean, which provide pelagic habitat for a number of game fish, which are targeted by deep sea fishing and big game fishing charters. The principal game fishing and deep-water fishing charter operators have bases located in Victoria (e.g., Queenscliff and Sorrento) and Tasmania (e.g., Launceston, Port Sorrell and Wynyard).

Near the Victorian coast, the targeted species include gummy shark, snappers, King George whiting, trevally, and barracuda, whilst further offshore larger recreational fishing boats will chase target game fish such as mako and thresher sharks. The shortfin mako shark (*Isurus oxyrinchus*) is a large pelagic shark that is a fast-swimming active predator and is capable of spectacular leaping and a favoured game fish (Last and Stevens, 2009). Other targeted species included barracuda and gummy, seven-gill and blue sharks (GameRec, 2019).

In addition, recreational tuna fishing is also practised in Bass Strait targeting subtropical species such as albacore (*Thunnus alalunga*), yellowfin (*T. albacares*) and skipjack (*Katsuwonus pelamis*) tuna, which appear with the southerly progression of the East Australia Current (DPIPWE, 2019). Temperate tuna species such as the southern bluefin tuna (*T. maccoyii*) occur in eastern Bass Strait, but this is outside the Central Zone of Bass Strait.

4. Potential issues

The potential environmental effects of subsea HVDC cables have been subject to public concern since the first subsea HVDC cable (20 MW) was installed in 1954 between the Swedish mainland and the island of Gotland in the Baltic Sea (ABB, 2019). Since that time, more than 100 subsea HVDC interconnectors have been built of which many of the later installations include the transmission of wind power generation from offshore windfarms.

The potential issues that were raised by the public, non-government organisations (NGOs), state and Commonwealth government scientists, commercial fishery bodies, and commercial and recreational fishers during the public hearings for the Basslink Project (NSR, 2001) are of direct relevance to Marinus Link, which is planned to be located across the central basin of Bass Strait.

Potential marine environmental and resource use issues are summarised below.

4.1. Potential marine ecology issues

Potential marine ecology issues associated with the construction, operations and decommissioning phases of Marinus Link are summarised below.

4.1.1. Construction phase potential issues

During the construction phase, potential issues relate principally to the installation of the interconnector cables across Bass Strait and within the Victorian and Tasmanian nearshore environments. Potential issues are:

- Space-use conflict issues with other maritime users:

  - Crossing of shipping lanes causing temporary route deviations of shipping.
  - Temporary exclusion zones around cable-lay ship and astern to shipping and fishing vessels.
  - Potential space-use conflicts with future nearshore and offshore aquaculture (e.g., Atlantic salmon fish farms) proposals in Tasmania.
- Localised physical disturbance of nearshore seabed habitats, flora and fauna:
  - Ploughing or water-jetting of soft seabed sediments and simultaneous cable installation mainly within the Victorian nearshore.
  - Rock cutting of cable trenches within hard seabed (rocky substrate) mainly within the Tasmanian nearshore.
  - Placement of rock mattresses or rock fill over cable if anchored on hard seabed in the Tasmanian nearshore.
- Localised physical disturbance of offshore Bass Strait seabed habitats, flora and fauna:
  - Ploughing or water-jetting of soft seabed sediments and simultaneous cable installation.
  - Cable laying directly onto very soft seabed sediments (muds and very fine sands) of central Bass Strait to allow self-burial of cable.
  - Disturbance of potential mesophotic coral-sponge bed habitat between 65 m and 75 m water depth in the offshore waters of southern Bass Strait to the north of Tasmania.
  - Placement of rock mattresses or rock fill over cable if anchored on hard seabed in the Tasmanian nearshore.
- Localised altered water quality (suspension of fine sediments, turbidity, and nutrients)
  - Ploughing or water-jetting, installation and burial of the interconnector cables.
  - Shore crossing trench excavation (backhoe) or preferred option of horizontal directional drilling (HDD) to cross the shorelines.
  - Turbulence from construction vessel propeller wash.
- Construction vessel interaction with marine mammals:
  - Vessel strikes or collisions with large whales.
  - Entanglement of large marine fauna in interconnector's bundled HVDC cables being laid astern of the cable-lay ship.
- Acoustic damage or disturbance impacts to noise-sensitive marine fauna:
  - Non-impulsive, continuous broadband noise from survey vessels (engines and propellers).
  - Non-impulsive intermittent noise from rock cutting or drilling and rock fill placement for cable protection.
- Interference with existing seabed infrastructure:
  - Issues associated with potential crossing of oil and gas pipelines.
  - Issues associated with potential crossing of telecommunication cables.
  - Issues associated with potential crossing of disused tailings disposal and/or outfall pipelines
  - Issues of potentially using the former Tioxide Plant marine pipeline outfall route that follows a submerged paleochannel that may also be suitable as a nearshore routing option for the Marinus Link interconnector.
- Physical disturbance of submerged cultural heritage sites:
  - Disturbance of potential shipwrecks and aeroplane wrecks.
  - Disturbance of submerged Aboriginal cultural heritage sites.

4.1.2. Operations phase potential issues

During operation of the proposed Marinus Link when power is being transmitted through the HVDC cables, potential issues that may arise are:

- Space-use conflict issues:
  - Potential permanent exclusion zones over alignment of interconnector.
  - Prohibition of ships anchoring over cable route alignment.
  - Potential conflict with fishing vessels that lay at anchor for some hours prior to retrieving gill nets set on the seafloor (shark fishery).
- Beneficial new seabed habitat issues within Tasmanian nearshore hard seabed:
  - Artificial substrate of cast iron half clamshells (if used) in nearshore Tasmania.
  - Artificial substrate of rock mattresses or dumped rock (if used) for cable protection.
- Static magnetic fields emitted from HVDC cable(s) during operation (i.e., power transmission):
  - Potential effects on marine fauna using magnetoreception for navigation, including some species of whales, sea turtles and decapod crustaceans, or for detecting prey (e.g., sharks and rays).
- Static electric fields induced by seawater flow (currents and tides) through HVDC cable magnetic fields:
  - Potential effects of induced electric fields on electrosensitive fauna such as sharks and rays when foraging for food.
  - Potential interference effects on those decapod crustaceans that use geoelectric fields for navigation or spatial orientation.
- Generation of heat during HVDC cable operation (i.e., power transmission):
  - Increased temperature gradient in water column overlying energised HVDC cable laid on seabed and potential thermal effects on benthic and epibenthic fauna (e.g., increased growth rates and productivity).
  - Increased temperature gradient of seabed surrounding buried energised HVDC cables and potential thermal effects on infauna such as nematodes and marine bacteria (food resource).

4.1.3. Decommissioning phase potential issues

Potential issues during the decommissioning phase of the project relate primarily to the removal of the subsea HVDC cables and optic fibre cable. Potential issues are, but not limited, to:

- Space-use conflict issues with other maritime users:
  - Cable-lay ship undertaking cable retrieval operations and crossing of shipping lanes causing temporary vessel route deviations.
  - Temporary exclusion zones around cable-lay ship and astern to shipping and fishing vessels.
- Seabed physical disturbance:
  - Localised disturbance and suspension of nearshore seabed in Tasmania to remove rock mattresses or rock fill for decommissioned cable retrieval (if required) and consequential impacts on marine fauna
  - Localised disturbance and suspension of fine-grained sediments (e.g., very fine sands, silts and clays) in the central basin of Bass Strait and consequential impacts on marine fauna.
- Seabed contamination:
  - If the disused Marinus Link interconnector is not to be retrieved and left in situ, there is a long-term potential for the release of contaminants (e.g., copper) within the seabed and overlying water as the HVDC cables progressively corrode and disintegrate.

- If not removed, the cables present an ongoing risk of anchor hook-up and potential liabilities associated with the safety of vessels and crews.

4.2. Potential marine resource use issues

Potential marine resource issues are summarised below for commercial fisheries and recreational and game fishing.

4.2.1. Shipping and navigation issues

Shipping and navigation issues arising during project construction and operations are summarised below:

Construction phase issues:

- Potential interference with shipping traffic using offshore waters by the temporary exclusion zones around the cable-lay ship and tender vessels.
- Potential interference with commercial fishing vessels' access to fishing grounds by the temporary exclusion zones around the cable-lay ship and support vessels.

Operations phase issues:

- Potential interference of HVDC cable-generated magnetic field with ships' magnetic compasses.

Decommissioning phase issues:

- Potential interference with shipping traffic using offshore waters by the temporary exclusion zones around the cable-lay ship or other vessel type used to recover the decommissioned HVDC cables (assuming it will be retrieved and not left in situ).
- Potential interference with commercial fishing vessels access to fishing grounds by the temporary exclusion zones around the cable-lay ship or other cable recovery vessels deployed to retrieve the disused cables.
- If the disused Marinus interconnector is not to be retrieved and left in situ, there is a long-term potential risk of anchor hook-up and liabilities associated with the safety of vessels and crews.

4.2.2. Commercial fisheries issues

Bass Strait represents an area that has a wide range of different commercial fisheries. At this stage, continental shelf fisheries that operate at the eastern and western margins of Bass Strait have been excluded from this assessment, as their target fishing areas do not include central Bass Strait. The principal commercial fisheries having the potential to be impacted by the project include the Bass Strait and Central Zone Scallop Fishery, Southern Shark Fishery and the South East Trawl Fishery. Potential commercial fishery issues have already been identified from previous, detailed consultations with commercial fishing companies in the 2000s during the Basslink Project (NSR, 2001). However, Marinus Link Pty Ltd will consult with Tasmanian and Victorian fishery organisations to identify all fisheries that may be affected by the Marinus Link.

The key commercial fisheries issues are summarised below for the construction and operations phases of the project:

- Commercial fisheries issues during construction:
  - Potential interference with access to commercial fishing grounds by the proposed temporary safety exclusion zone around the cable-lay ship.

- Commercial fisheries issues during operations:
  - Fears of potential risks of anchor or trawling gear hook-up on subsea cables.
  - Potential interference with access to commercial fishing grounds by a possible permanent anchoring and fishing exclusion zone over the cable route.
  - Potential interference with demersal trawling or overnight anchoring by commercial shark fishermen by the installed HVDC subsea cables.
  - Fears by shark gillnet fishers that the induced electric fields generated by seawater flow through the HVDC cable's magnetic field and induced dc and ac electric fields have the potential to affect east-west movements of sharks, which are known to be electrosensitive.
  - Potential cumulative loss or fragmentation of seabed fishing grounds arising from multiple seabed infrastructures (e.g., existing and future HVDC and telecommunications cables, and seabed oil and gas pipelines) across Bass Strait. This may lead to fears that loss or fragmentation of seabed fishing grounds might enlarge the overall area where permanent exclusion zones or restrictions may apply to fishing grounds.

4.2.3. Recreational fishing issues

Most recreational fishing is undertaken along the coast and mainly within the Victorian and Tasmanian nearshore waters. In addition, offshore game fishing and deep-water angling is undertaken in the offshore waters of Bass Strait but generally nearer the coast.

Nearshore recreational fishing issues

Potential nearshore recreational fishing issues include:

- Potential interference with recreational fishing boat access to fishing areas from the proposed temporary exclusion zone around shore crossing construction activities and nearshore cable-lay operations.
- Potential damage to, or disturbance of, fish habitats of nearshore Tasmanian hard seabed and reef system (if trenching is proposed).
- Potential noise impacts of construction activity, including noise generated by cable-lay ship and vessel operations, on nearshore fish targeted by recreational fishing.
- Potential impacts upon recreational fishing areas of suspended sediment and turbidity from the construction areas.

Offshore recreational fishing issues

Some recreational game fishing and deep-sea fishing is undertaken in the offshore waters of Bass Strait adjacent to the coast and outside of the Victorian and Tasmanian inshore waters. However, given the wide expanse of Bass Strait offshore waters, offshore recreational fishing issues are likely to be absent, although a minor issue could be the necessity for recreational fishers to deviate around the cable-lay ship during bundled HVDC cable installations.

5. Mitigation and management measures

This section outlines recommended mitigation and management measures that can be implemented to minimise potential impacts to marine ecology and resource use during the interconnector construction, operations, and decommissioning phases.

5.1. Mitigation by design

The proposed interconnector route across Bass Strait has been selected to cross the central basin of Bass Strait in a north-to-south alignment. The central basin is deep (up to 90 m) and has a seabed comprised of unconsolidated soft sediments that allows the HVDC cable to self-bury without the need for ploughing or water-jetting to excavate a seabed trench for cable installation.

A key mitigation by design measure is the burying of the subsea bundled HVDC cables, which is largely aimed at protecting the cable from the risk of damage from anchors, as well as from towed demersal fishing gear.

Other mitigations by design measures include the following:

- Avoid using a monopolar system with a sea-earth return path (e.g., sea or shore electrodes) as an interconnector configuration option, which generates:
  - elevated electromagnetic fields above background having potential adverse impacts on marine fauna
  - stray electric currents from the electrodes that create potential corrosion problems with metallic infrastructure within the sea and on land (e.g., pipelines, railway lines and fencing).
  - electrolysis products, mainly chlorine, if sea electrodes are used. Chlorine and other products are contaminants that could potentially affect marine organisms in close proximity to the electrodes.
- The selection of a cross-linked polyethylene (XLPE) HVDC cable with metal sheathing, which:
  - prevents electric field generation around the cable.
- Adoption of a symmetrical monopole configuration that involves:
  - bundling of the two 375 MW HVDC cables so that the size of the magnetic field around the bundled cable is greatly reduced. Repeated for the second symmetric monopole that is proposed to be installed about four years later.
- Selection of the shortest interconnector routing corridor across Bass Strait:
  - reduces the total area of seabed disturbance along the length of the interconnector including lateral sedimentation.
  - reduces total area of seabed and overlying seawater habitat affected by electromagnetic fields.
- Selection of Tasmanian nearshore routing options to either minimise traverses over hard seabed and seagrass areas or the preferred use of HDD to avoid hard seabed and seagrass areas.
- Selection of an interconnector route through the 35-km reach of seabed (between the 65 and 75 m depth) to avoid or minimise the interconnector traverse through patches of the mesophotic coral-sponge communities that may be present in an arc within southern Bass Strait offshore of Tasmania.

5.2. Mitigation by management

Construction and operation environmental management plans (EMPs) will be prepared by Marinus Link Pty Ltd, and it is recommended they include the following management measures during the construction, operations, and decommissioning phases of the project.

5.2.1. Construction phase management measures

A key issue during the construction phase is the potential for space-use conflicts with other maritime users of Bass Strait. During the construction phase, a moving safety exclusion zone will be temporally

established around the cable-lay vessel as it progresses across Bass Strait. The key management measures are outlined below.

Temporary safety exclusion zones

During the construction phase of the Marinus Link, the cable-lay vessel will travel slowly at about 1 knot across Bass Strait during cable trenching and installation and this requires a temporary moving exclusion zone to be set up to restrict ships and fishing and other third-party vessels from coming too close to the cable-lay operation. In general, a moving exclusion zone of around 1.5 km by 1 km around the cable-lay vessel is typical (NSR, 2001), which includes an extended buffer zone astern of the ship to include cable suspended from the cable-lay ship that may pose a hazard to other vessels such as commercial fishing vessels.

Marinus Link Pty Ltd is required to notify the Australian Maritime Safety Authority (AMSA) of the timing and duration of its proposed marine construction and cable-laying activities, so that other shipping can be notified of temporary exclusion zones that will be put in place. The timing and duration of the proposed activities will be gazetted and advertised in the Australian Notices to Mariners, which is published fortnightly by the Australian Hydrographic Office, Commonwealth of Australia.

Marinus Link Pty Ltd will need to inform AMSA of the planned locations, dates, and duration of cable-lay activities in Bass Strait. The steps following this are envisaged:

- AMSA will inform other maritime users of the proposed cable-lay operation areas and timetable by issuing a Notice to Mariners.
- The cable-lay ship will move at a low speed (typically between one and two knots), which reduces vessel interaction with large whales (vessel strikes or collisions).
- The cable-lay ship will display day shape signage (i.e., ball-diamond-ball) on its masthead and night-time lighting (red-white-red) due to its 24-hour cable laying operation, which alerts other maritime users that the cable-lay ship is ‘restricted in ability to manoeuvre’.
- The cable-lay ship will have an attendant works vessel to alert approaching vessels or ward them off from approaching the cable-lay ship safety exclusion zone.

5.2.2. Operations phase management measures

During operations, some management measures will allow additional protection of the subsea cables. Once the final alignment of the interconnector cable route has been determined, management measures will include consulting with the commercial fishing industries of Victoria and Tasmania and the respective government managers to develop a fishing and anchoring code of practice, which take into account any issues that may have arisen during the operational period of the Basslink Code of Practice.

It is anticipated that there will not be a need for a permanent exclusion zone to apply to trawlers, as the interconnector will be sufficiently buried in the offshore seabed or protected by either cast iron half-shell conduits or a rock cover (e.g., rock mattresses or rock dumping) in shallow waters adjacent to the nearshore areas. Marinus Link proposes that HDD be used to cross the shore out to about 1 km distance from the shoreline, which avoids the use of cable protection methods within the nearshore environment.

Recommended operational management measures include, but are not limited to, the following:

- The final subsea interconnector alignment will be shown on navigation charts as an area where anchoring or the dropping of anchors (save for an emergency) should not take place.

- In the unlikely event of a commercial fishing anchor or bottom-trawled fishing gear hook-up of the interconnector, Marinus Link Pty Ltd will have provided commercial fishers with instructions on what actions are to be taken and a list of Marinus Link's contacts for further advice.
- Commercial fishers will be provided with the coordinates of the final interconnector alignment, which can be added to each vessel's electronic charts or satellite navigation software.
- Liaison with commercial fishers will take place to determine the success (or otherwise) of Basslink's anchor replacement program, which provided Bruce or Claw type anchors that had no leading edge to damage a cable in exchange for the original plough-type anchors, which could crease and damage the cable if snagged. This liaison will determine the need for any extension or change to this anchor replacement program for the Marinus Link.
- Maintain ongoing consultation with commercial fishers to:
  - liaise and inform them of the project and its progress.
  - revisit or assess any levels of concern and potential issues.
  - assess past experiences and lessons relevant to the project.
  - revise the management measures as necessary.

5.2.3. Decommissioning phase management measures

Towards the end of the project, a decommissioning plan, which includes management measures, will be prepared. In general, many countries do not stipulate that subsea HVDC cables should be recovered and that they may be left in situ following decommissioning of the interconnector. However, interconnector removal after decommissioning has been stipulated in the approval process in some countries, as has already been implemented for subsea HVDC cables in the German exclusive economic zone (OSPAR, 2012). Marinus Link Pty Ltd needs to ascertain the decommissioning legal status in Australia and risks for either leaving decommissioned HVDC cables in situ or removing them. Based on experience with the Basslink Project, Basslink Pty Ltd noted that its interconnector would be decommissioned in consultation with relevant government authorities nearer the time of decommissioning.

If the interconnector is required to be removed, then many of the management measures implemented for installing the interconnector during the construction (installation) phase will be applicable during the decommissioning, but in reverse. For example, during the cable retrieval operation, a temporary safety exclusion zone will be required around a cable retrieval vessel.

5.2.4. Fisheries mitigation and management measures

There are a number of potential mitigation and management measures applicable to commercial fisheries, which are summarised below.

Interconnector route selection

The currently proposed Marinus interconnector route passes through the central, muddiest basin of Bass Strait, which is least fished. The engineering requirements for installation of the cable avoid areas of hard substrate or reef areas which have highest ecological and fishery importance. Nonetheless, in passing through the scallop, shark and trawl fishing grounds, some areas are likely to become commercially viable during the life of the project.

Development of a code of conduct

The potential for dragging of anchor was identified as a significant risk during the assessment of the Basslink Project (NSR, 2001). A Basslink Cable Awareness and Code of Conduct for Fishing and Anchoring Safely was developed by Basslink Pty Ltd in consultation with fishing industry bodies and state and Commonwealth Government agencies. It is a voluntary code of conduct, rather than a fishing exclusion zone, but mariners are advised to take extreme caution when using gear or anchors in the vicinity of the cable. The code provides awareness charts, instructions, and emergency contacts in the event of snagging and procedures for claiming for discarded gear. A similar code could be applicable to the Marinus Link, which will take into account any feedback from fishers on any issues that arose during Basslink operations and its specific code of conduct.

Anchor replacement

Shark fishing vessels typically used plough-type anchors that could cause damage to the interconnector in the event of a hook-up. It was noted that all commercial fishery vessels fishing in the area of the Basslink interconnector across Bass Strait, the skippers were provided with alternative ‘claw’ type anchors, to reduce the likelihood of damage to the interconnector in the event of a hook-up. The code of conduct instructs fishing vessels to discard anchors or gear if snagged in the vicinity of the interconnector and not to attempt to a recovery. The need, or otherwise, for further anchor replacements may be considered for Marinus Link, subject to outcomes of consultation.

Ongoing fishery consultation

Marinus Link Pty Ltd will undertake ongoing consultation with commercial and recreational fishing groups in Tasmania and Victoria with an aim to:

- inform commercial and recreational fishing organisations of the project.
- assess levels of concern and potential issues raised.
- discuss past experiences and lessons relevant to the project.
- revise mitigation and management measures as necessary.

The consultation is a two-way process and provides opportunities for Marinus Link Pty Ltd to communicate directly with fishery representative bodies and individual fishers and address their concerns as they arise during the construction (interconnector installation) and operations phases of the project.

6. Overview of potential impacts

This section presents an overview of potential impacts of the proposed Marinus Link subsea interconnector on the marine environment and marine resource use. Potential impacts are based on previous experience of the impacts generated by Basslink and overseas interconnectors during construction, operations, and decommissioning. The assessment takes account of information provided in previous sections of this report; namely:

- Description of the project (Section 2)
- Existing marine environment (Section 3)
- Potential environmental and marine resources use issues (Section 4)

- Mitigation and management measures (Section 5)

A detailed residual impact assessment after mitigation and management measures have been implemented will be undertaken during the environmental impact assessment phase of the project.

6.1. Potential impacts on marine fauna

This section provides an overview of potential impacts of the project on the marine fauna of Bass Strait, which is based on experience gained during the construction and operation of the Basslink interconnector, as well as international experience of subsea HVDC interconnector projects and operations.

6.1.1. Identified key sources of impacts to marine fauna

Potential impacts on the marine fauna of Bass Strait, are likely to arise from the following key mechanisms or physical sources.

Construction phase sources of potential impacts to marine fauna

- Seabed habitat physical disturbance:
  - direct physical disturbance of the seabed habitat during cable installation (wet jetting, cable emplacement and burial operations) with consequential impacts on benthic fauna and infauna.
  - indirect seabed habitat disturbance from lateral sedimentation either side of cable burial alignment and delayed settlement of laterally dispersed turbidity plumes with consequential impacts on demersal fish, epibenthic and benthic fauna, and infauna.
- Deterioration of water quality potentially arising from:
  - construction-derived turbidity plumes, with increases in total suspended solids and turbidity, and reduced light penetration with consequential impacts on water column and benthic marine algae and nekton (fish and invertebrate fauna)
  - potential release of particulate and dissolved chemicals, such as trace metals, nutrients and organic compounds, from disturbed seabed sediments with consequential impacts on growth and productivity of exposed marine algae and fauna.
- Generation of underwater noise during nearshore (shore-end) cable lay operations and offshore cable lay vessel operation having potential acoustic damage or disturbance impacts on marine fauna or masking of communication.

Operations phase sources of potential impacts to marine fauna

- Generation of electromagnetic fields:
  - magnetic field generated by the energised HVDC cable (i.e., power transmission) and potential navigation and orientation impacts on magnetosensitive fauna.
  - induced electric fields generated by seawater flow through the HVDC cable's generated magnetic field and consequential potential foraging or orientation impacts on electrosensitive fauna.
- Generation of heat during HVDC cable power transmission with consequential impacts to temperature sensitive marine fauna within the seabed and immediate overlying seawater.

Decommissioning phase sources of potential impacts to marine fauna

Decommissioning phase sources of impact to marine fauna are similar to those outlined above for the construction (e.g., seabed disturbance, deterioration of water quality and generation of underwater noise) assuming that the cables will be recovered. Otherwise, if the Marinus interconnector is left in situ, there are unlikely to be any sources of potential impact to marine fauna, except that corrosion of the interconnector in the very long term may release metallic and other contaminants to the seabed sediments and immediate overlying seawater.

Some of the abovementioned key sources of potential impacts are reviewed below with comments on consequential impacts on marine fauna. This report describes only those potential impacts that have the greatest likelihood of occurring and all others will be addressed in more detail in the environmental impact statement being prepared for the project.

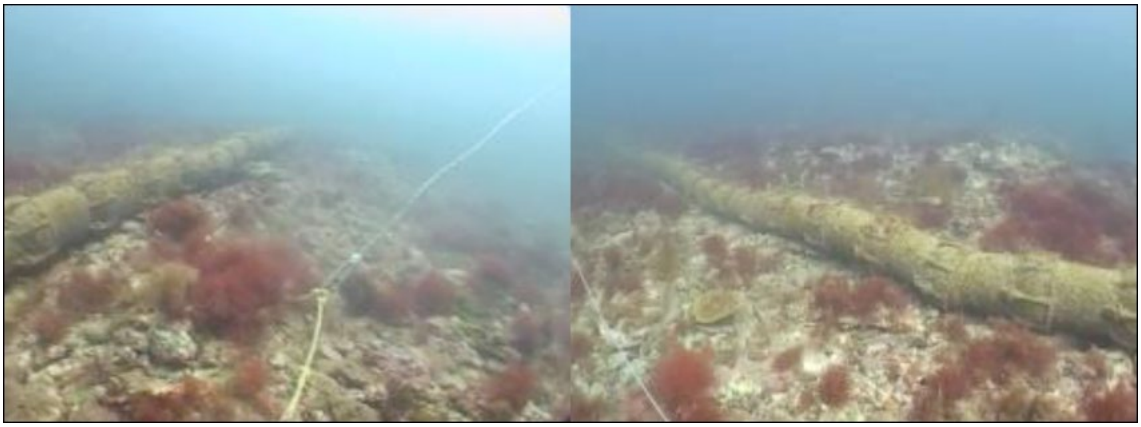
6.1.2. Potential impacts on seabed habitats and benthic communities

The seabed of the offshore route corridor is comprised of soft-bottom sediments, mainly coarse, medium and fine sands. Most of the central basin of Bass Strait comprises relatively featureless flat, soft seabed with a maximum water depth of approximately 90 m. However, some offshore sections nearer the coast may have a coarser substrate comprised of shell rubble and grit or coarse sands.

The installation of the HVDC subsea cables is relatively straight forward using a plough or water jetting ROV to excavate the cable trenches in both these seabed sediment types. In the case of the soft seabed sediments of the central basin of Bass Strait, ploughing or water-jetting may not be required, as cable laid on the seabed may self-bury and become embedded within these unconsolidated soft sediments. Note that a one-metre-long section of an HVDC subsea cable typically weighs up to 140 kg depending upon type of cable, and the Basslink bundled HVDC, metallic return and fibre-optic cables weighed 67 kg/m. The twin Marinus Link HVDC cables within a 750 MW symmetric monopole configuration will be powered to carry 375 MW each; therefore, a one-metre section may be of a similar weight or less (120 kg/m) to the Basslink HVDC cable (140 kg/m). The heavy weight of the cables assists cable self-burial. The weight of the Marinus HVDC cable per metre is yet to be determined.

Nearshore Tasmania

The marine biological monitoring program for the Basslink interconnector included post-installation monitoring of the HVDC cable overlying hard seabed in nearshore Tasmania. Monitoring was conducted at one, two and four years (February 2006, February 2007, and April 2009, respectively) after cable installation in 2005, and included transects of the HVDC cable itself (i.e., sheathed in a conduit of cast iron half-shells) and at 10 m and 50 m from the conduit (CEE, 2009). Plate 1 shows the cable conduit after one year (2006) with no growth evident on the cast iron conduit, but various fish including southern hulafish (*Trachinops caudimaculatus)* and boarfish (*Paristiopterus* sp.) were observed close to the cable.

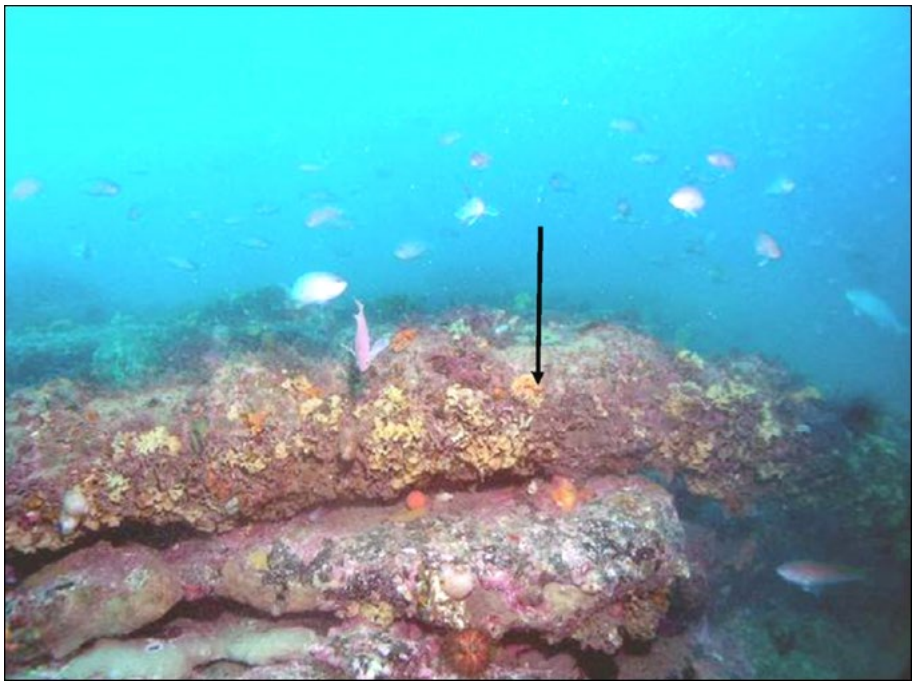


Source: CEE (2009).

Plate 1: Basslink HVDC cable conduit on hard seabed in nearshore Tasmania after one year

There was no difference visibly obvious to the marine biologists in the general nature of the assemblages close to the cable compared to the lateral 10-m and 50-m transects during the 2006 survey. Biological growths including sponges and algae were present on the rubble and rock within centimetres of the perimeter of the conduit.

In contrast, after four years, the 2009 survey showed that the cable conduit had provided a stable substratum for growth of marine organisms as demonstrated by the heavy encrustation by algal and invertebrate species in Plate 2.



Source: CEE (2009). The black arrow points to the Basslink HVDC cable conduit

Plate 2: Basslink HVDC cable conduit in hard seabed in nearshore Tasmania after four years

Marine algae including turfing species, and red, brown and green algae were all common on the conduit's upper surface, while invertebrates (such as lace-bryozoans, ascidians and sponges) were largely confined to the underside of the cable. The top of the conduit receives direct sunlight and is therefore a more favourable position for marine plants (such as seaweeds) that require light for

photosynthesis. Whereas the underside is less suitable for plants due to the lower light conditions and therefore encrusting invertebrates that do not require sunlight can successfully survive. Some areas of the conduit were devoid of, or had a low density of algae, which was attributed to algal-grazing purple sea urchins (*Heliocidaris erythrogramma*) associated with the cable conduit and the natural reef.

The 'crevice' habitat under the conduit may provide protection to some species (such as snails and urchins) that are susceptible to predation from larger species (such as large fish). The artificial physical habitat provided by the cable conduit appears to be acting as a fish aggregation device.

The monitoring program has documented a succession of ecological changes on the cable shell and surrounding seabed conditions that were a consequence of natural variation, colonisation, and ecological succession. The main conclusions drawn by CEE (2009) for the Basslink HVDC cable crossing of nearshore Tasmanian hard seabed were:

- There was no evidence of physical disturbance to the seabed due to the presence of the cable conduit.
- The installation of the cable conduit caused minimal physical disturbance to the seabed.
- The cable conduit provided a linear artificial habitat that was distinct from the randomly patchy natural reef habitats.
- The species present on the cable conduit were the same as those occurring on nearby natural seabed.
- The cable conduit provided habitat of similar stability and complexity to bedrock and boulder habitat nearby compared to the predominantly cobble habitat that previously existed along the cable conduit alignment.
- The cable habitat is narrow and does not appear to act as a barrier to fish or mobile seabed biota.
- Fish were observed swimming over and under the protective shell of the cable and mobile invertebrates such as sea urchins and abalone were using the underside of the cable shell as protective habitat.

The installation of the Marinus Link cable over similar hard seabed at the preferred nearshore Tasmanian cable route corridor option, is expected to show a similar outcome that has been shown to have occurred for the Basslink cable nearshore installation. Overall, the potential impacts of initial nearshore cable installation in nearshore Tasmanian are anticipated to be short term followed by a succession of ecological changes, such that a species matrix of the cable conduit in a few years, will be similar to those found on natural hard seabed habitats either side of the conduit. The physical presence of the Marinus Link cable in nearshore Tasmania is expected to have a beneficial impact as it provides additional vertical habitat structural diversity. However, should the HDD option be undertaken, potential impacts on nearshore seabed habitats in Tasmania within 1 km of the shoreline will largely be avoided by design.

Nearshore Victoria

The seabed within Waratah Bay in nearshore Victoria comprises mostly unconsolidated sandy seabed. The seabed habitat characteristics were investigated by CEE (2021). The work by CEE (2021) found that there is an area of cobble and patchy reef habitat covering an area of about 1 km^2 through which the Marinus interconnector route passes. This area of habitat has a well-developed biological community with a wide range of macroalgae, seagrasses, invertebrates, and some fish. Similar habitat occurs extensively to the west of the route, including along the route of the existing Bass Strait 1 telecommunications cable (CEE, 2021). Further seabed investigations will be conducted during preconstruction geotechnical sampling (e.g., van Veen grabs) and in situ measurements, as well as by baseline marine physical and biological baseline surveys.

In areas of unconsolidated seabed sediments where the HVDC cable installation involves ploughing or water jetting and burial, a larger width of seabed habitat is disturbed, including a zone of direct lateral sedimentation and a zone of indirect lateral but light sedimentation from the delayed settling of suspended sediments. This conclusion is supported by post-lay installation video surveys undertaken for the Basslink interconnector in offshore Bass Strait (Sherwood et at, 2016), which showed that post-lay conditions of the soft seabed sediment trench segments were typically represented by a shallow depression to approximately 1.5 m from either side of the cable trench. Andrulewicz et al. (2003) investigated the ecological effects of laying the SwePol HVDC cable between Sweden and Poland and, where it had been buried in sandy sediments, they found that there was no surface trace of the HVDC cable twelve months after its installation.

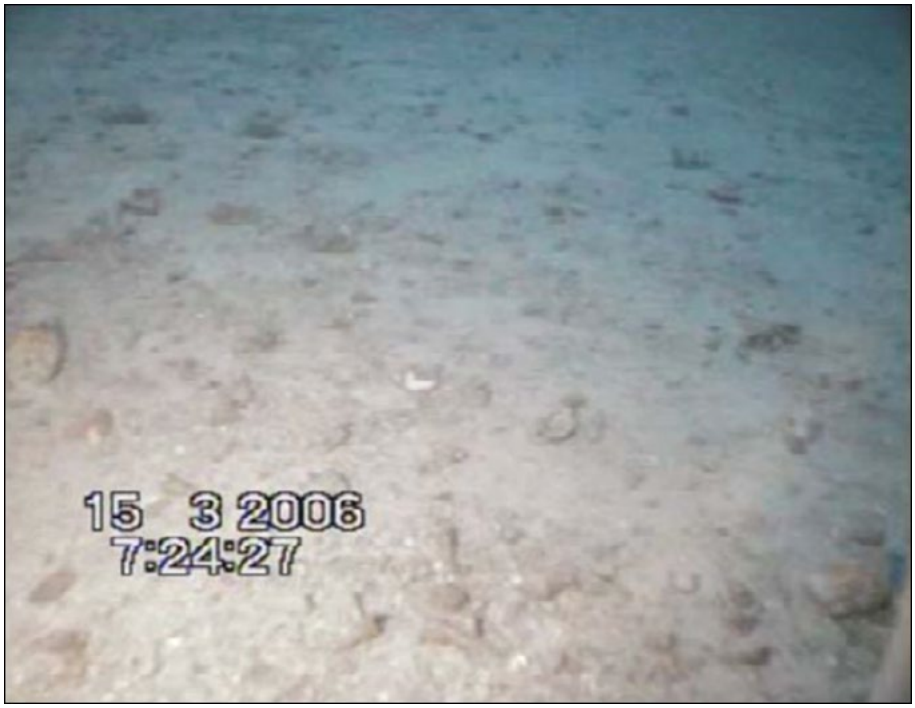
The Marinus Link will be buried in sandy seabed using either a plough or water-jetting machine to excavate, install and bury the cables. This method causes minimal disturbance to the seabed and the generally depauperate bottom flora and fauna, which are generally sparse on a sandy seabed. The post-lay disturbance of seabed is unlikely to be visible after one year, owing to seabed sediment transport filling any depressions left by the initial cable installation process. Overall, seabed and benthic community impacts are anticipated to be negligible.

If the geotechnical surveys and marine biological baseline studies do show the presence of hard seabed, then the potential impacts described above for cable installation of hard seabed for the Tasmanian nearshore would apply and are not repeated here, as the same assessment and conclusions also apply.

Offshore Bass Strait

An independent Bass Strait Environment Review Committee (BSERC) was established to oversee the monitoring of the environmental effects of the Basslink bundled cables during the installation and operation of the cable. Sherwood et al. (2016) reported on the results of remote towed video surveys of five selected locations along the offshore section of the Basslink bundled HVDC, metallic return and fibre-optic cables, which was undertaken between seven and 19 months after the cables were installed. The offshore monitoring revealed that post-lay condition of the soft seabed sediment trench segments was typically represented by a shallow depression approximately 1.5 m either side of the cable trench (e.g., see remote site 4 in Plate 3).

At some offshore sites with coarser seabed sediments, the edges of the trench with small mounds of excavated sediment (i.e., water-jetting or a rotary excavator) were still evident after 19 months. The latter suggests that natural trench infilling from mobilisation of adjacent seabed sediments may take longer in coarser seabed sediment areas of offshore Bass Strait. Notwithstanding, the results of the remote towed video surveys indicated that in both seabed types, the total area disturbed was less than 4-m wide (Sherwood et al., 2016).



Source: CEE (2007).

Plate 3: Remote Site 4 (offshore Bass Strait trench) at 12 months post-trenching

Natural filling of the trench was evident at two of the offshore sites within one year of cable emplacement. After 19 months, no surface trace of the cable trench was evident at one of the offshores sites (i.e., Remote Site 3, Plate 4).

Source: CEE (2007) reported in Sherwood et al. (2016)

Plate 4: Remote Site 3 (offshore Bass Strait trench) at 19 months post-trenching

The proposed Marinus Link cable trenches within offshore Bass Strait are anticipated to show a similar pattern of recovery from physical disturbance as was observed in the Basslink offshore cable trenches. However, in contrast to the offshore section of the Basslink HVDC cable that crossed coarser seabed sediments near the Hogan Group of islands, the proposed route of Marinus Link mainly traverses the central basin of Bass Strait, which comprises fine sands and coarse silts that will allow a more rapid recovery of seabed habitats.

The physical impacts of seabed disturbance on marine benthic communities in offshore Bass Strait are anticipated to be short term with significant recovery to pre-disturbance physical seabed conditions within about one year. Rapid recoveries of benthic infauna and epifauna are also expected to occur within a similar period (Sherwood et al., 2016).

Overall, seabed disturbances from cable-laying operations in the predominantly unconsolidated sediments of offshore Bass Strait are anticipated to be negligible and inconsequential given the much larger areas of unaffected and similar seabed habitat, as well as the rapid recovery of the post-lay seabed.

6.1.3. Potential water quality impacts on marine fauna

Potential impacts of deteriorated water quality may arise from disturbance of seabed contaminants (if present) and from turbidity plumes that will be generated by seabed disturbance during the construction phase (e.g., various cable trenching, water jetting and installation methods). Potential impacts of these stressors on marine fauna are assessed below.

Potential impacts from disturbed seabed contaminants

Field investigations for the Basslink interconnector did not reveal the presence of trace metal-contaminated sediments in Bass Strait (NSR, 2001); however, the Basslink interconnector crossed nearshore Tasmania at a relatively pristine sandy beach near Four Mile Buff, east of Georgetown. At this juncture, potential areas of contaminated sediments in Bass Strait along the proposed Marinus Link interconnector route corridors will be investigated during baseline field surveys in support of the project's environmental impact assessment.

In general, the highest concentrations of contaminants tend to be found in coastal areas, owing to human activities and the transport of contaminants by rivers to the sea. Since the nearshore Tasmanian interconnector corridor options are located near the towns of Burnie and Devonport, there is potential for seabed contamination from sources such as nearshore discharges of partially treated sewage effluents (coastal towns), offshore dredged spoil dumping grounds from construction and maintenance dredging at the ports of Burnie and Devonport, and historical contamination from the marine discharges of treated effluents from the titanium dioxide mill (Tioxide Plant) near Heybridge and the former paper mill near Burnie. The Tioxide Plant outfall pipeline discharged wastewater containing iron-based, orange-coloured particulates until closure of the mill in 1996. CEE (2021) undertook video surveys in the vicinity of the outfall, which showed no evidence of residual material on the seabed; however, sediment testing would be required to confirm whether residual trace elements or other contaminants are still present.

Assuming seabed contaminants may be present in Tasmanian nearshore sediments, interstitial (pore) waters and overlying seawater, disturbance of seabed sediments has the potential to release particulate and dissolved contaminants (e.g., trace metals and metalloids) and nutrients into the water column, with consequential effects on marine fauna. However, given the short duration and transient nature of nearshore and adjacent offshore Tasmanian construction activities, dilution of any released

contaminants and the natural dilution of resettled particulate-associated contaminants, are likely to be ephemeral with concentrations remaining below chronic toxicity threshold criteria for a range of marine organisms. Contaminated sediments are unlikely to be found in the nearshore Victorian waters (Waratah Bay) or the central basin of the Bass Strait along the proposed interconnector route corridor.

Potential impacts from construction phase turbidity plumes

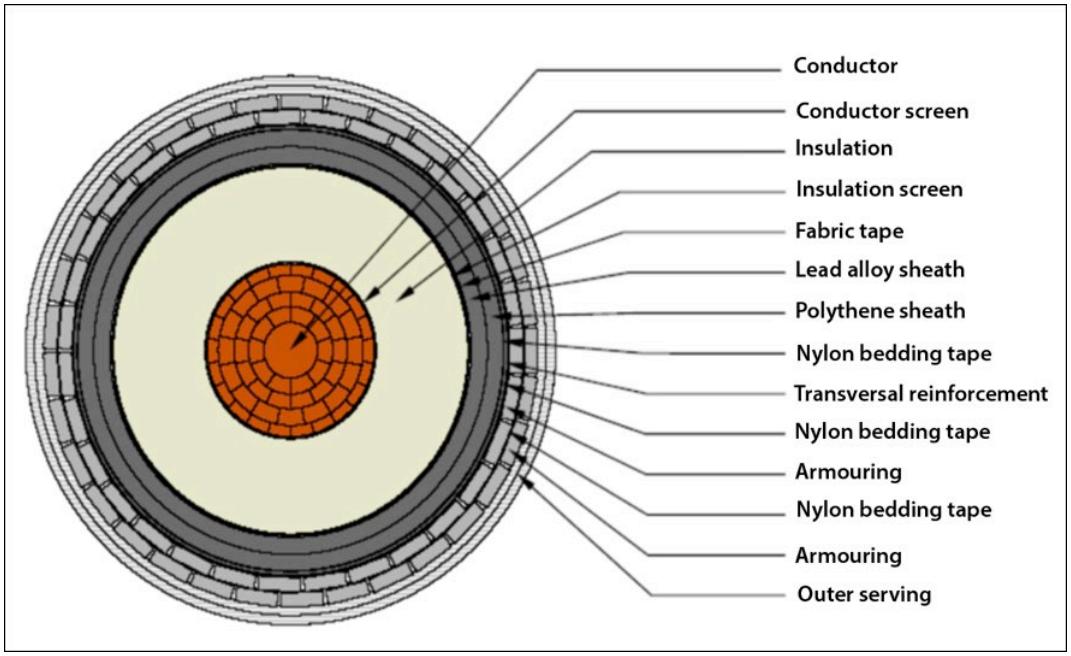
Installation of the interconnector on soft seabed sediments by ploughing or water jetting and burial activities during HVDC cable installation, will generate increased levels of total suspended sediments (TSS) and associated turbidity. The turbidity plumes that are generated will travel in the direction of prevailing currents near the seabed.

There is a higher propensity for forming turbidity plumes in those areas of seabed comprising fine sediments (e.g., fine sands and silts) than in areas where coarser seabed materials are found (e.g., coarse sands, gravels, and shell grit). However, in all types of seabed sediments the generated turbidity plumes and are expected to be generally short-lived and transient and tolerated by most fish and invertebrate marine organisms. Overall, turbidity plume impacts on marine fauna are assessed to be negligible.

6.1.4. Potential impacts of cable magnetic fields on marine fauna

During operations, subsea HVDC cables will generate a static (DC) magnetic field that will be higher than the ambient background of the Earth's DC magnetic field, which is around an average of 61.6 microTesla (μT) across Bass Strait (NSR, 2001).

Under the proposed symmetric monopole configuration, two 375 MW HVDC cables and a fibre optic cable will be bundled and laid across Bass Strait from Heybridge in Tasmania to Waratah Bay in Victoria. Figure 12 shows a cross section of a typical subsea or submarine HVDC cable for subsea application.

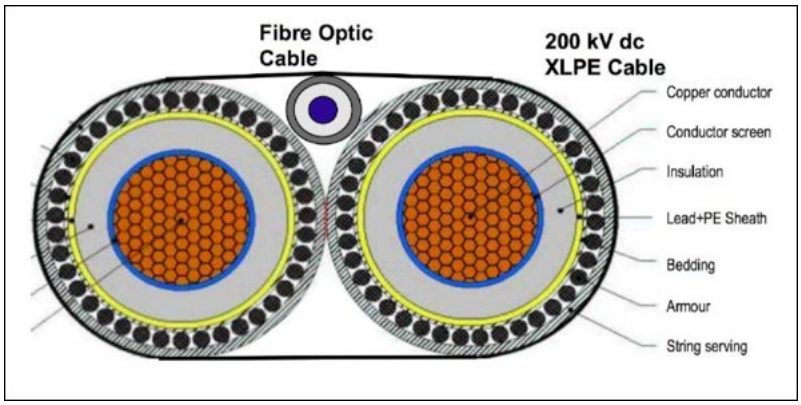


Source: Brand et al. (2014).

Figure 12: Cross section of a typical HVDC cable design for subsea applications

In Figure 12, submarine HVDC cables have a greater mechanical protection than land HVDC cables in that there is a lead alloy water protection sheath, steel wire armour layers as well as an outer string serving. The Marinus subsea HVDC cables will be a polymer type cable rather than a mass impregnated cable. The insulation of polymer-type cables is a cross linked polyethylene material, which is extruded over the conductor and conductor screen rather than wrapped as is the case for the mass impregnated cables.

Figure 13 shows an example of a typical symmetrical monopole subsea HVDC cable bundle configuration, which is the configuration that has been selected for the Marinus Link.



Source: Brand et al. (2014).

Figure 13: Typical symmetrical monopole subsea HVDC cable bundle configuration

There is expected to be a partial cancellation of the magnetic fields from the two Marinus Links' HVDC cables, which will be bundled together for each link. Magnetic fields in an energised subsea cable are caused by, and are proportional to, the current flowing through the cable (Anderson et al., 2017). Magnetic field intensity decreases rapidly with distance from the cable. Beside the presence of static magnetic and induced electric DC-fields, recent studies have shown the presence of oscillating AC-fields surrounding energised subsea HVDC cables (Hutchison et al., 2018).

Hutchison et al. (2018) measured in situ electromagnetic fields at two operating subsea HVDC cables and observed the presence of unexpected AC components in the EMF emissions for both the Cross Sound Cable and Neptune Cable in the USA. That study found that DC and AC magnetic fields extended out to 5 and 10 m from either side of the cables respectively, whereas the AC electric fields extended out to 100 m from either side of the cable. Actual in situ measurements of the Cross Sound Cable HVDC cable revealed that the average amplitude of the magnetic AC-field was 0.14 µT and the electric AC-field was 0.7 mV/m. The maximum AC-fields were measured at 0.17 µT and 0.8 mV/m for the magnetic and electric fields, respectively. The apparent presence of oscillating AC magnetic and AC electric fields will be addressed by an environmental impact assessment to be carried out in support of the Marinus Project EIS.

The background geomagnetic field across Bass Strait is variable as there are a few magnetic anomalies. Figure 14 shows natural magnetic anomalies in Bass Strait. A magnetic anomaly is the change in magnitude of the Earth's magnetic field with respect to the expected value for that location. Large volumes of magnetic materials will change the intensity of the earth's field. Across Bass Strait, the magnetic anomalies in Figure 14 mostly vary by ±200 nT, which is less than 0.5% of the total magnetic field of 61,600 nT (or 61.6 µT).

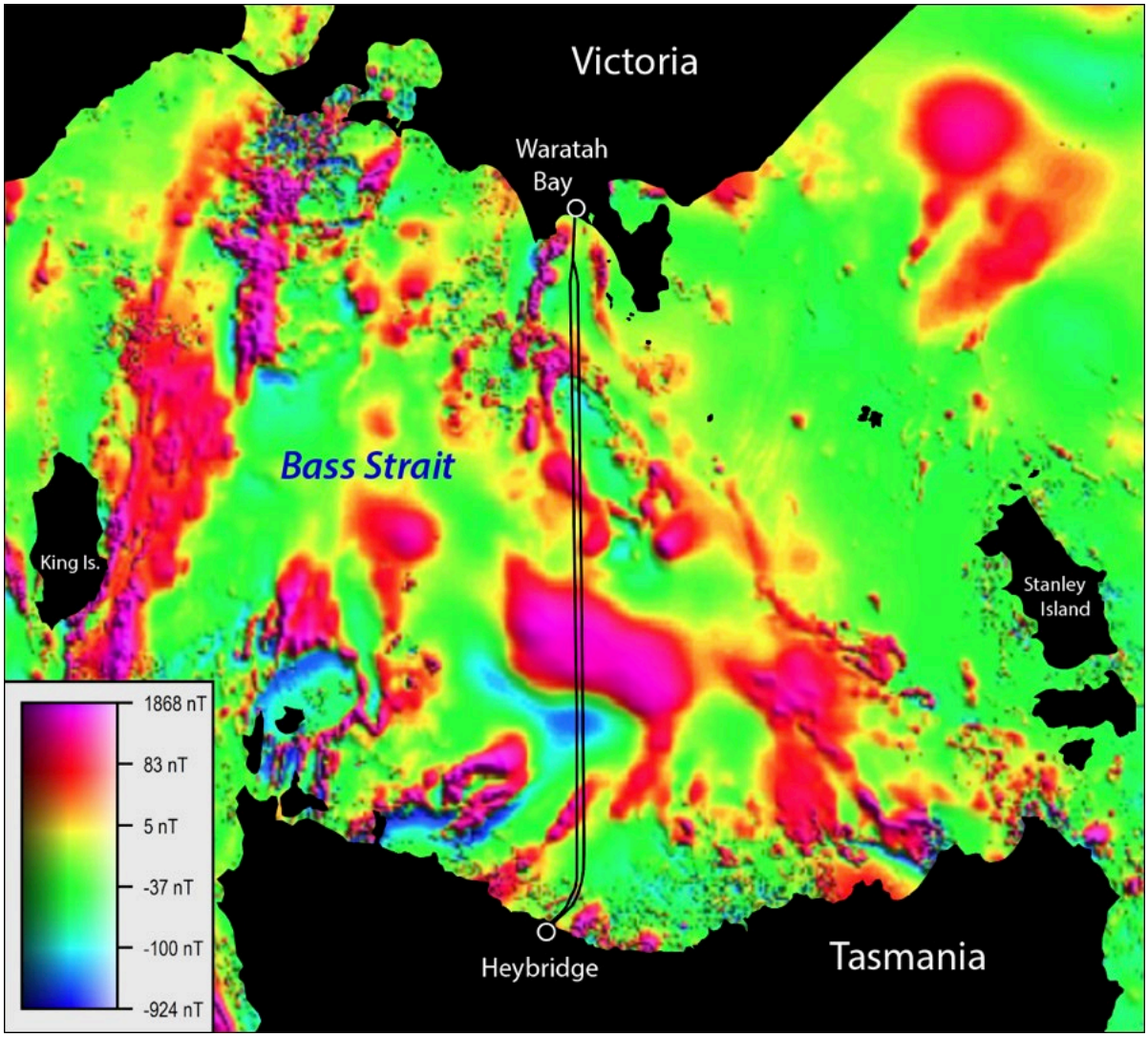
The project's environmental impact assessment will make predictions of the magnetic field generated by the project's symmetric monopole configuration, which are expected to generate a lower external

magnetic field due the partial cancelling out effect of cables' magnetic field components due to the very close proximity of the conductors to each other in a bundled configuration. Note that it is only within a coaxial cable with integral current return that the generated magnetic fields fully cancel out (Kim et al., 2009).

In the case of the Basslink interconnector, the individual conductors of the bundled HVDC cable and low voltage DC metallic return cable were separated by a short distance (i.e., 15 cm apart), which does not totally cancel out the cables' magnetic fields, resulting in the generation of a magnetic field that is above the Earth's background magnetic field in Bass Strait (average 61.6 μT). Since the magnetic fields are mainly dictated by the conductor separation distance and current (Ohman et al, 2007), once the distance between conductors of the bundled HVDC cables for the Marinus Link are known, the combined magnetic fields may be predicted (calculated using the laws of physics). Unavoidable helical twisting of the bundled cables during deployment from the cable-lay ship is anticipated to result in minor spatially higher and lower magnetic field strengths along the interconnector during operation.

The HVDC subsea cable will produce a static magnetic field, whose strength is of the same order of magnitude as the earth's magnetic field. The magnetic field from the cable will add to or subtract from the earth's magnetic field to produce a total magnetic field in the vicinity of the cable that will vary in magnitude and direction from the background magnetic field.

The potential impacts of magnetic fields generated by the Marinus interconnector during operation on magnetosensitive fauna are assessed below.



Source: Nakamura (2015). Black lines denote the Marinus Link interconnector route across Bass Strait

Figure 14: Natural magnetic field anomalies in Bass Strait

Potential impacts of magnetic fields on cetaceans

A key concern raised by the public and some scientists for the Basslink Project was that the generated magnetic field around the energised interconnector could pose a barrier to magnetosensitive whales moving or migrating through Bass Strait with the potential for live strandings. Since the Basslink interconnector (i.e., a monopolar link with bundled HVDC, metallic return and fibre-optic cables) was inaugurated in 2006, there have been no reported whale live stranding incidents to date (based on a literature review) that have been associated with or implicated to the interconnector's operation. This is also the case for the Sacoi subsea interconnector (i.e., monopolar link with an HVDC cable with an earth/sea return path) between Italy and Corsica, which is located within the Ligurian Sea Whale Sanctuary and has a higher magnetic field than the Basslink HVDC cable with a metallic return or the proposed Marinus Link interconnector with a bundled twin HVDC cable configuration that reduces the total magnetic field around the interconnector.

Based on the extensive literature review carried out for the Basslink interconnector project, no adverse impacts on cetaceans of magnetic fields generated by Basslink marine infrastructure were anticipated. This conclusion is based partly on overseas experience with subsea HVDC links, which

have not shown behavioural effects and have not linked live strandings with the operation of subsea cables. Coffey (2019) conducted a recent literature review of the effects of HVDC-generated magnetic fields on marine fauna (see Appendix F) and found that marine migratory species such as whales will generally sense HVDC cable-generated magnetic fields but concluded that they do not pose a physical barrier, which is based on the more detailed reviews undertaken by Kavet et al. (2016) and Hutchison et al. (2018). The magnetic field of the Marinus interconnector is likely to be perceived by magnetosensitive cetaceans as a highly localised 'new addition' to the heterogeneous pattern of geomagnetic anomalies prevailing in Bass Strait. Notwithstanding, the environmental impact assessment being prepared for the project will further address potential impacts of magnetic fields on cetaceans.

Potential impacts of magnetic fields on sea turtles

Much of what is known about animal response to the Earth's magnetic field comes from studies of sea turtle migration, and especially loggerhead turtles (*Caretta caretta*). Based on field and laboratory studies, Putman et al., (2015) assessed the magnetic navigation of the oceanic life stages of loggerhead turtles (*Caretta caretta*). The conclusion of these studies was that the navigation behaviour of sea turtles was closely tied to the interactions between oceanic circulation and the dynamics in the Earth's magnetic field.

The geomagnetic sense in loggerhead turtles has been studied fairly extensively, including critical early life stages, as this species depends on multiple senses at various stages of its long-distance movements. There are indications that the geomagnetic sense is critical for primary orientation to approach the general vicinity of a destination (e.g., nesting beaches, feeding grounds), but that fine-tuning is accomplished by using olfactory and visual cues (Tricas and Gill, 2011). Lohmann (1994) noted that sea turtles appear to rely on an inclination compass that does not distinguish the polarity of field lines (i.e. north versus south); instead, an inclination compass functionally defines 'poleward' as the direction along the earth's surface in which the angle formed between the total field vector and the gravity vector is smallest (Wiltschko and Wiltschko, 1972).

The main nesting beaches of loggerhead turtles are found along the northern coastline of New Guinea. Loggerhead turtles passing through Bass Strait are not likely to be exposed to the Marinus interconnector's generated magnetic field, which is expected to be at background levels in the upper water column of Bass Strait where most loggerhead turtles would be expected to be located. Overall, potential impacts on loggerhead turtles or other magnetosensitive sea turtles during transient passage through Bass Strait are assessed to be negligible. However, any conclusions about the effects of magnetic fields from HVDC cables remain somewhat hypothetical, as it is not known how sea turtles detect or process fluctuations in the Earth's magnetic field. Sea turtles are also known to use multiple cues (both geomagnetic and non-magnetic cues) for navigation and migration (Tricas and Gill, 2011).

Potential impacts of magnetic fields on bony fish

Studies have shown that there are fish species that are magnetosensitive using geomagnetic field information for the purpose of orientation (Harada et al., 2001). This implies that if the geomagnetic field is locally altered it could influence spatial patterns in fish (Ohman et al, 2007). Migrating fish would also be expected to use magnetic fields for orientation and Walker (1984) showed that the yellowfin tuna (*Thunnus albacares*) was able to discriminate between magnetic fields.

Potential impacts of the Marinus interconnector's generated magnetic field on bony fish and cartilaginous fish are assessed below.

Potential impacts of magnetic fields on bony fish

Most marine bony fish do not have a magnetosensory system; however, some species of bony fish such as European eels (*Anguilla anguilla*) and Atlantic salmon (*Salmo salar*) that undertake long distance migrations or movements to breeding grounds have a magnetosensory system. Eels are well known to migrate to distant spawning areas and have, for that reason, received special attention in studies on fish behaviour and magnetism (Ohman et al., 2007). However, it should be noted that senses that detect magnetic fields are not the only means of spatial orientation; vision, hearing, and olfaction as well as hydrographic and geoelectric information could all be used for spatial orientation (Taylor, 1986; Westin, 1990).

In a telemetry study by Westerberg and Begout-Anras (2000) the migratory patterns of European silver eels were monitored during the traverse of the subsea Baltic HVDC cable in the southern Baltic Sea. This cable produces a magnetic field of 5 μT at a 60 m distance. Using ultrasonic transmitters, the movements of the eels were tracked by boat and a fixed array of hydrophone buoys. The results were consistent with the hypothesis that the eels followed a constant magnetic compass course, with a deviation from a straight course of the same magnitude as was expected from the magnetic anomaly caused by the cable. In this case, the magnetic field of the Baltic HVDC cable was not a physical barrier to eel migration, as the eels crossed the cable with a transient and minor deviation in their heading. In addition, all the eels must also have crossed numerous HVDC cables in the Baltic Sea as returning elvers enter the Baltic Sea proper in the first place from their spawning grounds in the mid-Atlantic Sargasso Sea area.

Kilfoyle et al., (2018) assessed whether magnetic fields from subsea power cables affected coral reef fish assemblages using diver surveys of fish species occurrence and abundance associated with different cables and noted any fish reaction when the magnetic field changed. No difference was apparent between power states; however, there were indications of higher fish abundance at sites when the power was off, for which further study was suggested.

Baltazar-Soares and Eizaguirre (2017) have also shown that during the juvenile dispersal phase across the Atlantic Ocean, European eels (*Anguilla anguilla*) use the geomagnetic fields to navigate. Naisbett-Jones et al. (2018) found that eels appear to have an adaptive magnetic map linked to ocean circulation that is used throughout the different life history stages of the eel. It is assumed that the Pacific eels also possess a similar magnetosense that allows them to travel the long distance from the central Pacific Ocean to Bass Strait, where they enter the river systems of Tasmania and Victoria.

Overall, potential impacts of the Marinus interconnector's generated magnetic field are assessed to be negligible and not pose a physical barrier to magnetosensitive bony fish that may transiently pass through the magnetic field. This conclusion of negligible impacts is based on the findings of studies of migratory magnetosensory bony fish that undertake long migrations and that apparently readily pass through the magnetic fields of subsea HVDC cables.

Potential magnetic field impacts on cartilaginous fish

Anderson et al. (2017) studied free-swimming cartilaginous fish to determine how they obtain positional and navigational information via geomagnetic fields. In behavioural conditioning experiments, they showed that magnetic field perception was not just associated with the electrosensory system, but they also appear to have a putative magnetoreceptor within their naso-olfactory apparatus.

Juvenile lemon sharks (*Negaprion brevirostris*) in shallow water have been recorded avoiding magnetic fields associated with a net on their first encounter by O'Connell et al. (2011), however,

some of them became less sensitive to the magnetic field through repeated exposure to the same stimulus. Furthermore, O'Connell et al., (2014) indicated that the lemon sharks appear to increase their reliance on the electrosensory system when visual range is reduced, such as when water is more turbid.

Overall, potential impacts of the Marinus interconnector's generated magnetic field on free-swimming cartilaginous fish that transiently pass through the magnetic field are assessed to be negligible, and the magnetic field is unlikely to be a physical barrier to the transient passage of demersal cartilaginous fish through the interconnector's magnetic field.

Potential impacts of magnetic fields on decapod crustaceans

The western Atlantic spiny lobster (*Panulirus argus*) undergoes an annual mass migration in which thousands of lobsters vacate shallow, inshore areas and crawl seaward in single-file, head-to-tail processions, and is also capable of homing to specific dens in its coral reef environment (Lohmann et al., 1995).

Lohmann (1984) detected magnetic material (possibly magnetite) in the cephalothorax of the western Atlantic spiny lobster, which provides the physical basis for magnetic sensitivity. In addition, Boles and Lohmann (2003) investigated navigation and magnetic maps in spiny lobsters (Palinuridae), which also indicated the presence of a magnetosensory system. Lohmann et al. (1995) subjected spiny lobsters to a reversal of the horizontal magnetic field and noted the lobsters significantly altered course within a few minutes after the field change, whereas control lobsters tested in a constant field did not. They inferred that lobsters detected the geomagnetic field and used it as a cue in orientation.

Nevitt et al. (1995) demonstrated evidence of hydrodynamic rather than geomagnetic orientation in the western Atlantic spiny lobster (*Panulirus argus*). In their studies, tagged lobsters that were purposely displaced from patch reefs followed headings that were significantly correlated to the direction of local hydrodynamic cues and, specifically, to the direction of approaching wave surges. These studies suggested that lobsters may use cues (other than geomagnetic cues) in a local environment (in this case, patch reefs) or in areas where short, rather than long-distance, migrations or other movements take place.

Hutchison et al. (2018) conducted field experiments on migratory American lobsters (*Homarus americanus*) using large-netted enclosures to assess their behavioural response when exposed to the magnetic field generated by the Cross Sound Cable, which is a bipolar HVDC interconnector between New Haven (Connecticut) and Shoreham (Long Island New York) in the USA. The results of the experiments revealed that while the cable was fully powered (330 MW and 1175 Amps), the lobsters were exposed to a total magnetic field gradient of 47.9 to 65.3 μT, which was a maximum deviation of 14 μT from the Earth's magnetic field (51.3 μT). However, there was no evidence of lobster changes in behaviour being associated with zones of higher magnetic field (>52.6 μT) or lower magnetic field (<49.7 μT) within the treatment enclosure compared to control enclosure. Hutchison et al. (2018) concluded that the HVDC cable did not present a barrier to lobster movement.

Overall, the potential impacts of the Marinus interconnector's generated magnetic field on decapod crustacean movements in Bass Strait are assessed to be negligible, based on the above experiments and observations reported in literature.

6.1.5. Potential impacts of induced electric fields on marine fauna

The proposed HVDC cables for the Marinus Link interconnector have a metal sheathing and armouring that contains the electric field within the cable and prevents an external electric field

surrounding the cable. Recent studies (e.g., Hutchison et al., 2018) have measured the presence of unexpected magnetic and electric AC-fields associated with operating subsea HVDC cables, which will be addressed in the environmental impact assessment for the Marinus Project. However, as seawater (as an ionic medium) flows through the interconnector-generated magnetic DC- and AC-fields from tidal, alongshore, and offshore water movements will induce both electric DC- and AC-fields in the vicinity of the energised cable. The extent of seawater flow-induced electric DC-fields and induced electric AC-fields is expected to be highly localised and coincide with the extent of the generated magnetic DC- and AC-fields.

Induced electric fields may be detected by marine fauna that are capable of sensing weak electrical fields (i.e., electroreception). Electroreception has evolved in numerous cartilaginous fish species and decapod crustaceans. Potential impacts of induced electric fields associated with the Marinus Link interconnector during operation on these electrosensitive fauna are assessed below.

Potential impacts of induced electric fields on cartilaginous fish

Sharks, skates, and rays have specialised cells (‘ampullae of Lorenzini’) that allows them to detect the bioelectric signals of prey and swim across the ocean using magnetic and induced electric fields for orientation and for use as a compass. The ampullae of Lorenzini are located around the head and snout and are comprised of gel-filled pores and receptor cells, which transfer the electrical stimuli to the central nervous system where the brain analyses the incoming signal, and the cartilaginous fish responds accordingly. However, this electroreception is a short-range sensing system that some cartilaginous fish species use to detect pulsing bioelectric energy emitted by a prey organism (e.g., a flathead burrowed within a sandy seabed) and there is little evidence of this sense being used over longer distances (Caputi et al., 2013).

Naturally occurring electric fields tend to range from five nanovolts per centimetre (nV/cm) to over 500 nV/cm with a low frequency (>5 Hz), and so it is probable that in the immediate proximity of HVDC cables that the induced electric fields will generate higher values than natural background levels (Mojetta et al. 2001). The larger static induced electric field of an HVDC cable is unlikely to deter sharks and rays from detecting pulsating bioelectric fields of their prey. In laboratory studies, Kimber et al. (2011) showed that the benthic and electrosensitive small-spotted catshark (*Scyliorhinus canicula*) was unable to discriminate between biological electric fields from a typical crustacean prey (the shore crab, *Carcinus maenas*) and an artificially produced electric field. However, in a subsequent study, Kimber et al. (2014) clearly demonstrated how the same catshark species had a clear, innate ability to learn about electrical stimuli to enable them to distinguish between those that provide a food return (such as prey within sandy seabed located via their bioelectric fields) and those that are anthropogenic in origin and that provide no food return (Kimber et al., 2014).

Hutchison et al. (2018) conducted experiments with the electrosensitive little skate (*Leucoraja erinacea*) exposed in enclosures to the magnetic fields and induced electric fields generated over the Cross Sound Cable, which is a bipolar HVDC interconnector between New Haven (Connecticut) and Shoreham (Long Island New York) in the USA. They found that the HVDC cable’s electromagnetic field was not a physical barrier to the little skate’s movements. However, the skates were found more frequently and spent a greater amount of time in the zone of high EMF at the treatment enclosure (i.e., over the cable), where they swam slower and closer to the seabed. However, the behavioural differences in their study did not provide detail on whether the skates were responding to the DC magnetic field or the induced electric field from either water movement, or their own movement through the magnetic field (Kalmijn, 1982). Hutchison et al. (2018) concluded that the behavioural responses to exposure to the cable’s EMF did not represent a barrier to the little skate.

Overall, the potential impacts of induced electric fields generated by seawater flow through the Marinus interconnector's generated magnetic field during operation on electrosensitive cartilaginous fish are assessed to range from negligible to minor.

Potential impacts of induced electric fields on decapod crustaceans

Electroreception has not been detected in marine invertebrates. Overseas evidence indicates that marine invertebrates are insensitive to weak electric fields. Long-term studies and monitoring of operating sea electrodes of monopole HVDC interconnectors with an earth/return path in Scandinavian countries have not shown adverse reactions in macroinvertebrates, which live without apparent harm on and adjacent to the sea electrodes of the Koniskan HVDC link between Sweden and Denmark (ELSAM, 1986) and the Baltic Cable HVDC Link between Sweden and Poland (Poleo et al., 2001).

Due to their epibenthic habitat and relatively low mobility, some species of electrosensitive decapod crustaceans could be exposed to the induced electric field surrounding the Marinus interconnector's magnetic field during operation. However, the potential impacts of the induced electric field are assessed to be negligible, based on overseas studies and observations at operating HVDC links.

6.1.6. Potential thermal impacts on marine fauna

Electric current running through a conductor causes its temperature to increase. In the case of power transmission in HVDC interconnectors, a certain amount of energy gets lost as heat. This heat loss has the potential to cause an increase in temperature on the cable surface, potentially warming the surrounding ambient environment of water (i.e., cable laid on the seabed) or seabed sediments (i.e., cable buried in soft sediments). HVDC cables installed on the sea floor do not heat up the surrounding seawater due to the constant flow of water dissipating the thermal energy (Worzyk, 2009). However, buried subsea HVDC cables may result in surrounding sediment that is slightly warmer in the immediate vicinity of the cable (Worzyk, 2009).

Boehlert and Gill (2010) suggest that the thermal effect is a small increase in temperature within a few centimetres of the cable. A study for the BritNed interconnector indicated that during the northern summer, the temperature of the sediment immediately surrounding an energised HVDC cable may increase between 0.5°C and 5.5°C through localised heating when the cable is buried at a depth of 1 m. A field experiment on subsea power cables from Nysted offshore windfarm found the maximum temperature difference between control sites and cable sites was 2.5°C and the mean difference was 0.8°C (Meiβner et al., 2006).

As most of the Marinus Link will be buried in the seabed, the only organisms likely to be affected by warming are infauna and burrowing species, as the water column surrounding the interconnector sections exposed on bed rock in nearshore Tasmania, for example, is expected to dissipate any surface temperature increase as tidal and alongshore currents remove the heat generated. Overall, potential thermal impacts on marine fauna generated by the Marinus Link during operation are anticipated to be small and highly localised to the immediate vicinity of the energised interconnector. This conclusion is confirmed by Meiβner et al. (2006), who undertook a literature review on this topic and found that there was no evidence of significant influence on marine fauna due to water temperature rises caused by energised power cables.

6.1.7. Potential impacts of underwater noise on marine fauna

There are no clear indications that underwater noise caused by the installation of subsea cables poses a risk of acoustic damage impacts to noise-sensitive marine fauna such as marine mammals (whales, dolphins, seals), sea turtles and fish. Most project underwater noise emissions are low frequency, non-impulsive broadband noise, which is unlikely to cause acoustic damage impacts in contrast to loud impulsive noise sources such as from underwater explosions, 2-D or 3-D seismic surveys (large 2000-cubic inch airgun) or impact pile-driving activities. The underwater noise impact assessment for the Basslink Project (NSR, 2001) found that acoustic damage impacts to marine fauna were absent and that acoustic disturbance impacts to low-frequency hearing cetaceans (e.g., large baleen whales such as humpback whales) were unlikely to be significant, and the reaction of whales to the presence of a cable-lay ship or attendant construction work vessels were the same as that to the presence of ships and vessels in general.

Section 4.1.1 identified the principal underwater noise sources arise from impulsive intermittent low frequency broadband noise from seismic refraction (small airgun) during preconstruction geophysical surveys and non-impulsive continuous broadband noise from project-related vessels (engines, and propellers and thrusters) and cable installation activities (e.g., ploughing or water-jetting machines).

Potential impacts of interconnector installation noise on marine fauna

The potential impacts of underwater noise generated by the cable-lay ship and nearshore trenching on key noise-sensitive marine fauna has been assessed.

Potential impacts of cable-lay ship underwater noise on cetaceans

The cable-lay ship will maintain its position and heading using a dynamic positioning (DP) system. In the case of a typical cable-lay ship (e.g., CS *Giulio Verne*), the ship makes use of four azimuth thrusters and one bow tunnel thruster, all controlled by its DP2[5] system. A literature review did not reveal any underwater noise source level measurements of this cable-lay ship. However, underwater noise source levels for dynamically positioned vessels are reported for a 107-m long dive support ship of 178 dB re 1µPa at 1m (Seiche, 2008) and a 64-m long platform supply vessel under DP of 187 dB re 1µPa at 1m (Duncan and McCauley, 2008). For the purposes of this report, an underwater noise source level of 185 dB re 1µPa at 1m has been adopted for a large capacity cable-lay ship, such as the 133-m long CS *Giulio Verne,* maintaining position or heading using DP2 mode.

The acoustic disturbance threshold criterion for large low frequency hearing whales (Mysticeti) such as humpback whales is 120 dB re 1µPa rms (Environment Australia, 2001; McCauley and Duncan, 2008; NMFS, 2016:). Based on sound transmission loss using a crude spherical model ($20Log_{10}R$, where R is the range in metres), the acoustic disturbance zone is located within an approximate radius 1.8 km of the cable-lay ship. This represents a relatively small impact zone given the width of Bass Strait (283 km). The environmental impact assessment for the Marinus Link EIS will update the acoustic modelling of cable-lay ship noise to derive more quantitative estimates of distances to the acoustic disturbance threshold of 120 dB re 1µPa rms for low frequency hearing cetaceans.

The low frequency, continuous non-impulsive under water noise generated by the cable-lay ship and attendant vessels and the slow progress rate (speed <1 knot) of the cable-lay ship across Bass Strait

[5] DP2 has redundancy so that no single fault in an active system will cause the system to fail.

when laying the Marinus interconnector is not anticipated to significantly disturb large whales beyond about 3 km from the cable-lay ship. Watkins (1986) and McCauley et al. (1996) have shown that rapidly approaching or rapidly increasing noise may constitute a threat to whales and that vessel noises that are erratic and involve many sharp changes in levels over short time scales are more likely to cause adverse behavioural reactions. However, the cable-lay ship does not involve erratic or rapidly increasing noise source levels. Overall, the potential impacts of underwater noise generated by a large cable-lay ship on cetaceans are assessed to be negligible to minor (i.e., minor deviations of migrating whales).

Potential impacts of trenching underwater noise on cetaceans

Trenching noise has been found to be a mixture of broadband noise, tonal machinery noise and transients associated with excavation seabed materials. The level of noise can be highly variable and dependent on the physical properties of the seabed that is being trenched or cut (Nedwell et al., 2003).

In terms of nearshore trenching operations, Nedwell et al. (2004) measured a received underwater noise level of 123 dB re 1µPa rms at 160 m from a seabed trenching operation in very shallow water. This received level back-calculates to a trenching source level of 156 dB re 1µPa at 1m using the practical sound transmission loss equation ($15Log_{10}R$, where R is the range in metres).

The distance to the acoustic threshold criterion of 120 dB re 1µPa rms for disturbance to large cetaceans is 251 m radius from a trenching operation, assuming a sound pressure source level of 156 dB re 1µPa at 1m. This acoustic disturbance zone represents a small area of whale habitat in the nearshore area where trenching may occur. Overall, potential impacts of underwater noise from nearshore trenching on cetaceans are assessed as minimal, which includes mid-frequency hearing cetaceans such as dolphins that are inquisitive and may approach (attraction) active trenching operations.

Overall, the potential impacts of seabed interconnector installation underwater noise on the key noise-sensitive, low frequency cetaceans of Bass Strait are assessed to range from negligible to minor. This conclusion is partially based on the fact, that whales moving or migrating through Bass Strait may be widely dispersed within offshore areas of, say, tens or hundreds of square kilometres. In this case, only a very small percentage of the whale population might be in areas where they may be disturbed by cable installation activities. In addition, marine mammal observers onboard the CS *Giulio Verne* during its first leg of the Basslink cable-lay operation did not observe any whales or dolphins (G. Pinzone, 2019, pers. com.) and during the remaining legs to nearshore Tasmania (Gwyther, 2019, pers. com.). In terms of underwater noise, compared to seismic surveys, drilling, pile hammering or military activities, noise generation related to subsea cable projects is not considered to have the greatest potential for harming cetaceans or other marine fauna (Meißner et al., 2006).

Potential impacts of underwater noise on sea turtles

Sea turtle hearing sensitivity is not a well-researched topic, and a literature review did not reveal any published acoustic damage or acoustic disturbance threshold criteria for unconstrained, free-ranging sea turtles at sea.

McCauley et al. (2000) conducted a trial on a caged green and a loggerhead turtle with an approaching-departing single airgun. This study found that above a received level of 166 dB re 1µPa rms both turtles increased their swimming activity noticeably compared to non-airgun operations. Above a received level of 175 dB re 1µPa rms their behaviour become erratic, which was concluded to be approximately equal to the point at which unrestrained turtles may show avoidance behaviour.

For the purposes of this report an acoustic threshold of 166 dB re 1µPa rms has been adopted as a conservative criterion at which behavioural effects may occur in free ranging (non-constrained) sea turtles in the absence of acoustic impact criteria.

Based on the sound pressure noise source level of 185 dB re 1µPa at 1m for a typical, large cable-lay ship, the distance to the acoustic disturbance threshold of 166 dB re 1µPa rms for free-ranging sea turtles is a radius of 9 m radius, based on a spherical transmission loss model. This represents a very small acoustic disturbance impact zone and potential impacts of underwater noise from the cable-lay ship on sea turtles are assessed to be negligible.

In the case of nearshore trenching with a sound pressure source level of 156 dB re 1µPa at 1m, the acoustic disturbance threshold of 166 dB re 1µPa rms for free-ranging sea turtles is not exceeded; therefore, potential underwater noise impacts of nearshore trenching on sea turtles are assessed as negligible.

Potential impacts of underwater noise on fish

In general, there are no underwater noise level criteria that are promulgated to minimise acoustic disturbance to fish. However, a literature search found that WSDOT (2015) suggested an acoustic disturbance criterion of 150 dB re 1µPa rms for all marine fish, which was based on impulsive noise (e.g., pile driving). For the purposes of the present report, an acoustic disturbance criterion of 150 dB re 1µPa rms has been adopted as a threshold criterion above which acoustic disturbance of bony fish may be expected. This acoustic disturbance criterion does not apply to cartilaginous fish as they only possess inner ear labyrinths, which allows them to detect particle motion (Myrberg, 2001). They have no accessory organs of hearing often found in bony fishes, such as a swim bladder or bony connections between the swim bladder and the labyrinths (Amundsen and Landro, 2011).

Based on the sound pressure noise source level of 185 dB re 1µPa at 1m for the cable-lay ship CS *Giulio Verne*, the distance to the acoustic disturbance threshold of 150 dB re 1µPa rms for pelagic and mid-water bony fish is a radius of 56 m radius, based on a spherical transmission loss model. This represents a very small acoustic disturbance impact zone and potential impacts of underwater noise from this source on sea turtles are assessed to be negligible. This conclusion is confirmed by Røstad et al. (2006) who found contrary to their initial expectations that fish were attracted to vessels rather than being repelled by them. They found that fish rapidly accumulated below research vessels at anchor or kept stationary by dynamic positioning, or freely drifting.

In terms of underwater noise from nearshore trenching and based on the sound pressure noise source level of 156 dB re 1µPa at 1m, the distance to the acoustic disturbance threshold of 150 dB re 1µPa rms for pelagic and mid-water bony fish is a radius of <2.5 m radius, based on the practical transmission loss model. This presents a very small zone of impact within which bony fish may be disturbed and temporarily displaced horizontally. Overall, underwater noise impacts from trenching on bony fish are assessed to be negligible.

6.1.8. Potential impacts on marina fauna of conservation value

The proposed route corridor options do not pass through any conservation areas such as marine protected areas or coastal national parks. However, the offshore section of the interconnector will pass through a deepwater zone (between the 65 to 75 m isobaths) in southern Bass Strait that is known to contain habitat that could be occupied by a deep-water coral-sponge community, which is currently being evaluated to assess its biodiversity value. Potential seabed disturbance impacts on this deepwater habitat zone are assessed below.

Potential impacts on Bass Strait mesophotic coral-sponge beds

Mesophotic coral-sponge communities (known simply as 'sponge beds') of the seabed in Bass Strait have been described and their biodiversity value assessed by Butler et al. (2002). The Museum of Victoria conducted research cruises to assess the marine diversity of Bass Strait and identified the existence of 'sponge beds' around an arc in southern central Bass Strait. The sponge beds are located at a water depth between 65 m and 75 m and comprise a mesophotic community of sessile, filter-feeding fauna generally containing habitat-forming organisms such as sponges, octocorals, bryozoans and ascidians.

The Marinus Link interconnector cable route cannot avoid crossing this potential area of sponge beds and will cross them to the north of Heybridge, where a 35-km long traverse of the proposed interconnector route crosses the 65-m and 75-m isobaths. The presence, extent, and density of sponge beds in this area will be ascertained during baseline video and seabed sampling surveys. Based on the expected direct cable trenching and burial disturbance and lateral sedimentation width combined with indirect lateral sedimentation from delayed settling of suspended sediments of around one to several metres, the area of sponge beds potentially impacted would be small, given the large area of remaining unaffected sponge beds in the arc of seabed between 65 and 75 m found in southern Bass Strait. Overall, potential impacts in offshore sponge beds from cable installation are assessed to be minimal and the beds are expected to recover once the depression of the cable trench is naturally filled with similar sediment types from adjacent seabed sediment transport.

6.2. Potential impacts on marine resource use

Potential impacts on marine resource use relate principally to space-use conflicts with other maritime users including navigation and shipping, as well as the Bass Strait commercial and recreational fishing industries.

6.2.1. Potential impacts on navigation and shipping

Potential impacts on navigation and shipping relates primarily to the moving temporary safety exclusion zone around the cable-lay ship and attendant vessels, and the potential impact of the HVDC cable's magnetic field on ships' compasses.

Potential temporary exclusion zone impacts

Figure 11 shows a cumulative snapshot of shipping traffic density in Bass Strait on 25 March 2019. During the construction phase, a moving temporary exclusion zone will be established around the cable-lay ship as it moves slowly (less than 1 to 2 knots) across Bass Strait. Implementation of mitigation and management measures (e.g., Notices to Mariners, radio communications, and the presence of tender vessels to alert and ward off third-party vessels that approach too closely) will have alerted ships' captains or skippers to the presence of the cable-lay ship operations in terms of areas, dates, timing and duration.

Commercial fishing vessels are also required to abide by the conditions set by the temporary exclusion zone and not to operate fishing gear astern of the cable-lay ship, where cable being actively laid may extend to about one nautical mile astern of the ship. Potential impacts on commercial fisheries are assessed in Section 6.2.2.

Overall, potential impacts on navigation and shipping and commercial fishing vessels are envisaged to be minor or negligible (i.e., inconsequential), given that only minor deviations around the cable-lay ship may be required.

Permanent exclusion zone impacts

During operations, the final alignment of the interconnector will be marked up on navigation charts, which serves as an indication to ships' masters of the presence of the HVDC transmission cables and to avoid, where practicable (save for emergencies), and not to anchor or drop anchors within the alignment. However, the HVDC subsea and fibre-optic cables buried in the seabed still require to be protected from ship and fishing vessel anchors, despite the protective mitigation measure of burying the cables at a minimum depth of 1.5 m within the seabed.

The risk of an anchor or fishing gear snagging the cable in the offshore buried Marinus Link interconnector is considered to be low. In Section 5.2.4, various fisheries mitigation and management measures were outlined, such that a permanent exclusion zone during operations may not be required. In some jurisdictions, permanent exclusion zones are applied to prohibit commercial fishing (e.g., trawlers) from fishing adjacent to and over the cables. An example of a permanent exclusion zone is the Cook Strait Cable Protection Zone (CPZ), which is an approximate 7-km wide zone overlying the subsea HVDC interconnectors between the north and south islands of New Zealand (TransPower, 2011). The Basslink interconnector operates with a voluntary code of conduct, rather than a fishing exclusion zone, but mariners are advised to take extreme caution when using gear or anchors in the vicinity of the cable. They are also provided with charts of the cable location and detailed instructions and contact numbers in the event of a suspected hook-up. Subject to consultation with commercial fishers and relevant authorities, a similar process may be proposed for Marinus Link.

Potential impacts on ships' magnetic compasses

The static magnetic field generated by buried HVDC cables that are energised (i.e., power is being transmitted) reaches background levels of the Earth's total magnetic fields within 5 to 10 m, as was shown for monitoring of the Basslink HVDC cable during operations (Coffey, 2007; Sherwood et al., 2016) and at other overseas interconnectors (Andrulewicz et al., 2003).

In the deeper waters of Bass Strait, the magnetic field at the sea surface above the buried sea HVDC cable is the same as the average background level of 61.6 microTesla (μT); therefore, it is unlikely to be detected or appear as just a passing blip by modern ships' magnetic compasses. However, in the shallow (<10 m water depth) nearshore waters of Tasmania and Victoria, the generated magnetic field will be above the Earth's background level of 61.6 μT and, as such, may show up as a momentary compass needle deflection as a vessel or small boat passes over the cable's position. Overall, the potential impact of the Marinus Link's generated magnetic field is assessed to have negligible impacts on ships magnetic compasses.

6.2.2. Potential impacts on commercial fisheries

Offshore cable laying operations will potentially cross over a number of commercially important fishing grounds. Potential construction phase impacts on commercial fishing relates mainly to the temporary exclusion zone and fishing over the interconnector during the operation phase.

Offshore temporary exclusion zone around the cable-lay ship

During the construction phase, commercial fishing vessels are required to abide by the conditions set by the temporary exclusion zone and not to enter or operate fishing gear astern of the cable-lay ship. As noted in Section 6.2.1, potential impacts on navigation and shipping movements applies equally to the movements of commercial fishing vessels.

In central Bass Strait, the cable will be laid directly on the seabed in those areas where unconsolidated fine-sized sediments prevail, and the cable allowed to self-bury (or assisted burial in some locations to ensure adequate cover) and slowly become embedded (i.e., sinking) into the seabed. During this period of delayed embedding, the cable may be at risk of damage from anchor drop, as well as from towed demersal fishing gear.

Given the large areal extent of the Bass Strait fishing grounds, alternative areas may be fished while cable-laying operations are in progress and the temporary exclusion zone remains in force. Therefore, potential impacts on commercial fishing activities are not expected to arise from the moving temporary exclusions zone around the cable-lay vessel as it traverses central Bass Strait. The lower levels of commercial fishing in the deep waters of the central basin of Bass Strait as opposed to higher levels of fishing activities in western and eastern Bass Strait also reduces potential fishing vessel interactions with the moving cable-laying operation.

Fishing or anchoring over the installed subsea cable

The mitigation measure undertaken to bury the subsea cables are largely aimed at protecting the cable from the risk of damage from anchor drop, as well as from towed demersal fishing gears. The risk of an anchor or fishing gear snagging the cable in the buried section of the offshore alignment is assessed to be low. In addition, proposed fisheries mitigation and management measures outlined in Section 5.2.4 will serve to minimise interaction of the laid interconnector and commercial fisheries with bottom-fishing gears. Overall, potential impacts on commercial fisheries during project operations are anticipated to be negligible. No significant impacts on commercial fishing activity within the main fishing grounds that lie outside the final interconnector alignment are expected.

6.2.3. Potential impacts on recreational fishing

Potential impacts on recreational fishing relate mainly to the construction phase as during operations, the nearshore and offshore interconnector is either protected by cast iron half-shells or buried within the seabed.

Nearshore temporary exclusion zones

During the construction phase, a temporary exclusion zone will be in place around shore crossing construction and nearshore interconnector installation in both Tasmania and Victoria. The recreational fishing areas of Tasmania and Victoria will be identified during marine resource use surveys or consultations with recreational fishing bodies. However, nearshore recreational fishing activities will be expected to be concentrated in areas closer to the population centres with boat ramps (e.g., Heybridge in nearshore Tasmania and Walkerville boat ramp in Waratah Bay).

Potential impacts on recreational fishing in nearshore Tasmania

During the construction phase, a temporary exclusion zone around shore crossing construction activities and nearshore interconnector installation will be required. The project will have informed

recreational fishers and boaters of the dates and duration of proposed nearshore construction activities via public notices in local newspapers or via other media.

In the case of transiting boats, a minor deviation offshore and around the temporary exclusion zone will be required. In terms of recreational fishers fishing from the shoreline (e.g., surf fishing), there are alternative areas to fish along the coast during the laying time. Overall, potential impacts on recreational fishing in nearshore Tasmania are assessed to be negligible and can be managed though implementation of recreational fishing mitigation and management measures.

Potential impacts on recreational fishing of nearshore Victoria

Given the anticipated lower level of recreational fishing within Waratah Bay (compared to nearshore Tasmania), which has a predominantly sandy seabed with an absence of higher fish diversity reef habitats, potential impacts on recreational fishing in the nearshore Victoria interconnector route corridor is assessed to be negligible. However, there is seasonal camping around the bay when additional recreational fishing by boat and from the shoreline is likely to be undertaken. Overall, installation of the Marinus interconnector in nearshore Victoria will be undertaken over a relatively short period (less than 5 days) compared with nearshore Tasmania, which has subtidal rock platforms, cobbles, and low-profile reef areas.

7. Information and data gaps

Based on the findings of this report, previous experience with the Basslink interconnector across Bass Strait and a literature review of other HVDC interconnectors around the world, the following information and data gaps are identified at this juncture (June 2021).

7.1. Knowledge gaps

Potential knowledge gaps relate to HVDC cable installation and operation in general. Some of the identified knowledge gaps are summarised below.

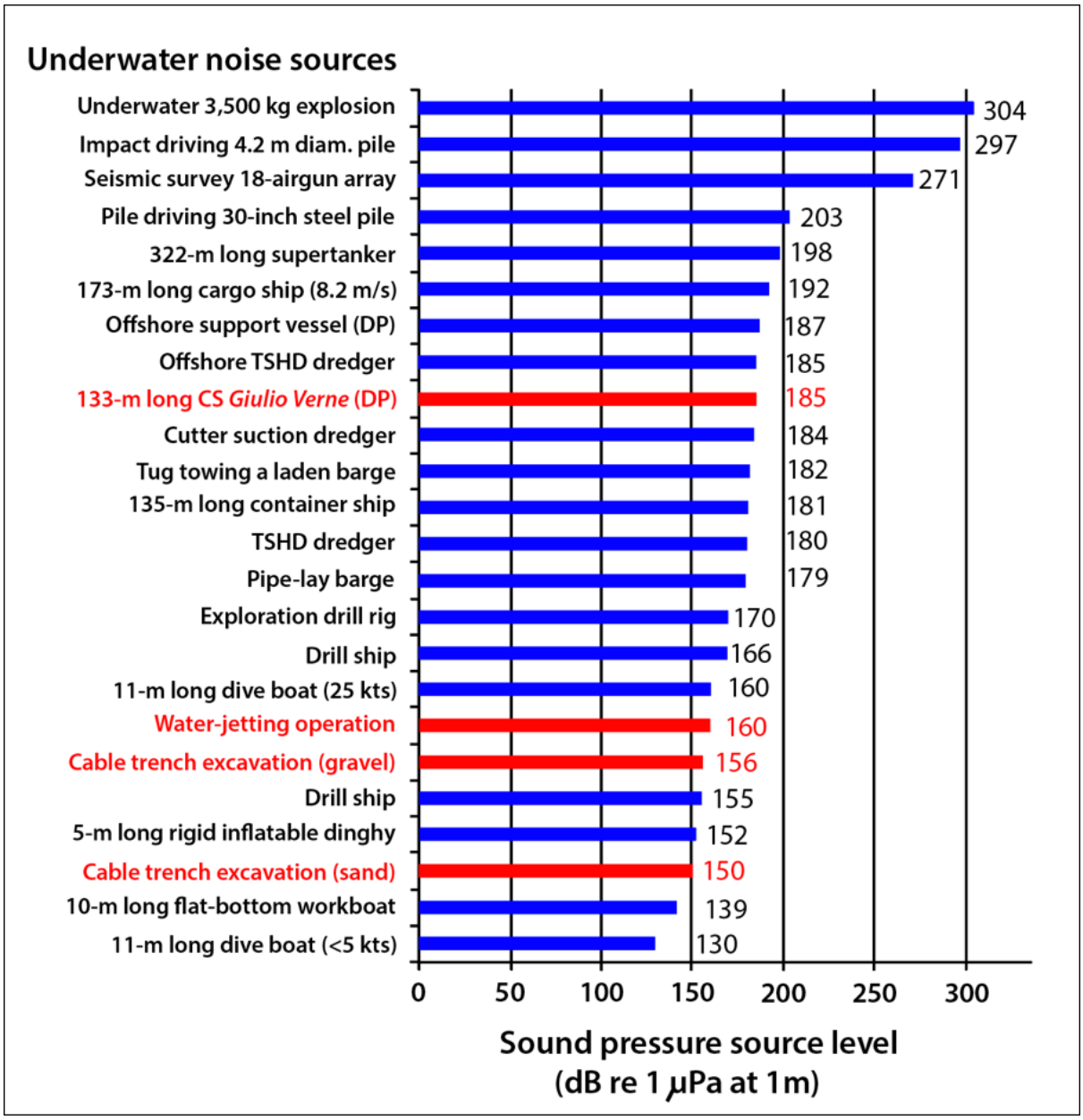
7.1.1. Impacts of electromagnetic fields to marine fauna

Knowledge gaps in relation to the potential environmental impacts of subsea HVDC cables are associated with uncertainties around how electromagnetic fields (EMF) impact upon magnetosensitive marine fauna. The findings of this report agree with those of recent reviews of the effects of EMF generated by overseas subsea interconnectors on marine fauna by Coffey (2019), Hutchison et al. (2018), Taormina et al., 2018), and Kavet et al. (2016) and Basslink (Sherwood et al., 2016). While Hutchison et al (2018) concluded that “to date, there is no demonstrable impact (negative or positive) of EMF related to subsea cable energy emissions on EM-sensitive species”, their recent measurements of both magnetic and electric AC-fields associated with operating subsea HVDC cables in the USA requires further investigation and an assessment of implications for the Marinus Link.

7.1.2. Acoustic impacts to noise-sensitive marine fauna

Information on acoustic impacts of construction activities and interconnector installation and burial is generally lacking, especially for the noise levels produced by the range of available cable burial

devices and tools in the various types of seabed sediments likely to be encountered in nearshore and offshore Bass Strait. Once the numbers, types and sizes of construction-associated vessels likely to be used in Marinus Link and interconnector installation techniques are known, it is recommended that a more detailed underwater noise impact assessment is carried out for the environmental impact statement being prepared for the project. Notwithstanding, Figure 15 shows a comparison of underwater noise sources including those predicted for the Marinus Link Project at this juncture, which shows that project underwater noise sources are relatively benign compared to other sources of marine construction or operational noise, except for the underwater noise generated by a typical, large cable-lay ship (e.g., CS *Giulio Verne*).



Notes: Marinus Link -related noise source levels are shown in red.

Figure 15: Comparison of Marinus Link underwater noise source levels with other sources

In Figure 15, the sound pressure source levels of project construction activities such as cable installation and nearshore trenching are shown in red. Note that most construction noise sources associated with cable water-jetting and trench excavations are transient and low-level underwater noise sources. The exception will be a typical large cable-lay ship, which is estimated to have a sound pressure source level of 185 dB re 1µPa at 1m. Unlike louder impulsive noise sources (e.g., seismic surveys using airguns or impact pile driving), the cable-lay ship will generate non-impulsive continuous or intermittent broadband noise from the combined or individual operations of its bow thruster and azimuth pod thrusters when holding position or maintaining its heading via dynamic positioning (DP2).

7.1.3. Potentially contaminated seabed sediments

CEE (2021) undertook video surveys in the vicinity of the outfall of the Tioxide Plant offshore of Heybridge in February 2019, which showed no evidence of residual material on the seabed. However, it is recommended that seabed sediment sampling and testing should be carried out to confirm whether residual trace elements or other contaminants are still present or not.

8. Conclusions

Based on the findings of this report, a few preliminary conclusions may be drawn, which will be confirmed or discounted by further detailed assessment in the Marinus Link project's environmental impact assessment. The main conclusions at this juncture are as follows:

- While there appear to be some knowledge gaps (see Section 7) in certain areas of understanding at this juncture, the potential impacts of the proposed Marinus subsea HVDC interconnector on the Bass Strait environment and marine resource use are anticipated to be manageable and of negligible to low (minimal) impact.
- Holistically, there seems to be a reasonably comprehensive knowledge on the marine environmental effects of subsea HVDC interconnectors and projects that have not been hindered by a perceived lack of knowledge.
- The project environmental impact assessment will address the residual impacts of constructing (cable installation), operating, and decommissioning the Marinus Link interconnector across Bass Strait after mitigation and management measures have been implemented.
- Based on experience gained from the environmental monitoring program of the Basslink interconnector across Bass Strait, potential impacts of the proposed Marinus Link interconnector (if similarly configured, i.e., bundled cables) are anticipated to be of similar magnitude and extent, since both projects have the same marine environmental and resource use issues and concerns.

Finally, note that this preliminary document does not substitute for the environmental impact assessment that will be prepared for the project. If there is any apparent ambiguity or insufficient information, then reference should be made to the environmental impact assessment and its supporting documents in a future environmental impact statement.

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APPENDIX A

EPBC Act Protected Matters Search Tool (PMST) Report
Waratah Bay, Victoria

by

Department of Agriculture, Water and the Environment
Australian Government

20 May 2021

Australian Government

Department of Agriculture, Water and the Environment

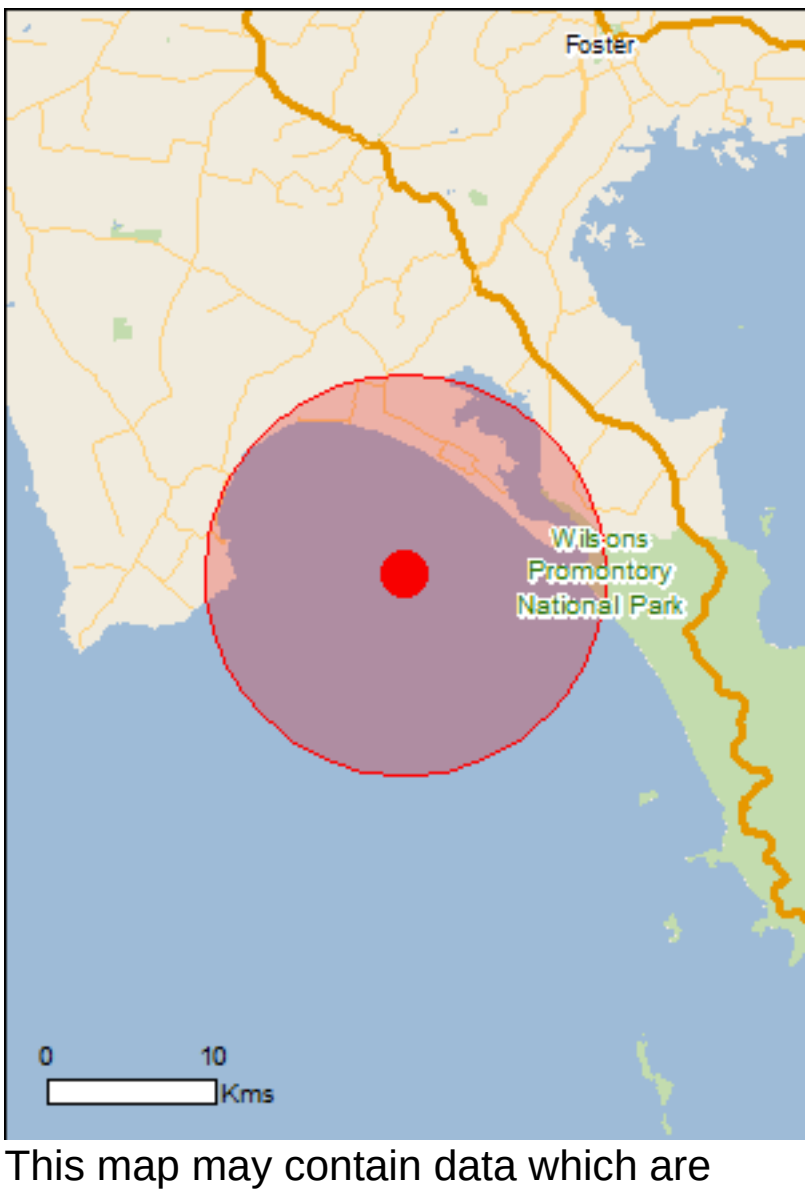
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

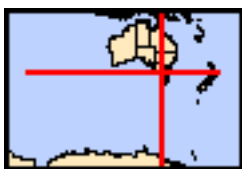
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 20/05/21 15:31:45



Coordinates

Buffer: 12.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	68
Listed Migratory Species:	61

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	99
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	1
Invasive Species:	37
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Corner inlet	Within 10km of Ramsar

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-east

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Giant Kelp Marine Forests of South East Australia	Endangered	Community may occur within area
Natural Damp Grassland of the Victorian Coastal Plains	Critically Endangered	Community may occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur

Name	Status	Type of Presence
		within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
Fish		
Galaxiella pusilla Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat likely to occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Antechinus minimus maritimus Swamp Antechinus (mainland) [83086]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Isoodon obesulus obesulus		
Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat likely to occur within area
Mastacomys fuscus mordicus		
Broad-toothed Rat (mainland), Tooarrana [87617]	Vulnerable	Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Amphibromus fluitans		
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat may occur within area
Caladenia orientalis		
Eastern Spider Orchid [83410]	Endangered	Species or species habitat likely to occur within area
Caladenia tessellata		
Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum frenchii		
Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek-orchid, French's Leek-orchid, Swamp Leek-orchid [9704]	Endangered	Species or species habitat likely to occur within area
Prasophyllum spicatum		
Dense Leek-orchid [55146]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis chlorogramma		
Green-striped Greenhood [56510]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
[Pterostylis cucullata](#) Leafy Greenhood [15459]	Vulnerable	Species or species habitat likely to occur within area
[Pterostylis tenuissima](#) Swamp Greenhood, Dainty Swamp Orchid [13139]	Vulnerable	Species or species habitat may occur within area
[Senecio psilocarpus](#) Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat may occur within area
[Xerochrysum palustre](#) Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat may occur within area
Reptiles		
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Sharks		
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardenna carneipes](#) Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
[Ardenna grisea](#) Sooty Shearwater [82651]		Species or species habitat may occur within area
[Diomedea antipodensis](#) Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea exulans](#) Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea sanfordi](#) Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
[Hydroprogne caspia](#) Caspian Tern [808]		Breeding known to occur within area
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel	Endangered	Species or species

Name	Threatened	Type of Presence
[1060]		habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Lagenorhynchus obscurus](#) Dusky Dolphin [43]		Species or species habitat may occur within area
[Lamna nasus](#) Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
[Orcinus orca](#) Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area
[Arenaria interpres](#) Ruddy Turnstone [872]		Roosting known to occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Roosting known to occur within area
[Calidris alba](#) Sanderling [875]		Roosting known to occur within area
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Calidris ruficollis](#) Red-necked Stint [860]		Roosting known to occur within area
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Roosting known to occur within area
[Charadrius bicinctus](#) Double-banded Plover [895]		Roosting known to occur

Name	Threatened	Type of Presence
		within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur

Name	Threatened	Type of Presence
		within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys mollisoni Mollison's Pipefish [66260]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
		to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Cape Liptrap Coastal Park	VIC
Wilsons Promontory	VIC

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
Gippsland RFA	Victoria

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Turdus philomelos Song Thrush [597]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species

Name	Status	Type of Presence
		habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Shallow Inlet Marine & Coastal Park	VIC

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-38.87539 146.09692

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX B

EPBC Act Protected Matters Search Tool (PMST) Report
Central Bass Strait

by

Department of Agriculture, Water and the Environment
Australian Government

18 May 2021

Australian Government

Department of Agriculture, Water and the Environment

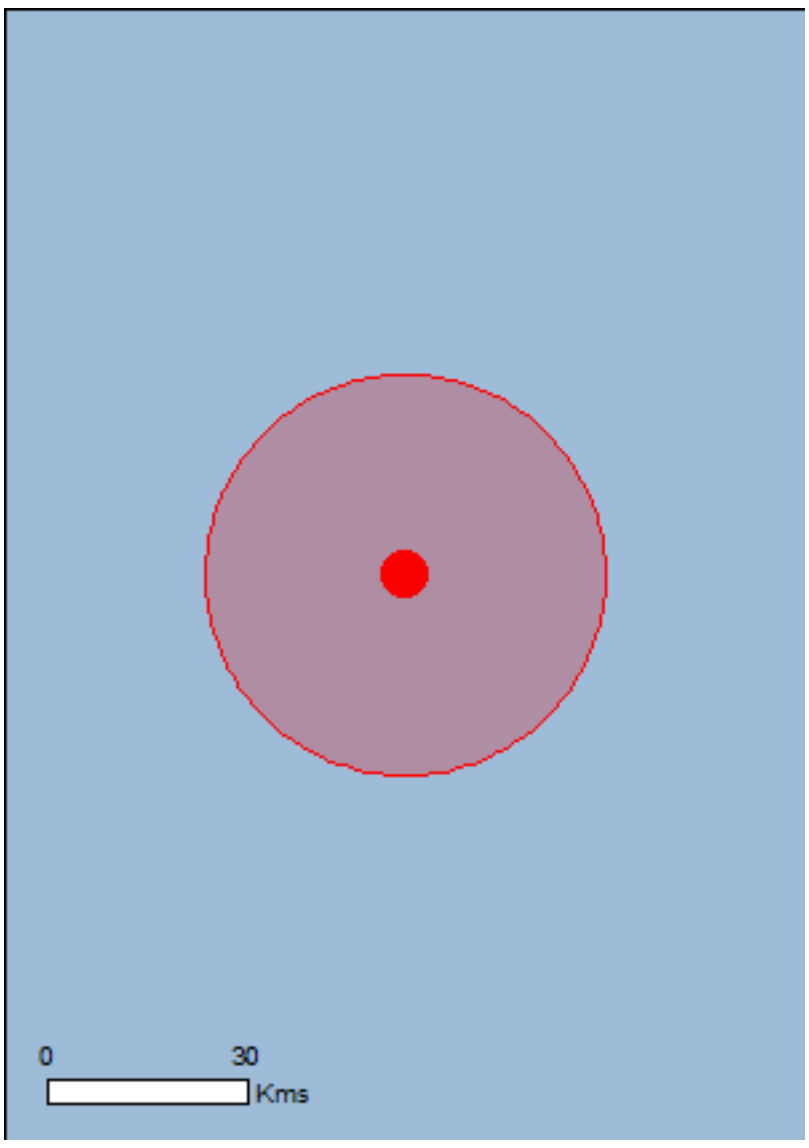
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

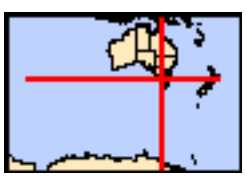
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 18/05/21 16:19:22



Coordinates

Buffer: 30.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	35
Listed Migratory Species:	36

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	45
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-east

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Lagenorhynchus obscurus		
Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus		
Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Arctocephalus pusillus		
Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis		
Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Globicephala macrorhynchus		
Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus		
Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus		
Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens		
False Killer Whale [48]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-39.8601 146.09592

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX C

EPBC Act Protected Matters Search Tool (PMST) Report
Nearshore Heywood, Tasmania

by

Department of Agriculture, Water and the Environment
Australian Government

18 May 2021

Australian Government

Department of Agriculture, Water and the Environment

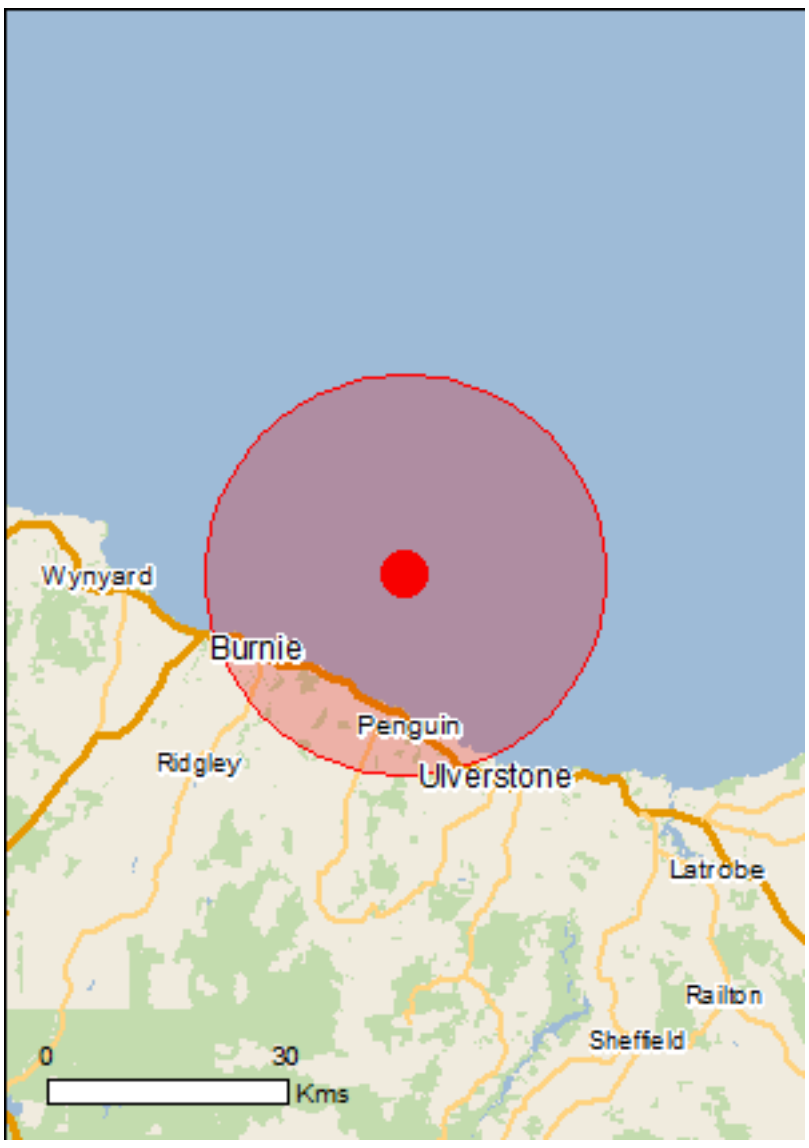
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

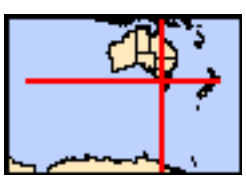
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 18/05/21 16:18:22



Coordinates

Buffer: 25.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	60
Listed Migratory Species:	41

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	69
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	14
Regional Forest Agreements:	1
Invasive Species:	29
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-east

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community may occur within area
Giant Kelp Marine Forests of South East Australia	Endangered	Community may occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Aquila audax fleayi Tasmanian Wedge-tailed Eagle, Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Breeding likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Ceyx azureus diemenensis Tasmanian Azure Kingfisher [25977]	Endangered	Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or

Name	Status	Type of Presence
		related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Breeding known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
Tyto novaehollandiae castanops (Tasmanian population) Masked Owl (Tasmanian) [67051]	Vulnerable	Species or species habitat known to occur within area
Crustaceans		
Astacopsis gouldi Giant Freshwater Crayfish, Tasmanian Giant Freshwater Lobster [64415]	Vulnerable	Species or species habitat known to occur within area
Engaeus granulatus Central North Burrowing Crayfish [78959]	Endangered	Species or species habitat may occur within area
Engaeus yabbimunna Burnie Burrowing Crayfish [66781]	Vulnerable	Species or species habitat known to occur within area
Fish		
Galaxiella pusilla Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Dasyurus maculatus maculatus (Tasmanian population) Spotted-tail Quoll, Spot-tailed Quoll, Tiger Quoll	Vulnerable	Species or species

Name	Status	Type of Presence
(Tasmanian population) [75183]		habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Perameles gunnii gunnii Eastern Barred Bandicoot (Tasmania) [66651]	Vulnerable	Species or species habitat known to occur within area
Sarcophilus harrisii Tasmanian Devil [299]	Endangered	Species or species habitat likely to occur within area
Plants		
Barbarea australis Native Wintercress, Riverbed Wintercress [12540]	Endangered	Species or species habitat likely to occur within area
Caladenia caudata Tailed Spider-orchid [17067]	Vulnerable	Species or species habitat likely to occur within area
Epacris exserta South Esk Heath [19879]	Endangered	Species or species habitat may occur within area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat likely to occur within area
Hypolepis distans Scrambling Ground-fern [2148]	Endangered	Species or species habitat may occur within area
Lepidium hyssopifolium Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat may occur within area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat may occur within area
Prasophyllum apoxychilum Tapered Leek-orchid [64947]	Endangered	Species or species habitat may occur within area
Pterostylis ziegeleri Grassland Greenhood, Cape Portland Greenhood [64971]	Vulnerable	Species or species habitat may occur within area
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat likely to occur within area
Thelymitra jonesii Sky-blue Sun-orchid [76352]	Endangered	Species or species habitat may occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Sharks		

Name	Status	Type of Presence
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardenna carneipes](#) Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
[Ardenna grisea](#) Sooty Shearwater [82651]		Species or species habitat may occur within area
[Diomedea antipodensis](#) Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea exulans](#) Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea sanfordi](#) Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
[Macronectes halli](#) Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
[Phoebetria fusca](#) Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
[Sternula albifrons](#) Little Tern [82849]		Species or species habitat may occur within area
[Thalassarche bulleri](#) Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
[Thalassarche cauta](#) Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
[Thalassarche chrysostoma](#) Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
[Thalassarche impavida](#) Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Thalassarche melanophris](#) Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis		
Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Isurus oxyrinchus		
Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus		
Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus		
Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Breeding known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Defence - BURNIE TRAINING DEPOT
Defence - TS Leven

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Breeding known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat may occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Stigmatopora nigra		
Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus		
Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Urocampus carinirostris		
Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus phillipi		
Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus		
Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri		
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus		
Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Breeding likely to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis		
Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Globicephala macrorhynchus		
Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus		
Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area

Name	Status	Type of Presence
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Blythe River	TAS
Chasm Creek	TAS
Dial Range	TAS
Emu River	TAS
Ferndene	TAS
Gwandalan	TAS
Heybridge	TAS
Mount Dial	TAS
Mount Montgomery	TAS
Mount Montgomery	TAS
North Motton	TAS
Sith Cala	TAS
Three Sisters-Goat Island	TAS
Unnamed (Fern Glade)	TAS

Regional Forest Agreements	[Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
Tasmania RFA	Tasmania

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-40.98964 146.06536

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX D

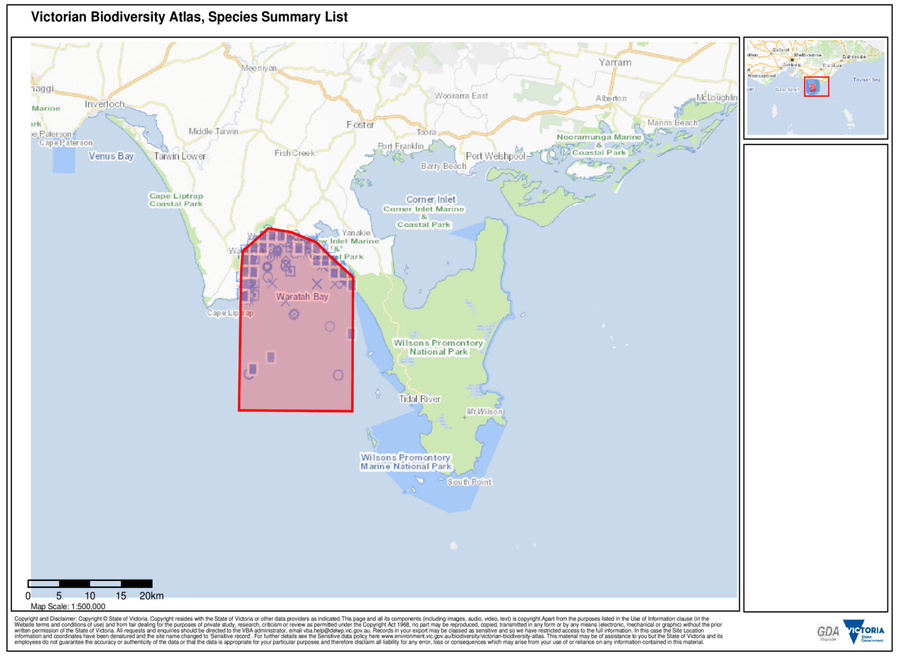
Victorian Biodiversity Atlas – Species Summary List
Waratah Bay, Victoria

by

Department of Environment, Land, Water and Planning (DELWP)
Victoria State Government

8 September 2021

Victorian Biodiversity Atlas, Species Summary List
(Date: 08/09/2021 04:02 PM)



Selected Area
Type: User Polygon Value: POLYGON ((145.983337 -39.048517,146.194891 -39.047821,146.19346 -38.863788,146.148047 -38.833846,146.124942 -38.816787,146.076773 -38.802927,146.034843 -38.798525,145.987303 -38.829895,145.984643 -38.859104,145.983337 -39.048517))

Common Filter

Scientific Name :		Common Name :	
VBA Taxon ID :		Conservation Status :	
Taxon Level :		Taxon Type :	
Other Agency Codes :		Discipline :	
Date Since :	(dd/mm/yyyy)	Date To :	(dd/mm/yyyy)

Last Review Date:31 Aug 2021

Taxon ID	Scientific Name	Common Name	FFG Status	Conservation Status	Discipline	Taxon Origin	Short Name	Count of Sightings	Last Record
4693	Galaxias truttaceus	Spotted Galaxias			Aquatic fauna, Aquatic invertebrates, Terrestrial fauna, Marine			4	23/01/1996
4766	Hyporhamphus melanochir	Southern Sea Garfish			Marine, Aquatic fauna, Aquatic invertebrates		hyp mel	1	01/01/1760
4782	Atherinosoma microstoma	Smallmouthed Hardyhead			Aquatic fauna, Aquatic invertebrates, Terrestrial fauna, Marine		ath mic	1	01/01/1760
4840	Gymnapistes marmoratus	Soldierfish			Marine, Aquatic fauna		gym mar	1	01/01/1760
4860	Platycephalus speculator	Southern Bluespotted Flathead			Marine, Aquatic fauna, Aquatic invertebrates			1	01/01/1760
4911	Arripis trutta	Eastern Australian Salmon			Aquatic fauna, Marine			1	01/01/1760
4960	Aldrichetta forsteri	Yellow-eye Mullet			Aquatic fauna, Aquatic invertebrates, Terrestrial fauna, Marine		ald for	1	01/01/1760
4982	Crapatalus munroi	Pink Sandfish			Aquatic fauna, Aquatic invertebrates, Marine			1	01/01/1760
5018	Afurcagobius tamarensis	Tamar Goby			Aquatic fauna, Aquatic invertebrates, Terrestrial fauna		afu tam	1	01/01/1760
5025	Favonigobius lateralis	Southern Longfin Goby			Aquatic fauna, Aquatic invertebrates, Terrestrial fauna, Marine		fav lat	1	01/01/1760
5071	Ammotretis rostratus	Longsnouted Flounder			Marine, Aquatic fauna, Aquatic invertebrates, Terrestrial fauna			1	01/01/1760
5073	Rhombosolea tapirina	Greenback Flounder			Marine, Aquatic fauna			1	01/01/1760
5104	Contusus brevicaudus	Prickly Toadfish			Aquatic fauna, Aquatic invertebrates, Marine			1	01/01/1760
5107	Tetractenos glaber	Smooth Toadfish			Marine, Aquatic fauna, Terrestrial fauna			1	01/01/1760
10100	Microcarbo melanoleucos	Little Pied Cormorant			Terrestrial fauna			35	30/10/2018
10500	Calamanthus fuliginosus	Striated Fieldwren			Terrestrial fauna			10	12/02/2004
11600	Orcinus orca	Killer Whale			Marine, Terrestrial fauna			1	18/05/1996
500100	Acacia verticillata	Prickly Moses			Flora		Acac vert	6	12/04/2011
500500	Bromus diandrus	Great Brome		*	Flora	Introduced	Brom dian	2	11/12/1983
501600	Hedycarya angustifolia	Austral Mulberry			Flora		Hedy angu	4	13/04/2011
503100	Goodenia radicans	Shiny Swamp-mat			Flora		Good radi	1	04/11/1983
10001	Dromaius novaehollandiae	Emu			Terrestrial fauna			1	01/01/1798
10003	Eudyptes chrysocome	Rockhopper Penguin			Marine, Terrestrial fauna			2	01/01/1901
10004	Eudyptes pachyrhynchus	Fiordland Penguin			Marine, Terrestrial fauna			2	01/01/1901
10005	Eudyptula minor	Little Penguin			Marine, Terrestrial fauna			19	25/03/2008
10009	Coturnix pectoralis	Stubble Quail			Terrestrial fauna			10	01/12/1981
10010	Synoicus ypsilophorus	Brown Quail			Terrestrial fauna			3	31/08/1980
10012	Synoicus chinensis	King Quail	Endangered	en	Terrestrial fauna			1	01/01/1973
10014	Turnix varius	Painted Button-quail			Terrestrial fauna			4	01/09/1975

10018	Turnix velox	Little Button-quail			Terrestrial fauna	2	01/01/1901
10020	Pedionomus torquatus	Plains-wanderer	Critically Endangered	CR cr	Terrestrial fauna	2	01/01/1901
10034	Phaps chalcoptera	Common Bronzewing			Terrestrial fauna	9	20/01/2006
10035	Phaps elegans	Brush Bronzewing			Terrestrial fauna	19	25/03/2008
10044	Leucosarcia melanoleuca	Wonga Pigeon			Terrestrial fauna	1	05/12/2008
10045	Lewinia pectoralis	Lewin's Rail	Vulnerable	vu	Terrestrial fauna	1	01/01/1973
10046	Hypotaenidia philippensis	Buff-banded Rail			Terrestrial fauna	2	31/08/1974
10049	Porzana fluminea	Australian Spotted Crake			Terrestrial fauna	2	21/01/1978
10050	Porzana pusilla	Baillon's Crake			Terrestrial fauna	3	01/01/1901
10051	Porzana tabuensis	Spotless Crake			Terrestrial fauna	2	01/01/1901
10056	Gallinula tenebrosa	Dusky Moorhen			Terrestrial fauna	14	05/12/1980
10058	Porphyrio melanotus	Australasian Swamphen			Terrestrial fauna	13	10/02/1980
10059	Fulica atra	Eurasian Coot			Terrestrial fauna	8	10/02/1980
10060	Podiceps cristatus	Great Crested Grebe			Terrestrial fauna	2	04/05/1974
10061	Tachybaptus novaehollandiae	Australasian Grebe			Terrestrial fauna	8	19/08/2001
10062	Poliocephalus poliocephalus	Hoary-headed Grebe			Terrestrial fauna	5	21/01/1978
10065	Pelagodroma marina	White-faced Storm-Petrel	Endangered	en	Terrestrial fauna	1	01/01/1973
10068	Puffinus gavia	Fluttering Shearwater			Terrestrial fauna	7	25/03/2008
10070	Ardenna grisea	Sooty Shearwater			Terrestrial fauna	2	01/01/1901
10071	Ardenna tenuirostris	Short-tailed Shearwater			Terrestrial fauna	21	27/04/2017
10072	Ardenna carneipes	Flesh-footed Shearwater			Terrestrial fauna	1	01/01/1973
10074	Fulmarus glacialoides	Southern Fulmar			Terrestrial fauna	1	01/01/1973
10075	Pterodroma macroptera	Great-winged Petrel			Terrestrial fauna	4	05/05/1985
10077	Pterodroma lessonii	White-headed Petrel			Terrestrial fauna	4	05/05/1985
10078	Pterodroma leucoptera	Gould's Petrel		EN	Terrestrial fauna	2	01/01/1901
10080	Daption capense	Cape Petrel			Terrestrial fauna	1	01/01/1973
10081	Halobaena caerulea	Blue Petrel		VU	Terrestrial fauna	2	01/01/1901
10083	Pachyptila turtur	Fairy Prion			Terrestrial fauna	3	31/08/1980
10085	Pelecanoides urinatrix	Common Diving-Petrel			Terrestrial fauna	6	31/08/1980
10086	Diomedea exulans	Wandering Albatross	Critically Endangered	VU cr	Terrestrial fauna	1	01/01/1973
10088	Thalassarche melanophris	Black-browed Albatross		VU	Terrestrial fauna	6	16/04/2004
10089	Thalassarche carteri	Indian Yellow-nosed Albatross	Endangered	VU en	Terrestrial fauna	4	31/08/1974
10090	Thalassarche chrysostoma	Grey-headed Albatross	Endangered	EN en	Terrestrial fauna	2	04/05/1974
10091	Thalassarche cauta	Shy Albatross	Endangered	EN en	Terrestrial fauna	5	16/10/1977
10096	Phalacrocorax carbo	Great Cormorant			Terrestrial fauna	30	30/10/2018
10097	Phalacrocorax sulcirostris	Little Black Cormorant			Terrestrial fauna	24	30/10/2018
10098	Phalacrocorax fuscescens	Black-faced Cormorant			Terrestrial fauna	16	30/10/2018
10099	Phalacrocorax varius	Pied Cormorant			Terrestrial fauna	26	26/05/2019
10101	Anhinga novaehollandiae	Australasian Darter			Terrestrial fauna	5	07/01/1977
10104	Morus serrator	Australasian Gannet			Terrestrial fauna	14	25/03/2008
10106	Pelecanus conspicillatus	Australian Pelican			Terrestrial fauna	27	27/01/2019
10109	Chlidonias leucopterus	White-winged Black Tern			Terrestrial fauna	1	01/01/1973
10110	Chlidonias hybrida	Whiskered Tern			Terrestrial fauna	1	01/01/1973
10111	Gelochelidon macrotarsa	Australian Gull-billed Tern	Endangered	en	Terrestrial fauna	2	24/06/1986
10112	Hydroprogne caspia	Caspian Tern	Vulnerable	vu	Terrestrial fauna	18	13/08/2010
10114	Sterna striata	White-fronted Tern			Terrestrial fauna	5	11/05/1986
10115	Thalasseus bergii	Crested Tern			Terrestrial fauna	41	18/11/2018
10117	Sternula albifrons	Little Tern	Critically Endangered	cr	Terrestrial fauna	4	08/07/2000
10118	Sternula nereis	Fairy Tern	Critically Endangered	VU cr	Terrestrial fauna	4	03/07/2000
10125	Chroicocephalus novaehollandiae	Silver Gull			Terrestrial fauna	88	05/03/2019
10128	Stercorarius parasiticus	Arctic Jaeger			Terrestrial fauna	2	25/03/2008
10129	Arenaria interpres	Ruddy Turnstone	Endangered	en	Terrestrial fauna	6	15/10/2018
10130	Haematopus longirostris	Pied Oystercatcher			Terrestrial fauna	24	18/11/2018
10131	Haematopus fuliginosus	Sooty Oystercatcher			Terrestrial fauna	45	17/06/2019
10132	Erythrogonys cinctus	Red-kneed Dotterel			Terrestrial fauna	3	10/02/1980
10133	Vanellus miles	Masked Lapwing			Terrestrial fauna	46	17/03/2010
10135	Vanellus tricolor	Banded Lapwing			Terrestrial fauna	1	01/01/1973
10136	Pluvialis squatarola	Grey Plover	Vulnerable	vu	Terrestrial fauna	1	01/01/1973
10137	Pluvialis fulva	Pacific Golden Plover	Vulnerable	vu	Terrestrial fauna	10	05/12/2008
10138	Thinornis cucullatus	Hooded Plover	Vulnerable	VU vu	Terrestrial fauna	175	05/04/2019
10139	Charadrius mongolus	Lesser Sand Plover	Endangered	EN en	Terrestrial fauna	3	01/10/1981
10140	Charadrius bicinctus	Double-banded Plover			Terrestrial fauna	14	10/03/2010
10141	Charadrius leschenaultii	Greater Sand Plover	Vulnerable	VU vu	Terrestrial fauna	2	28/03/1984
10143	Charadrius ruficapillus	Red-capped Plover			Terrestrial fauna	22	02/12/2018
10144	Elseyornis melanops	Black-fronted Dotterel			Terrestrial fauna	5	10/02/1980
10148	Recurvirostra novaehollandiae	Red-necked Avocet			Terrestrial fauna	2	31/08/1974
10149	Numenius madagascariensis	Eastern Curlew	Critically Endangered	CR cr	Terrestrial fauna	27	02/12/2018
10150	Numenius phaeopus	Whimbrel	Endangered	en	Terrestrial fauna	8	02/12/2018
10151	Numenius minutus	Little Curlew			Terrestrial fauna	2	01/01/1971
10153	Limosa lapponica	Bar-tailed Godwit	Vulnerable	VU vu	Terrestrial fauna	8	05/12/2008
10154	Tringa glareola	Wood Sandpiper	Endangered	en	Terrestrial fauna	2	10/02/1980
10155	Tringa brevipes	Grey-tailed Tattler	Critically Endangered	cr	Terrestrial fauna	2	04/05/1974
10157	Actitis hypoleucos	Common Sandpiper	Vulnerable	vu	Terrestrial fauna	3	13/12/1986
10158	Tringa nebularia	Common Greenshank	Endangered	en	Terrestrial fauna	6	02/12/2018
10160	Xenus cinereus	Terek Sandpiper	Endangered	en	Terrestrial fauna	1	01/01/1973
10161	Calidris ferruginea	Curlew Sandpiper	Critically Endangered	CR cr	Terrestrial fauna	21	15/10/2018
10162	Calidris ruficollis	Red-necked Stint			Terrestrial fauna	20	21/03/2008
10163	Calidris acuminata	Sharp-tailed Sandpiper			Terrestrial fauna	10	01/10/1981
10164	Calidris canutus	Red Knot	Endangered	EN en	Terrestrial fauna	2	04/05/1974

10165	Calidris tenuirostris	Great Knot	Critically Endangered	CR cr	Terrestrial fauna	1	01/01/1973
10166	Calidris alba	Sanderling			Terrestrial fauna	17	02/12/2018
10168	Gallinago hardwickii	Latham's Snipe			Terrestrial fauna	7	10/11/2004
10170	Rostratula australis	Australian Painted-snipe	Critically Endangered	EN cr	Terrestrial fauna	3	01/09/1975
10172	Glareola maldivarum	Oriental Pratincole			Terrestrial fauna	1	01/01/1973
10174	Burhinus grallarius	Bush Stone-curlew	Critically Endangered	cr	Terrestrial fauna	1	01/01/1901
10176	Ardeotis australis	Australian Bustard	Critically Endangered	cr	Terrestrial fauna	1	01/01/1798
10177	Antigone rubicunda	Brolga	Endangered	en	Terrestrial fauna	1	01/01/1798
10179	Threskiornis molucca	Australian White Ibis			Terrestrial fauna	66	08/03/2019
10180	Threskiornis spinicollis	Straw-necked Ibis			Terrestrial fauna	31	18/08/2001
10181	Platalea regia	Royal Spoonbill			Terrestrial fauna	19	26/05/2019
10182	Platalea flavipes	Yellow-billed Spoonbill			Terrestrial fauna	12	05/12/1980
10185	Egretta garzetta	Little Egret	Endangered	en	Terrestrial fauna	3	16/04/2004
10186	Ardea intermedia plumifera	Plumed Egret	Critically Endangered	cr	Terrestrial fauna	2	01/01/1901
10187	Ardea alba modesta	Eastern Great Egret	Vulnerable	vu	Terrestrial fauna	1	26/05/2019
10188	Egretta novaehollandiae	White-faced Heron			Terrestrial fauna	83	08/03/2019
10189	Ardea pacifica	White-necked Heron			Terrestrial fauna	17	14/10/1980
10191	Egretta sacra	Eastern Reef Egret			Terrestrial fauna	2	07/08/2010
10192	Nycticorax caledonicus	Nankeen Night-Heron			Terrestrial fauna	4	21/01/1978
10197	Botaurus poiciloptilus	Australasian Bittern	Critically Endangered	EN cr	Terrestrial fauna	3	31/08/1974
10198	Cereopsis novaehollandiae	Cape Barren Goose			Terrestrial fauna	11	28/11/2003
10202	Chenonetta jubata	Australian Wood Duck			Terrestrial fauna	12	19/08/2001
10203	Cygnus atratus	Black Swan			Terrestrial fauna	50	08/03/2019
10207	Tadorna tadornoides	Australian Shelduck			Terrestrial fauna	16	05/11/1999
10208	Anas superciliosa	Pacific Black Duck			Terrestrial fauna	30	24/05/2007
10210	Anas castanea	Chestnut Teal			Terrestrial fauna	13	02/12/2018
10211	Anas gracilis	Grey Teal			Terrestrial fauna	9	05/12/1980
10212	Spatula rhynchotis	Australasian Shoveler	Vulnerable	vu	Terrestrial fauna	5	18/08/2001
10213	Malacorhynchus membranaceus	Pink-eared Duck			Terrestrial fauna	1	01/01/1973
10214	Stictonetta naevosa	Freckled Duck	Endangered	en	Terrestrial fauna	1	31/08/1974
10215	Aythya australis	Hardhead	Vulnerable	vu	Terrestrial fauna	6	01/09/1980
10216	Oxyura australis	Blue-billed Duck	Vulnerable	vu	Terrestrial fauna	2	01/01/1973
10217	Biziura lobata	Musk Duck	Vulnerable	vu	Terrestrial fauna	5	01/04/1979
10218	Circus assimilis	Spotted Harrier			Terrestrial fauna	4	12/05/2013
10219	Circus approximans	Swamp Harrier			Terrestrial fauna	20	01/10/1981
10220	Accipiter novaehollandiae	Grey Goshawk	Endangered	en	Terrestrial fauna	4	13/03/2017
10221	Accipiter fasciatus	Brown Goshawk			Terrestrial fauna	13	25/03/2008
10222	Accipiter cirrocephalus	Collared Sparrowhawk			Terrestrial fauna	3	01/01/1901
10224	Aquila audax	Wedge-tailed Eagle			Terrestrial fauna	29	11/11/2018
10225	Hieraaetus morphnoides	Little Eagle	Vulnerable	vu	Terrestrial fauna	2	31/08/1974
10226	Haliaeetus leucogaster	White-bellied Sea-Eagle	Endangered	en	Terrestrial fauna	24	26/05/2019
10228	Haliastur sphenurus	Whistling Kite			Terrestrial fauna	10	08/03/2000
10229	Milvus migrans	Black Kite			Terrestrial fauna	1	01/12/1979
10232	Elanus axillaris	Black-shouldered Kite			Terrestrial fauna	19	01/09/1981
10233	Elanus scriptus	Letter-winged Kite			Terrestrial fauna	3	14/10/1980
10235	Falco longipennis	Australian Hobby			Terrestrial fauna	5	26/01/1999
10237	Falco peregrinus	Peregrine Falcon			Terrestrial fauna	16	24/05/2007
10238	Falco subniger	Black Falcon	Critically Endangered	cr	Terrestrial fauna	1	01/01/1973
10239	Falco berigora	Brown Falcon			Terrestrial fauna	20	13/12/2003
10240	Falco cenchroides	Nankeen Kestrel			Terrestrial fauna	29	05/12/2008
10241	Pandion cristatus	Eastern Osprey			Terrestrial fauna	1	01/01/1840
10242	Ninox boobook	Southern Boobook			Terrestrial fauna	18	01/12/1981
10246	Ninox connivens	Barking Owl	Critically Endangered	cr	Terrestrial fauna	3	31/08/1974
10248	Ninox strenua	Powerful Owl	Vulnerable	vu	Terrestrial fauna	3	31/08/1974
10249	Tyto alba	Barn Owl			Terrestrial fauna	9	01/06/1981
10254	Trichoglossus molucannus	Rainbow Lorikeet			Terrestrial fauna	3	11/04/2003
10258	Glossopsitta concinna	Musk Lorikeet			Terrestrial fauna	1	01/01/1973
10259	Parvipsitta porphyrocephala	Purple-crowned Lorikeet			Terrestrial fauna	2	01/01/1901
10260	Parvipsitta pusilla	Little Lorikeet			Terrestrial fauna	2	01/01/1901
10265	Calyptorhynchus lathami	Glossy Black-Cockatoo	Critically Endangered	cr	Terrestrial fauna	1	31/08/1974
10267	Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo			Terrestrial fauna	26	08/03/2019
10268	Callocephalon fimbriatum	Gang-gang Cockatoo			Terrestrial fauna	16	08/03/2019
10269	Cacatua galerita	Sulphur-crested Cockatoo			Terrestrial fauna	4	20/01/2006
10271	Cacatua sanguinea	Little Corella			Terrestrial fauna	1	11/11/2018
10272	Cacatua tenuirostris	Long-billed Corella			Terrestrial fauna	2	01/01/1850
10273	Eolophus roseicapilla	Galah			Terrestrial fauna	29	07/03/2019
10274	Nymphicus hollandicus	Cockatiel			Terrestrial fauna	2	01/01/1901
10281	Alisterus scapularis	Australian King-Parrot			Terrestrial fauna	8	07/03/2019
10282	Platycercus elegans	Crimson Rosella			Terrestrial fauna	75	07/03/2019
10288	Platycercus eximius	Eastern Rosella			Terrestrial fauna	41	22/02/2019
10295	Psephotus haematonotus	Red-rumped Parrot			Terrestrial fauna	1	01/01/1973
10305	Neophema chrysogaster	Orange-bellied Parrot	Critically Endangered	CR cr	Terrestrial fauna	1	01/01/1973
10306	Neophema chrysostoma	Blue-winged Parrot			Terrestrial fauna	9	12/02/2004
10309	Lathamus discolor	Swift Parrot	Critically Endangered	CR cr	Terrestrial fauna	2	01/01/1901
10310	Melopsittacus undulatus	Budgerigar			Terrestrial fauna	1	01/01/1798
10311	Pezoporus wallicus	Ground Parrot	Endangered	en	Terrestrial fauna	1	01/01/1798
10313	Podargus strigoides	Tawny Frogmouth			Terrestrial fauna	3	01/02/1978
10317	Aegotheles cristatus	Australian Owlet-nightjar			Terrestrial fauna	2	01/01/1973
10318	Eurystomus orientalis	Oriental Dollarbird			Terrestrial fauna	2	01/01/1901

10319	Ceyx azureus	Azure Kingfisher			Terrestrial fauna	2	01/01/1901
10322	Dacelo novaeguineae	Laughing Kookaburra			Terrestrial fauna	60	07/03/2019
10326	Todiramphus sanctus	Sacred Kingfisher			Terrestrial fauna	4	31/08/1974
10329	Merops ornatus	Rainbow Bee-eater			Terrestrial fauna	3	01/01/1971
10330	Eurostopodus mystacalis	White-throated Nightjar			Terrestrial fauna	2	01/01/1901
10334	Hirundapus caudacutus	White-throated Needletail	Vulnerable	VU vu	Terrestrial fauna	20	24/03/2017
10335	Apus pacificus	Fork-tailed Swift			Terrestrial fauna	1	01/01/1973
10337	Cacomantis pallidus	Pallid Cuckoo			Terrestrial fauna	6	01/10/1981
10338	Cacomantis flabelliformis	Fan-tailed Cuckoo			Terrestrial fauna	17	13/08/2010
10342	Chrysococcyx basalis	Horsfield's Bronze-Cuckoo			Terrestrial fauna	10	30/10/2018
10344	Chrysococcyx lucidus	Shining Bronze-Cuckoo			Terrestrial fauna	9	30/10/2018
10350	Menura novaehollandiae	Superb Lyrebird			Terrestrial fauna	2	31/08/1974
10357	Hirundo neoxena	Welcome Swallow			Terrestrial fauna	91	30/10/2018
10359	Petrochelidon nigricans	Tree Martin			Terrestrial fauna	7	20/01/2006
10360	Petrochelidon ariel	Fairy Martin			Terrestrial fauna	6	16/01/1977
10361	Rhipidura albiscapa	Grey Fantail			Terrestrial fauna	86	22/02/2019
10362	Rhipidura rufifrons	Rufous Fantail			Terrestrial fauna	9	29/12/2017
10364	Rhipidura leucophrys	Willie Wagtail			Terrestrial fauna	64	10/03/2010
10365	Myiagra rubecula	Leaden Flycatcher			Terrestrial fauna	5	28/11/2003
10366	Myiagra cyanoleuca	Satin Flycatcher			Terrestrial fauna	4	12/11/1999
10369	Myiagra inquieta	Restless Flycatcher			Terrestrial fauna	3	31/08/1974
10377	Microeca fascinans	Jacky Winter			Terrestrial fauna	5	04/12/1978
10380	Petroica boodang	Scarlet Robin			Terrestrial fauna	14	01/03/1980
10382	Petroica phoenicea	Flame Robin			Terrestrial fauna	15	01/06/1981
10383	Petroica rodinogaster	Pink Robin			Terrestrial fauna	2	01/02/1980
10384	Petroica rosea	Rose Robin			Terrestrial fauna	1	21/01/1978
10385	Melanodryas cucullata	Hooded Robin	Vulnerable	vu	Terrestrial fauna	1	01/01/1973
10392	Eopsaltria australis	Eastern Yellow Robin			Terrestrial fauna	48	22/02/2019
10398	Pachycephala pectoralis	Golden Whistler			Terrestrial fauna	25	13/08/2010
10401	Pachycephala rufiventris	Rufous Whistler			Terrestrial fauna	18	05/12/2008
10405	Pachycephala olivacea	Olive Whistler			Terrestrial fauna	18	13/08/2010
10408	Colluricincla harmonica	Grey Shrike-thrush			Terrestrial fauna	69	30/10/2018
10415	Grallina cyanoleuca	Magpie-lark			Terrestrial fauna	59	01/01/2019
10416	Falcunculus frontatus	Eastern Shrike-tit			Terrestrial fauna	4	24/05/2007
10421	Psophodes olivaceus	Eastern Whipbird			Terrestrial fauna	25	18/11/2018
10424	Coracina novaehollandiae	Black-faced Cuckoo-shrike			Terrestrial fauna	32	17/01/1996
10430	Lalage tricolor	White-winged Triller			Terrestrial fauna	3	31/08/1974
10436	Cinclosoma punctatum	Spotted Quail-thrush			Terrestrial fauna	1	01/01/1973
10443	Pomatostomus temporalis	Grey-crowned Babbler	Vulnerable	vu	Terrestrial fauna	2	01/01/1901
10448	Epthianura albifrons	White-fronted Chat			Terrestrial fauna	26	13/08/2010
10465	Smicrornis brevirostris	Weebill			Terrestrial fauna	2	04/12/1978
10470	Acanthiza lineata	Striated Thornbill			Terrestrial fauna	29	18/11/2018
10471	Acanthiza nana	Yellow Thornbill			Terrestrial fauna	5	01/01/1977
10475	Acanthiza pusilla	Brown Thornbill			Terrestrial fauna	50	06/03/2019
10484	Acanthiza reguloides	Buff-rumped Thornbill			Terrestrial fauna	2	31/08/1974
10486	Acanthiza chrysorrhoa	Yellow-rumped Thornbill			Terrestrial fauna	31	17/01/1996
10488	Sericornis frontalis	White-browed Scrubwren			Terrestrial fauna	51	22/02/2019
10498	Calamanthus pyrrhopygius	Chestnut-rumped Heathwren	Vulnerable	vu	Terrestrial fauna	1	31/08/1974
10506	Pycnoptilus floccosus	Pilotbird			Terrestrial fauna	1	31/08/1974
10508	Cincloramphus cruralis	Brown Songlark			Terrestrial fauna	3	08/03/1998
10509	Cincloramphus mathewsi	Rufous Songlark			Terrestrial fauna	2	01/01/1901
10522	Poodytes gramineus	Little Grassbird			Terrestrial fauna	7	05/12/1980
10524	Acrocephalus australis	Reed-Warbler			Terrestrial fauna	9	10/02/1980
10525	Cisticola exilis	Golden-headed Cisticola			Terrestrial fauna	7	10/02/1980
10526	Stipiturus malachurus	Southern Emu-wren			Terrestrial fauna	10	12/02/2004
10529	Malurus cyaneus	Superb Fairy-wren			Terrestrial fauna	99	22/02/2019
10544	Artamus personatus	Masked Woodswallow			Terrestrial fauna	2	29/10/1982
10545	Artamus superciliosus	White-browed Woodswallow			Terrestrial fauna	2	01/01/1901
10547	Artamus cyanopterus	Dusky Woodswallow			Terrestrial fauna	11	14/10/1980
10549	Daphoenositta chrysoptera	Varied Sittella			Terrestrial fauna	8	17/05/2000
10558	Cormobates leucophaea	White-throated Treecreeper			Terrestrial fauna	22	13/08/2010
10564	Dicaeum hirundinaceum	Mistletoebird			Terrestrial fauna	9	30/10/2018
10565	Pardalotus punctatus	Spotted Pardalote			Terrestrial fauna	14	01/01/1981
10574	Zosterops lateralis	Silvereye			Terrestrial fauna	55	22/02/2019
10578	Melithreptus lunatus	White-naped Honeyeater			Terrestrial fauna	10	20/01/2006
10583	Melithreptus brevirostris	Brown-headed Honeyeater			Terrestrial fauna	8	20/01/2006
10591	Acanthorhynchus tenuirostris	Eastern Spinebill			Terrestrial fauna	47	07/03/2019
10593	Glyciphila melanops	Tawny-crowned Honeyeater			Terrestrial fauna	8	01/02/1980
10605	Meliphaga lewinii	Lewin's Honeyeater			Terrestrial fauna	6	01/12/1981
10608	Gavicalis virescens	Singing Honeyeater			Terrestrial fauna	2	01/01/1973
10613	Ptilotula fusca	Fuscous Honeyeater			Terrestrial fauna	1	01/01/1971
10614	Caligavis chrysops	Yellow-faced Honeyeater			Terrestrial fauna	16	05/12/2008
10617	Nesoptilotis leucotis	White-eared Honeyeater			Terrestrial fauna	26	20/01/2006
10619	Lichenostomus melanops	Yellow-tufted Honeyeater			Terrestrial fauna	2	01/01/1901
10625	Ptilotula penicillata	White-plumed Honeyeater			Terrestrial fauna	27	11/02/2004
10630	Phylidonyris pyrrhopterus	Crescent Honeyeater			Terrestrial fauna	31	30/10/2018
10631	Phylidonyris novaehollandiae	New Holland Honeyeater			Terrestrial fauna	40	13/08/2010
10633	Manorina melanophrys	Bell Miner			Terrestrial fauna	2	22/03/1801
10634	Manorina melanocephala	Noisy Miner			Terrestrial fauna	15	01/12/1981

10637	Anthochaera chrysoptera	Little Wattlebird			Terrestrial fauna		38	22/02/2019
10638	Anthochaera carunculata	Red Wattlebird			Terrestrial fauna		40	13/08/2010
10640	Acanthagenys rufogularis	Spiny-cheeked Honeyeater			Terrestrial fauna		3	23/04/1978
10645	Philemon corniculatus	Noisy Friarbird			Terrestrial fauna		2	01/01/1901
10647	Anthus australis	Australian Pipit			Terrestrial fauna		29	10/11/2004
10648	Mirafra javanica	Horsfield's Bushlark			Terrestrial fauna		1	01/01/1973
10650	Stagonopleura bella	Beautiful Firetail			Terrestrial fauna		12	22/02/2019
10662	Neochmia temporalis	Red-browed Finch			Terrestrial fauna		35	13/08/2010
10671	Oriolus sagittatus	Olive-backed Oriole			Terrestrial fauna		1	01/01/1973
10673	Dicrurus bracteatus	Spangled Drongo			Terrestrial fauna		2	01/01/1901
10679	Ptilonorhynchus violaceus	Satin Bowerbird			Terrestrial fauna		2	31/08/1974
10693	Corcorax melanorhamphos	White-winged Chough			Terrestrial fauna		2	01/01/1901
10694	Strepera graculina	Pied Currawong			Terrestrial fauna		14	01/06/1981
10697	Strepera versicolor	Grey Currawong			Terrestrial fauna		9	24/05/2007
10702	Cracticus torquatus	Grey Butcherbird			Terrestrial fauna		38	07/03/2019
10705	Gymnorhina tibicen	Australian Magpie			Terrestrial fauna		92	07/03/2019
10779	Zoothera lunulata	Bassian Thrush			Terrestrial fauna		8	11/05/2017
10868	Corvus tasmanicus	Forest Raven			Terrestrial fauna		3	20/01/2006
10919	Pterodroma inexpectata	Mottled Petrel			Terrestrial fauna		2	01/01/1901
10929	Macronectes giganteus	Southern Giant-Petrel	Endangered	EN en	Terrestrial fauna		2	31/08/1974
10930	Corvus coronoides	Australian Raven			Terrestrial fauna		43	22/02/2019
10931	Thalassarche bulleri	Buller's Albatross	Endangered	VU en	Terrestrial fauna		1	05/06/1985
10942	Pachyptila belcheri	Slender-billed Prion			Terrestrial fauna		1	16/10/1977
10945	Stercorarius pomarinus	Pomarine Jaeger			Terrestrial fauna		2	27/06/1983
10952	Sterna paradisaea	Arctic Tern			Terrestrial fauna		2	01/01/1901
10953	Sterna hirundo	Common Tern			Terrestrial fauna		3	03/07/2000
10954	Corvus mellori	Little Raven			Terrestrial fauna		17	13/08/2010
10957	Columba livia	Domestic Pigeon		*	Terrestrial fauna	Introduced	6	01/02/1980
10976	Pardalotus striatus	Striated Pardalote			Terrestrial fauna		8	01/01/1981
10977	Bubulcus coromandus	Eastern Cattle Egret			Terrestrial fauna		8	01/03/1980
10978	Calidris melanotos	Pectoral Sandpiper			Terrestrial fauna		1	01/01/1973
10980	Stercorarius antarcticus	Great Skua			Terrestrial fauna		3	27/06/1983
10981	Larus dominicanus	Kelp Gull			Terrestrial fauna		11	13/08/2010
10989	Spilopelia chinensis	Spotted Dove		*	Terrestrial fauna	Introduced	37	10/03/2010
10991	Turdus merula	Common Blackbird		*	Terrestrial fauna	Introduced	80	30/10/2018
10992	Turdus philomelos	Song Thrush		*	Terrestrial fauna	Introduced	1	01/10/1977
10993	Alauda arvensis	Eurasian Skylark		*	Terrestrial fauna	Introduced	14	18/08/2001
10994	Passer montanus	Eurasian Tree Sparrow		*	Terrestrial fauna	Introduced	2	05/12/1980
10995	Passer domesticus	House Sparrow		*	Terrestrial fauna	Introduced	46	05/12/2008
10997	Chloris chloris	European Greenfinch		*	Terrestrial fauna	Introduced	18	11/03/1999
10998	Acridotheres tristis	Common Myna		*	Terrestrial fauna	Introduced	34	05/12/2008
10999	Sturnus vulgaris	Common Starling		*	Terrestrial fauna	Introduced	69	22/02/2019
11003	Tachyglossus aculeatus	Short-beaked Echidna			Terrestrial fauna		4	26/01/2019
11028	Antechinus agilis	Agile Antechinus			Terrestrial fauna		8	11/05/2017
11034	Antechinus minimus maritimus	Swamp Antechinus	Vulnerable	VU vu	Terrestrial fauna		1	01/06/1977
11069	Sminthopsis leucopus	White-footed Dunnart	Vulnerable	vu	Terrestrial fauna		1	30/05/1977
11097	Perameles nasuta	Southern Long-nosed Bandicoot			Terrestrial fauna		2	11/03/2013
11113	Trichosurus vulpecula	Common Brush-tailed Possum			Terrestrial fauna		1	03/11/2000
11129	Pseudocheirus peregrinus	Eastern Ring-tailed Possum			Terrestrial fauna		4	07/02/2017
11150	Cercartetus nanus	Eastern Pygmy-possum			Terrestrial fauna		2	10/11/1999
11162	Phascolarctos cinereus	Koala			Terrestrial fauna		41	07/03/2019
11165	Vombatus ursinus	Bare-nosed Wombat			Terrestrial fauna		9	07/02/2017
11242	Wallabia bicolor	Black-tailed Wallaby			Terrestrial fauna		4	11/05/2017
11261	Notamacropus rufogriseus banksianus	Red-necked Wallaby			Terrestrial fauna		1	01/11/1963
11265	Macropus giganteus	Eastern Grey Kangaroo			Terrestrial fauna		1	02/02/2016
11395	Rattus fuscipes	Bush Rat			Terrestrial fauna		7	11/05/2017
11398	Rattus lutreolus	Swamp Rat			Terrestrial fauna		3	17/03/2000
11408	Rattus rattus	Black Rat		*	Terrestrial fauna	Introduced	3	10/02/1994
11412	Mus musculus	House Mouse		*	Terrestrial fauna	Introduced	4	11/05/2017
11510	Oryctolagus cuniculus	European Rabbit		*	Terrestrial fauna	Introduced	6	07/02/2017
11511	Lepus europaeus	European Brown Hare		*	Terrestrial fauna	Introduced	1	02/02/2016
11525	Axis porcinus	Hog Deer		*	Terrestrial fauna	Introduced	2	02/02/2016
11542	Arctocephalus pusillus doriferus	Australian Fur Seal			Marine, Terrestrial fauna		5	26/10/2016
11561	Eubalaena australis	Southern Right Whale	Endangered	EN en	Marine, Terrestrial fauna		13	29/08/2018
11575	Megaptera novaeangliae australis	Southern Humpback Whale	Critically Endangered	VU cr	Marine, Terrestrial fauna		1	02/07/2013
11578	Physeter macrocephalus	Sperm Whale			Marine, Terrestrial fauna		1	19/08/1990
11581	Kogia breviceps	Pygmy Sperm Whale			Marine, Terrestrial fauna		1	04/05/1993
11582	Kogia sima	Dwarf Sperm Whale			Marine, Terrestrial fauna		1	08/12/2016
11606	Globicephala melas	Long-finned Pilot Whale			Marine, Terrestrial fauna		1	19/07/2001
11612	Tursiops truncatus	Common Bottle-nosed dolphin			Marine, Terrestrial fauna		1	05/09/1998
11616	Delphinus delphis	Short-beaked Common Dolphin			Marine, Terrestrial fauna		1	04/11/2008
12008	Eretmochelys imbricata	Hawksbill Turtle		VU	Marine, Aquatic fauna, Terrestrial fauna		2	21/06/2006
12451	Lampropholis guichenoti	Garden Skink			Terrestrial fauna		3	25/05/1977
12452	Saproscincus mustelinus	Weasel Skink			Terrestrial fauna		4	25/05/1977
12462	Niveoscincus metallicus	Metallic Skink			Terrestrial fauna		15	21/06/1977
12578	Tiliqua nigrolutea	Blotched Blue-tongued Lizard			Terrestrial fauna		1	22/08/1974
12665	Drysdalia coronoides	White-lipped Snake			Terrestrial fauna		1	27/01/2002
12681	Notechis scutatus	Tiger Snake			Terrestrial fauna		2	01/01/2001
12682	Acritoscincus duperreyi	Eastern Three-lined Skink			Terrestrial fauna		3	16/02/1979

APPENDIX E

Tasmania Natural Values Atlas Report
Nearshore Burnie/Heybridge, Tasmania

by

Department of Primary Industries, Parks, Water and Environment (DPIPWE)
Tasmania State Government

6 September 2021

Natural Values Atlas Report

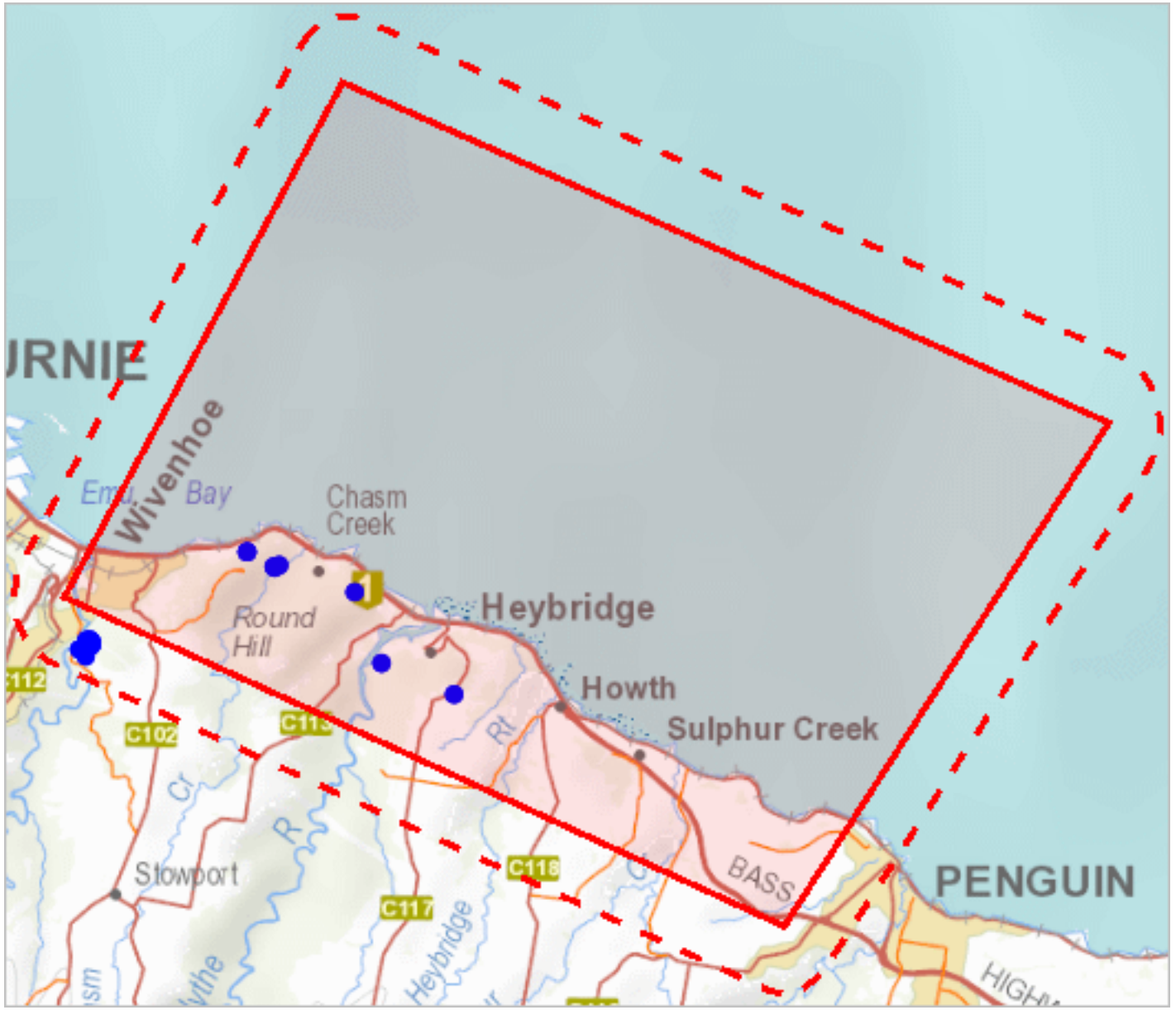
Authoritative, comprehensive information on Tasmania's natural values.

Reference:	215878ML
Requested For:	Barton Napier
Report Type:	Summary Report
Timestamp:	10:55:06 AM Monday 06 September 2021
Threatened Flora:	buffers Min: 1000m Max: 10000m
Threatened Fauna:	buffers Min: 1000m Max: 10000m
Raptors:	buffers Min: 1000m Max: 10000m
Conservation Significance Flora:	buffers Min: 1000m Max: 10000m
Conservation Significance Fauna:	buffers Min: 1000m Max: 10000m
Conservation Significance filtered by:	
	Biogeographic Origin
	Scientific Significance
	Reservation Status
	Species Sensitivity
	Cultural Significance
Tasmanian Weed Management Act Weeds:	buffers Min: 1000m Max: 10000m
Priority Weeds:	buffers Min: 1000m Max: 10000m
Geoconservation:	buffer 5000m
Acid Sulfate Soils:	buffer 5000m
TASVEG:	buffer 5000m
Threatened Communities:	buffer 5000m
Fire History:	buffer 5000m
Tasmanian Reserve Estate:	buffer 5000m
Biosecurity Risks:	buffer 5000m

The centroid for this query GDA94: 416925.0, 5454004.0 falls within:

Threatened flora within 1000 metres

425835, 5461574



408274, 5446457

Please note that some layers may not display at all requested map scales

Threatened flora within 1000 metres

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Threatened flora within 1000 metres

Verified Records

Species	Common Name	SS	NS	Bio	Observation Count	Last Recorded
Baumea gunnii	slender twigsedge	r		n	1	06-Jul-2009
Caladenia patersonii	patersons spider-orchid	v		n	1	12-Oct-1978
Caladenia pusilla	tiny fingers	r		n	2	17-Oct-1976
Epilobium pallidiflorum	showy willowherb	r-		n	3	30-Jun-2004
Persicaria decipiens	slender waterpepper	v		n	11	23-Oct-2018
Tetratheca ciliata	northern pinkbells	r		n	2	14-Sep-1892

Unverified Records

No unverified records were found!

For more information about threatened species, please contact Threatened Species Enquiries.
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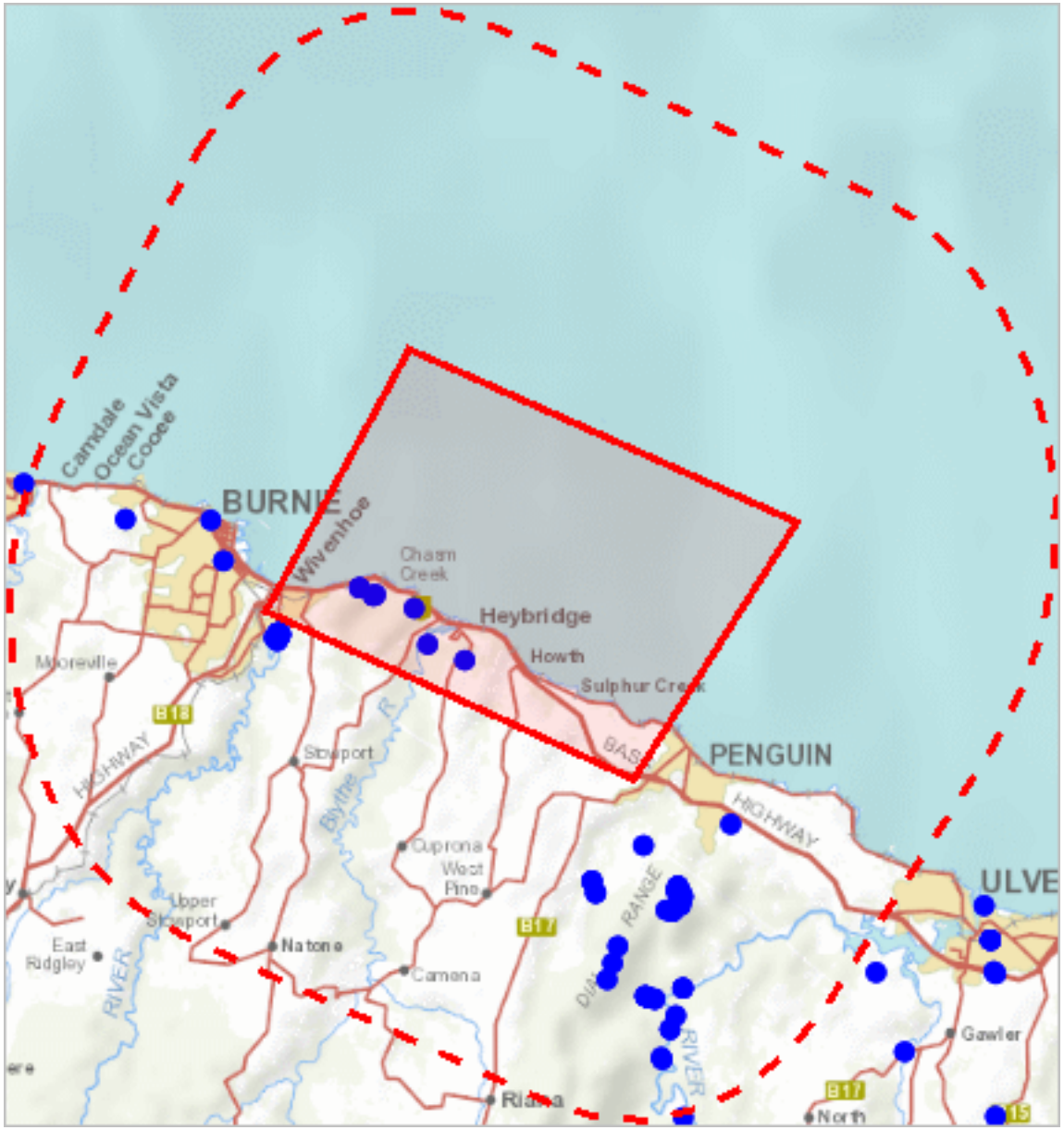
Email: ThreatenedSpecies.Enquiries@dpipwe.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Threatened flora within 10000 metres

432702, 5470591



401337, 5437391

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Threatened flora within 10000 metres

Legend: Verified and Unverified observations

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- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Threatened flora within 10000 metres

Verified Records

Species	Common Name	SS	NS	Bio	Observation Count	Last Recorded
Baumea gunnii	slender twigsedge	r		n	1	06-Jul-2009
Blechnum cartilagineum	gristle fern	v		n	13	16-Jul-2019
Blechnum spinulosum	small raspfern	e		n	7	07-Nov-2007
Caladenia patersonii	patersons spider-orchid	v		n	2	14-Oct-1979
Caladenia pusilla	tiny fingers	r		n	2	17-Oct-1976
Chiloglottis valida	large bird-orchid	-e		n	3	23-Nov-2020
Desmodium gunnii	southern ticktrefoil	v		n	1	01-Jan-1840
Epilobium pallidiflorum	showy willowherb	r-		n	5	04-Feb-2020
Glycine microphylla	small-leaf glycine	v		n	1	18-Oct-1841
Persicaria decipiens	slender waterpepper	v		n	12	23-Oct-2018
Podotheca angustifolia	sticky longheads	x		n	1	01-Nov-1978
Pterostylis atriola	snug greenhood	r		e	44	18-Feb-2021
Tetratheca ciliata	northern pinkbells	r		n	2	14-Sep-1892

Unverified Records

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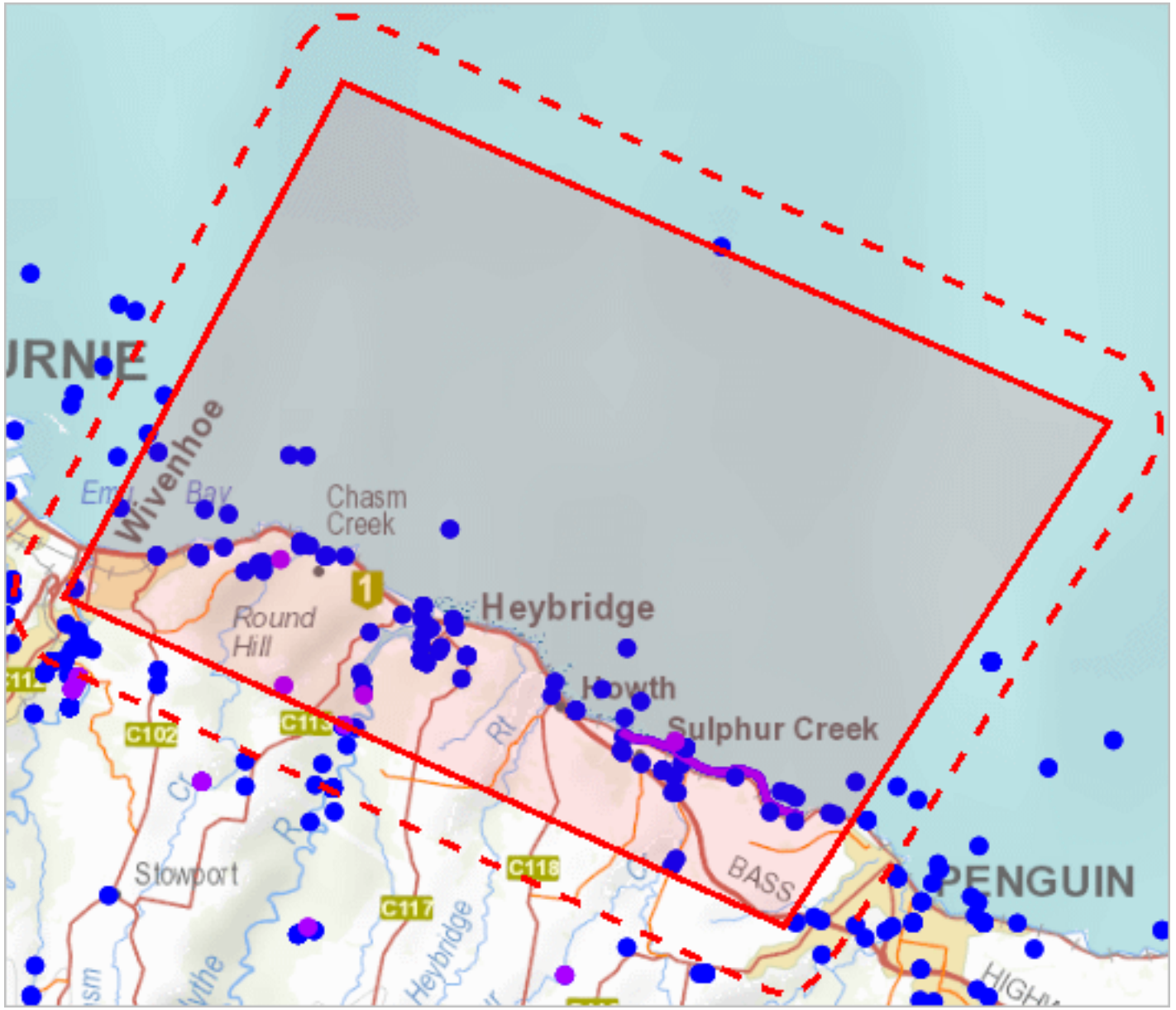
Threatened fauna within 1000 metres

425835, 5461574



408274, 5446457

Please note that some layers may not display at all requested map scales

Threatened fauna within 1000 metres

Legend: Verified and Unverified observations

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- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Threatened fauna within 1000 metres

Verified Records

Species	Common Name	SS	NS	Bio	Observation Count	Last Recorded
Accipiter novaehollandiae	grey goshawk	e		n	72	26-Feb-2019
Alcedo azurea subsp. diemenensis	azure kingfisher or azure kingfisher (tasmanian)	e	EN	e	8	01-Jan-2009
Aquila audax	wedge-tailed eagle	pe	PEN	n	49	23-Apr-2018
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	5	25-May-2021
Astacopsis gouldi	giant freshwater crayfish	v	VU	e	4	04-Apr-2003
Botaurus poiciloptilus	australasian bittern		EN	n	1	06-Sep-1977
Ceyx azureus subsp. diemenensis	Tasmanian azure kingfisher	e	EN	e	6	09-Jun-1987
Dasyurus maculatus	spotted-tail quoll	r	VU	n	4	28-Apr-2020
Dasyurus maculatus subsp. maculatus	spotted-tail quoll	r	VU	n	4	03-May-2019
Dasyurus viverrinus	eastern quoll		EN	n	1	01-May-1996
Diomedea cauta subsp. cauta	shy albatross	pv	PVU		3	28-Feb-1981
Diomedea melanophrys subsp. melanophrys	black-browed albatross	pe	PVU		4	31-Aug-1980
Eagle sp.	Eagle	e	EN	n	3	25-May-2020
Engaeus yabbimunna	burrowing crayfish (burnie)	v	VU	e	7	26-Aug-2016
Eubalaena australis	southern right whale	e	EN	m	6	31-Aug-2014
Haliaeetus leucogaster	white-bellied sea-eagle	v		n	184	03-Jul-2019
Hirundapus caudacutus	white-throated needletail		VU	n	18	04-Mar-2016
Lathamus discolor	swift parrot	e	CR	mbe	14	10-Dec-2020
Megaptera novaeangliae	humpback whale	e	VU	m	12	12-Nov-2017
Mirounga leonina subsp. macquariensis	southern elephant seal	pe	PVU	n	4	09-Nov-2007
Pachyptila turtur subantarctica	southern fairy prion	e	VU		2	30-Nov-1980
Perameles gunnii	eastern barred bandicoot		VU	n	7	24-Apr-2021
Prototroctes maraena	australian grayling	v	VU	ae	4	01-Jan-1976
Sarcophilus harrisii	tasmanian devil	e	EN	e	29	29-Jan-2020
Sterna nereis subsp. nereis	fairy tern	pv	PVU		2	31-May-1981
Sternula nereis subsp. nereis	fairy tern	v	VU	n	2	17-Mar-2012
Thalassarche cauta	shy albatross	v	EN	n	78	27-Oct-2018
Thalassarche melanophris	black-browed albatross	e	VU	n	7	25-Oct-2013
Thinornis rubricollis	hooded plover		VU	n	2	17-Mar-2012
Tyto novaehollandiae	masked owl	pe	PVU	n	1	29-Nov-2008

Unverified Records

Species	Common Name	SS	NS	Bio	Observation Count
Accipiter novaehollandiae	grey goshawk	e		n	3
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	1
Astacopsis gouldi	giant freshwater crayfish	v	VU	e	12
Theclinesthes serpentata	chequered blue	pr			1

Threatened fauna within 1000 metres

(based on Range Boundaries)

Species	Common Name	SS	NS	BO	Potential	Known	Core
Engaeus yabbimunna	burrowing crayfish (burnie)	v	VU	e	1	2	0
Dasyurus maculatus subsp. maculatus	spotted-tail quoll	r	VU	n	1	0	1
Lathamus discolor	swift parrot	e	CR	mbe	1	0	0
Litoria raniformis	green and gold frog	v	VU	n	1	0	0
Prototroctes maraena	australian grayling	v	VU	ae	1	0	0
Ceyx azureus subsp. diemenensis	Tasmanian azure kingfisher	e	EN	e	0	0	1
Pseudemoia pagenstecheri	tussock skink	v		n	1	0	0
Haliaeetus leucogaster	white-bellied sea-eagle	v		n	3	0	0
Oreisplanus munionga subsp. larana	marrawah skipper	e	VU	e	1	0	1
Astacopsis gouldi	giant freshwater crayfish	v	VU	e	1	0	0
Tyto novaehollandiae subsp. castanops	masked owl (Tasmanian)	e	VU	e	1	0	1
Limnodynastes peroni	striped marsh frog	e		n	1	0	0
Galaxiella pusilla	eastern dwarf galaxias	v	VU	n	1	0	0
Accipiter novaehollandiae	grey goshawk	e		n	1	0	1
Sarcophilus harrisii	tasmanian devil	e	EN	e	1	0	0
Perameles gunnii	eastern barred bandicoot		VU	n	1	0	0
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	1	0	0
Dasyurus viverrinus	eastern quoll		EN	n	0	0	1

Threatened fauna within 1000 metres

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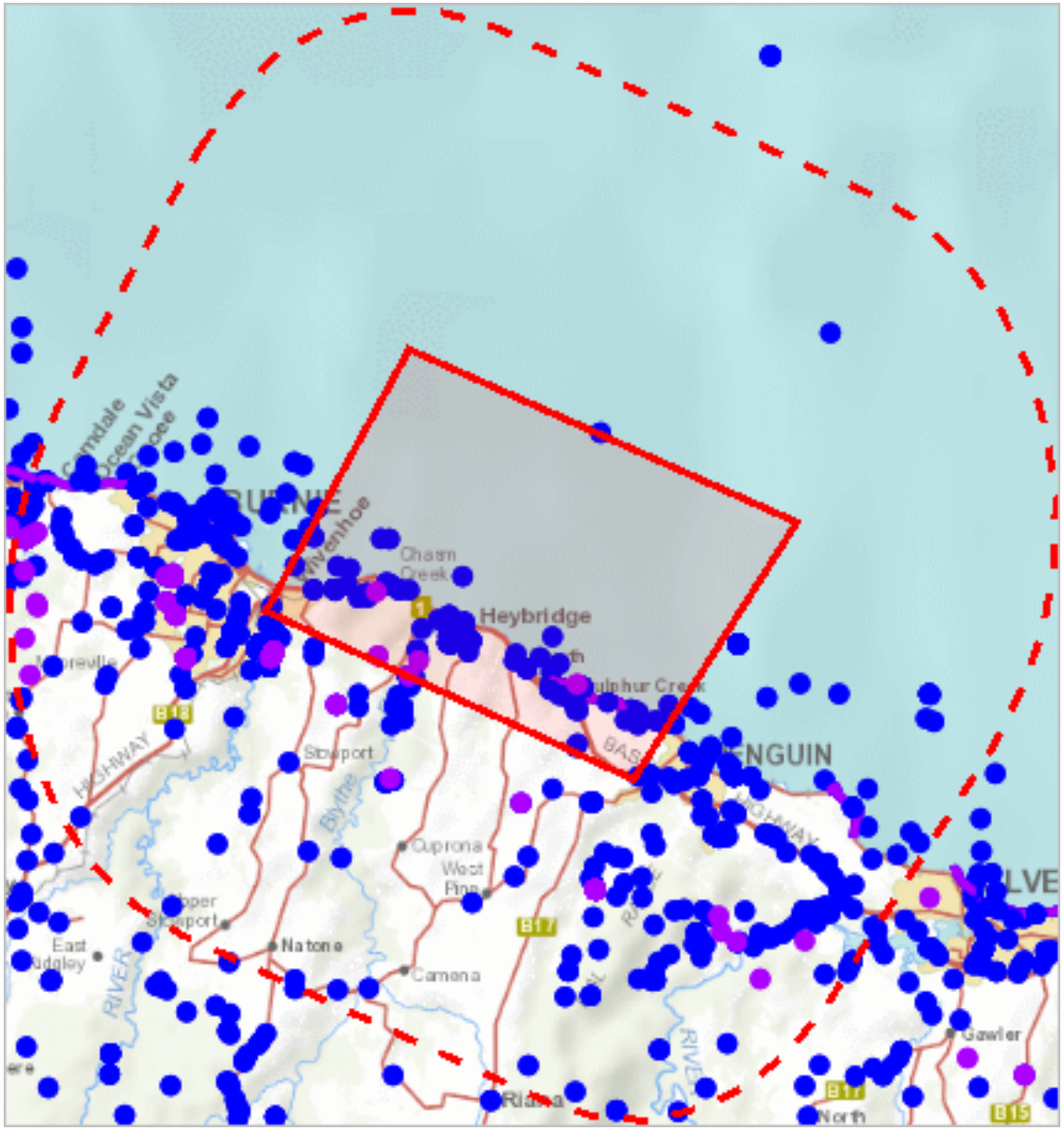
Threatened fauna within 10000 metres

432702, 5470591



401337, 5437391

Please note that some layers may not display at all requested map scales

Threatened fauna within 10000 metres

Legend: Verified and Unverified observations

Point Verified | Point Unverified | Line Verified | Line Unverified

Polygon Verified | Polygon Unverified

Legend: Cadastral Parcels

Threatened fauna within 10000 metres

Verified Records

Species	Common Name	SS	NS	Bio	Observation Count	Last Recorded
Accipiter novaehollandiae	grey goshawk	e		n	90	07-Jun-2021
Alcedo azurea subsp. diemenensis	azure kingfisher or azure kingfisher (tasmanian)	e	EN	e	18	23-Sep-2009
Aquila audax	wedge-tailed eagle	pe	PEN	n	72	24-Jun-2019
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	31	25-May-2021
Astacopsis gouldi	giant freshwater crayfish	v	VU	e	51	12-May-2020
Beddomeia phasianella	hydrobiid snail (keddies creek)	v		eH	17	01-Feb-2002
Botaurus poiciloptilus	australasian bittern		EN	n	1	06-Sep-1977
Ceyx azureus subsp. diemenensis	Tasmanian azure kingfisher	e	EN	e	18	07-Mar-2020
Chelonia mydas	green turtle	v	VU	n	1	30-Jun-1959
Dasyurus maculatus	spotted-tail quoll	r	VU	n	18	28-Apr-2020
Dasyurus maculatus subsp. maculatus	spotted-tail quoll	r	VU	n	12	03-May-2019
Dasyurus viverrinus	eastern quoll		EN	n	5	19-Jul-2019
Diomedea cauta subsp. cauta	shy albatross	pv	PVU		3	28-Feb-1981
Diomedea melanophrys subsp. melanophrys	black-browed albatross	pe	PVU		4	31-Aug-1980
Eagle sp.	Eagle	e	EN	n	10	25-May-2020
Engaeus yabbimunna	burrowing crayfish (burnie)	v	VU	e	43	15-Oct-2017
Eubalaena australis	southern right whale	e	EN	m	16	23-Oct-2015
Gazameda gunnii	Gunn's screw shell	v		ae	3	11-Apr-2006
Haliaeetus leucogaster	white-bellied sea-eagle	v		n	244	14-Dec-2020
Halobaena caerulea	blue petrel	v	VU	n	1	25-Aug-1984
Hirundapus caudacutus	white-throated needletail		VU	n	29	23-Mar-2016
Lathamus discolor	swift parrot	e	CR	mbe	39	10-Dec-2020
Litoria raniformis	green and gold frog	v	VU	n	3	10-Apr-2018
Megaptera novaeangliae	humpback whale	e	VU	m	39	12-Nov-2017
Mirounga leonina subsp. macquariensis	southern elephant seal	pe	PVU	n	4	09-Nov-2007
Oreisplanus munionga subsp. larana	marrawah skipper	e	VU	e	1	26-Jan-2005
Pachyptila turtur subantarctica	southern fairy prion	e	VU		2	30-Nov-1980
Perameles gunnii	eastern barred bandicoot		VU	n	45	24-Apr-2021
Prototroctes maraena	australian grayling	v	VU	ae	16	13-Oct-1987
Pteropus poliocephalus	grey-headed flying-fox		VU	n	1	16-Aug-2010
Sarcophilus harrisii	tasmanian devil	e	EN	e	114	17-Feb-2021
Seriolella brama	Blue Warehou		CD	n	3	01-Jan-2002
Sterna nereis subsp. nereis	fairy tern	pv	PVU		2	31-May-1981
Sternula albifrons subsp. sinensis	little tern	e		n	1	27-Mar-2011
Sternula nereis subsp. nereis	fairy tern	v	VU	n	4	10-May-2015
Thalassarche cauta	shy albatross	v	EN	n	100	03-Apr-2019
Thalassarche melanophris	black-browed albatross	e	VU	n	11	04-Sep-2016
Thinornis rubricollis	hooded plover		VU	n	2	17-Mar-2012
Tyto novaehollandiae	masked owl	pe	PVU	n	12	21-Feb-2013
Tyto novaehollandiae subsp. castanops	masked owl (Tasmanian)	e	VU	e	2	11-Oct-2015

Unverified Records

Species	Common Name	SS	NS	Bio	Observation Count
Accipiter novaehollandiae	grey goshawk	e		n	11
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	8
Astacopsis gouldi	giant freshwater crayfish	v	VU	e	97
Haliaeetus leucogaster	white-bellied sea-eagle	v		n	4
Perameles gunnii	eastern barred bandicoot		VU	n	1
Theclinesthes serpentata	chequered blue	pr			1

Threatened fauna within 10000 metres

(based on Range Boundaries)

Species	Common Name	SS	NS	BO	Potential	Known	Core
Dasyurus maculatus subsp. maculatus	spotted-tail quoll	r	VU	n	1	0	4
Engaeus yabbimunna	burrowing crayfish (burnie)	v	VU	e	2	3	0
Lathamus discolor	swift parrot	e	CR	mbe	1	0	0
Litoria raniformis	green and gold frog	v	VU	n	1	0	0
Prototroctes maraena	australian grayling	v	VU	ae	24	0	0
Beddomeia phasianella	hydrobiid snail (keddies creek)	v		eH	1	1	0
Ceyx azureus subsp. diemenensis	Tasmanian azure kingfisher	e	EN	e	0	0	1

Threatened fauna within 10000 metres

Species	Common Name	SS	NS	BO	Potential	Known	Core
Pseudemoia pagenstecheri	tussock skink	v		n	1	0	0
Haliaeetus leucogaster	white-bellied sea-eagle	v		n	3	0	0
Oreisplanus munionga subsp. larana	marrawah skipper	e	VU	e	1	0	1
Astacopsis gouldi	giant freshwater crayfish	v	VU	e	1	0	0
Tyto novaehollandiae subsp. castanops	masked owl (Tasmanian)	e	VU	e	1	0	1
Limnodynastes peroni	striped marsh frog	e		n	1	0	0
Galaxiella pusilla	eastern dwarf galaxias	v	VU	n	24	0	0
Accipiter novaehollandiae	grey goshawk	e		n	1	0	1
Sarcophilus harrisii	tasmanian devil	e	EN	e	1	0	0
Perameles gunnii	eastern barred bandicoot		VU	n	1	0	0
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	1	0	0
Dasyurus viverrinus	eastern quoll		EN	n	0	0	1

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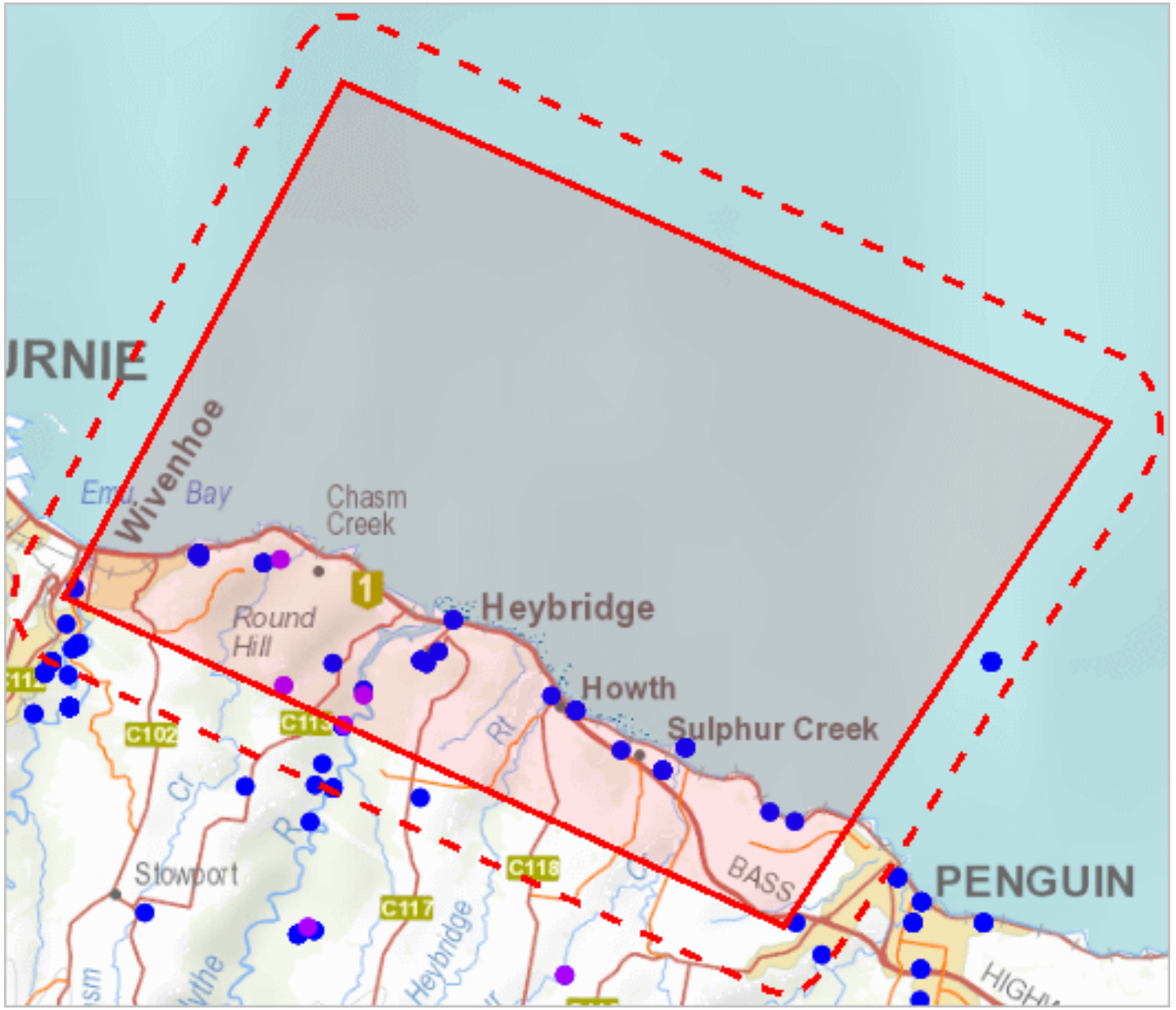
Raptor nests and sightings within 1000 metres

425835, 5461574



408274, 5446457

Please note that some layers may not display at all requested map scales

Raptor nests and sightings within 1000 metres

Legend: Verified and Unverified observations

Legend: Cadastral Parcels

Raptor nests and sightings within 1000 metres

Verified Records

Nest Id/Location Foreign Id	Species	Common Name	Obs Type	Observation Count	Last Recorded
1323	Eagle sp.	Eagle	Nest	2	07-Dec-2006
2573	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	4	25-May-2021
2771	Eagle sp.	Eagle	Nest	1	25-May-2020
553	Accipiter novaehollandiae	grey goshawk	Nest	1	01-Jan-1985
	Accipiter novaehollandiae	grey goshawk	Audible	2	17-Sep-2018
	Accipiter novaehollandiae	grey goshawk	Not Recorded	55	12-Jul-2018
	Accipiter novaehollandiae	grey goshawk	Sighting	14	26-Feb-2019
	Aquila audax	wedge-tailed eagle	Not Recorded	49	23-Apr-2018
	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Sighting	1	31-May-1979
	Falco cenchroides	nankeen kestrel	Sighting	1	31-May-1981
	Falco peregrinus	peregrine falcon	Not Recorded	9	08-Apr-2016
	Haliaeetus leucogaster	white-bellied sea-eagle	Not Recorded	169	14-Jul-2018
	Haliaeetus leucogaster	white-bellied sea-eagle	Sighting	15	03-Jul-2019
	Tyto novaehollandiae	masked owl	Carcass	1	29-Nov-2008

Unverified Records

Nest Id/Location Foreign Id	Species	Common Name	Obs Type	Observation Count
	Accipiter novaehollandiae	grey goshawk	Sighting	3
	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Sighting	1

Raptor nests and sightings within 1000 metres

(based on Range Boundaries)

Species	Common Name	SS	NS	Potential	Known	Core
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	1	0	0
Accipiter novaehollandiae	grey goshawk	e		1	0	1
Haliaeetus leucogaster	white-bellied sea-eagle	v		3	0	0

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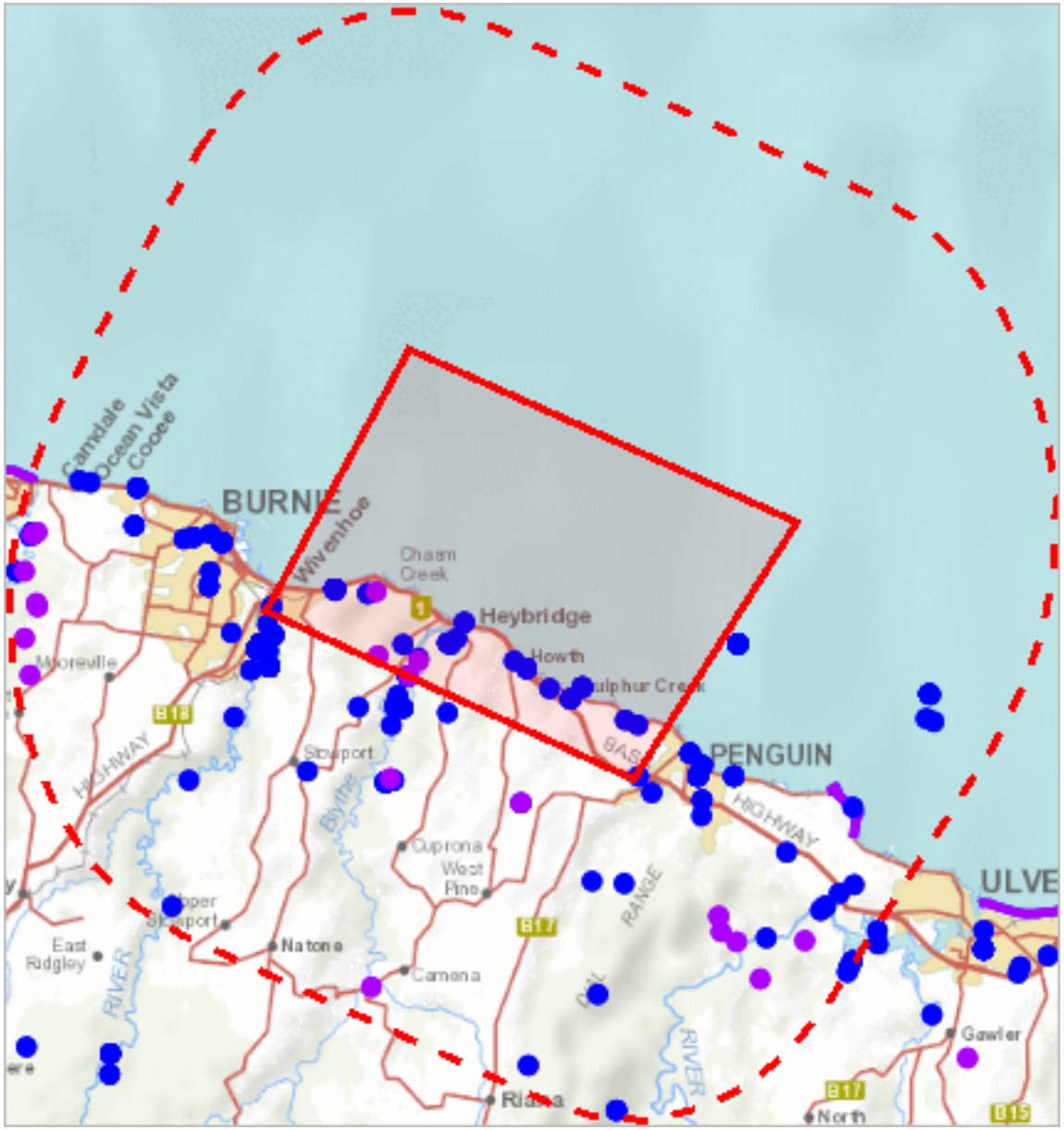
Raptor nests and sightings within 10000 metres

432702, 5470591



401337, 5437391

Please note that some layers may not display at all requested map scales

Raptor nests and sightings within 10000 metres

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Raptor nests and sightings within 10000 metres

Verified Records

Nest Id/Location Foreign Id	Species	Common Name	Obs Type	Observation Count	Last Recorded
1084	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	6	07-Dec-2006
1085	Aquila audax	wedge-tailed eagle	Nest	1	17-Jun-2019
1085	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	2	12-Sep-2002
1086	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	14-Sep-2002
1323	Eagle sp.	Eagle	Nest	2	07-Dec-2006
2273	Haliaeetus leucogaster	white-bellied sea-eagle	Nest	1	07-Dec-2015
2573	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	4	25-May-2021
2574	Falco peregrinus	peregrine falcon	Nest	1	22-Sep-2018
2668	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	25-Dec-2019
2668	Eagle sp.	Eagle	Nest	1	17-Jun-2019
2669	Haliaeetus leucogaster	white-bellied sea-eagle	Nest	2	25-May-2020
2670	Eagle sp.	Eagle	Nest	1	17-Jun-2019
2676	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	25-May-2020
2676	Eagle sp.	Eagle	Nest	1	20-Jun-2019
2677	Eagle sp.	Eagle	Nest	2	25-May-2020
2678	Aquila audax	wedge-tailed eagle	Nest	1	20-Jun-2019
2678	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	25-May-2020
2680	Eagle sp.	Eagle	Nest	1	24-Jun-2019
2729	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	13-May-2020
2770	Eagle sp.	Eagle	Nest	1	25-May-2020
2771	Eagle sp.	Eagle	Nest	1	25-May-2020
2772	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	25-May-2020
5	Falco peregrinus	peregrine falcon	Nest	1	01-Jan-1985
553	Accipiter novaehollandiae	grey goshawk	Nest	1	01-Jan-1985
605	Haliaeetus leucogaster	white-bellied sea-eagle	Nest	1	29-Sep-2004
710	Falco peregrinus	peregrine falcon	Nest	1	01-Jan-1985
743	Aquila audax	wedge-tailed eagle	Nest	1	20-Jun-2019
743	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	2	25-May-2020
776	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	01-Jan-1985
891	Haliaeetus leucogaster	white-bellied sea-eagle	Nest	3	22-Sep-2008
923	Aquila audax	wedge-tailed eagle	Nest	1	24-Jun-2019
923	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	19-Dec-2000
924	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	19-Dec-2000
925	Aquila audax	wedge-tailed eagle	Nest	1	10-Sep-2009
925	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	19-Dec-2000
957	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	01-Jan-1985
958	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	01-Jan-1985
961	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	2	22-May-2007
	Accipiter novaehollandiae	grey goshawk	Audible	2	17-Sep-2018
	Accipiter novaehollandiae	grey goshawk	Not Recorded	66	12-Jul-2018
	Accipiter novaehollandiae	grey goshawk	Sighting	21	07-Jun-2021
	Aquila audax	wedge-tailed eagle	Not Recorded	66	27-Aug-2018
	Aquila audax	wedge-tailed eagle	Sighting	1	20-Sep-2001
	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Carcass	7	17-Apr-2018
	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Sighting	4	29-Apr-2021
	Falco cenchroides	nankeen kestrel	Not Recorded	1	01-Jan-1900
	Falco cenchroides	nankeen kestrel	Sighting	1	31-May-1981
	Falco peregrinus	peregrine falcon	Not Recorded	10	08-Apr-2016
	Haliaeetus leucogaster	white-bellied sea-eagle	Carcass	1	16-Aug-2020
	Haliaeetus leucogaster	white-bellied sea-eagle	Not Recorded	212	14-Jul-2018
	Haliaeetus leucogaster	white-bellied sea-eagle	Sighting	22	14-Dec-2020
	Tyto novaehollandiae	masked owl	Carcass	1	29-Nov-2008
	Tyto novaehollandiae	masked owl	Not Recorded	6	21-Feb-2013
	Tyto novaehollandiae	masked owl	Sighting	5	10-Mar-1985

Unverified Records

Raptor nests and sightings within 10000 metres

Nest Id/Location Foreign Id	Species	Common Name	Obs Type	Observation Count
	Accipiter novaehollandiae	grey goshawk	Sighting	11
	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Sighting	8
	Falco longipennis	australian hobby	Sighting	1
	Haliaeetus leucogaster	white-bellied sea-eagle	Sighting	4

Raptor nests and sightings within 10000 metres

(based on Range Boundaries)

Species	Common Name	SS	NS	Potential	Known	Core
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	1	0	0
Accipiter novaehollandiae	grey goshawk	e		1	0	1
Haliaeetus leucogaster	white-bellied sea-eagle	v		3	0	0

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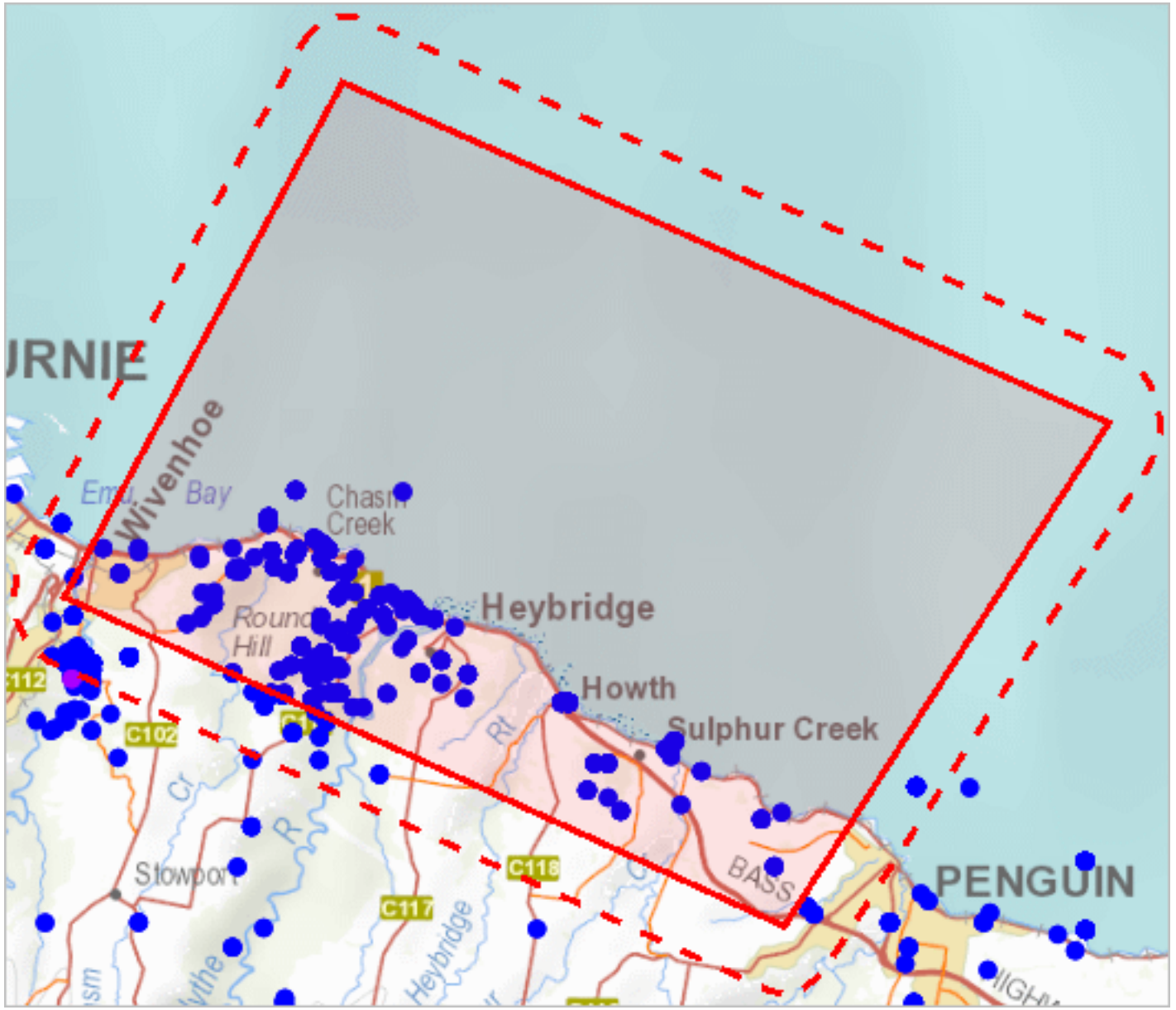
Non-threatened flora of conservation significance within 1000 metres

425835, 5461574



408274, 5446457

Please note that some layers may not display at all requested map scales

Non-threatened flora of conservation significance within 1000 metres

Legend: Verified and Unverified observations

Point Verified | Point Unverified | Line Verified | Line Unverified

Polygon Verified | Polygon Unverified

Legend: Cadastral Parcels

Non-threatened flora of conservation significance within 1000 metres

Verified Records

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Acacia dealbata subsp. dealbata	silver wattle					n	2				y	13	24-Aug-2020
Acacia leprosa var. graveolens	varnish wattle					n	3a					1	27-Jan-2011
Acacia longifolia subsp. longifolia	sydney coast wattle					u	3a-6-8					1	08-Jul-2019
Acacia longifolia subsp. sophorae	coast wattle					n	3a					16	23-Jun-2019
Acacia mearnsii	black wattle					n	3a				y	1	01-Aug-1993
Acacia melanoxylon	blackwood					n	2				y	29	27-Jan-2011
Acacia mucronata subsp. dependens	blunt caterpillar wattle		n	dnct		e	2					10	30-Jun-2004
Acacia mucronata subsp. mucronata	erect caterpillar wattle					e	H					12	21-Jul-2020
Acacia myrtifolia	redstem wattle					n	3a					13	16-Apr-2004
Acacia stricta	hop wattle					n	3a					2	01-Jul-1994
Acacia suaveolens	sweet wattle					n	3a					9	17-Jun-2020
Acacia verticillata	prickly moses					n	2				y	13	23-Mar-2004
Acacia verticillata subsp. verticillata	prickly moses					n	H				y	2	01-Jul-1994
Acianthus caudatus	mayfly orchid					n	3a				y	4	29-Oct-1991
Acianthus pusillus	small mosquito-orchid					n	2				y	6	01-Jul-1994
Acrotriche serrulata	ants delight					n	2				y	3	17-Mar-2004
Aira elegantissima	delicate hairgrass					i	3a					1	23-Mar-2004
Allocasuarina littoralis	black sheoak					n	2				y	12	11-Sep-2018
Allocasuarina monilifera	necklace sheoak					e	2				y	13	27-Jan-2011
Allocasuarina verticillata	drooping sheoak					n	3a					1	14-Nov-2017
Apium prostratum subsp. prostratum	sea celery					n	ltl				y	1	01-Jan-1992
Apium prostratum subsp. prostratum var. prostratum	creeping sea-celery					n	3a				y	1	03-Jan-1937
Apodasmia brownii	coarse twinerush					n	3a					1	01-Jan-1992
Argentipallium dealbatum	white everlasting					n	3a					1	24-Dec-1998
Aristotelia peduncularis	heartberry					e	3a				y	1	01-Jul-1994
Asplenium trichomanes subsp. quadrivalens	limestone spleenwort					n	3a					1	18-Mar-2004
Austrostipa flavescens	yellow speargrass					n	3a					1	18-Mar-2004
Austrostipa stipoides	coast speargrass					n	3a					3	14-Nov-2017
Banksia marginata	silver banksia					n	2	y			y	23	21-Jul-2020
Beyeria viscosa	pinkwood					n	2				y	1	01-Jul-1994
Billardiera longiflora	purple appleberry					e	2				y	3	01-Jul-1994
Blandfordia punicea	christmas bells					e	2				y	1	08-Jan-1947
Bursaria spinosa subsp. spinosa	prickly box					n	2				y	12	12-Sep-2018
Caladenia alata	fairy fingers			dnct		n	3a				y	1	09-Nov-2017
Caladenia carnea	pink fingers					n	2				y	9	19-Oct-2020
Caladenia cracens	elegant finger-orchid					e	3a				y	1	19-Oct-2020
Calochilus paludosus	strap beard-orchid					n	3a				y	1	28-Nov-1986
Calochilus platychilus	purple beard-orchid					n	2				y	2	15-Nov-1989
Calochlaena dubia	rainbow fern					n	3a	y			y	7	18-Mar-2004
Carpobrotus rossii	native pigface					n	3a				y	2	14-Nov-2017
Cassytha glabella	slender dodderlaurel					n	3a				y	7	18-Mar-2004
Cassytha melantha	large dodderlaurel					n	2				y	15	27-Jan-2011
Cassytha pubescens	downy dodderlaurel					n	2				y	9	18-Mar-2004
Chiloglottis cornuta	green bird-orchid					n	3a				y	1	29-Oct-1991
Chiloglottis reflexa	autumn bird-orchid					n	2				y	2	27-Jan-2011
Chiloglottis sp.	bird-orchid					n					y	2	01-Jul-1994
Coprosma hirtella	coffeeberry					n	2				y	2	18-Mar-2004
Coprosma quadrifida	native currant					n	2				y	8	18-Mar-2004
Corybas aconitiflorus	spurred helmet-orchid					n	3a				y	1	30-Jun-1985
Corybas unguiculatus	small pelican-orchid					n	3a				y	3	24-Jun-2021
Cyathea australis subsp. australis	rough treefern					n	3a	y			y	3	18-Mar-2004
Cyperus lucidus	leafy flatsedge					n	3a					1	19-Jun-1980
Cystophora xiphocarpa	algae					tb						1	10-Mar-1999
Dianella brevicaulis	shortstem flaxlily					n	3a				y	1	27-Jan-2011

Non-threatened flora of conservation significance within 1000 metres

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Dianella revoluta	spreading or black-anther flax-lily					n	2				y	7	27-Jan-2011
Dianella revoluta var. revoluta	spreading flaxlily					n	H				y	2	12-Sep-2018
Dianella tasmanica	forest flaxlily					n	2				y	17	11-Dec-2018
Dicksonia antarctica	soft treefern					n	2	y			y	17	24-Aug-2020
Dillwynia cinerascens	grey parrotpea					n	3a					2	16-Mar-2004
Diplazium australe	southern ladyfern					n	3a					1	01-Aug-1993
Dipodium roseum	rosy hyacinth-orchid					n	2				y	6	30-Jan-2017
Distichlis distichophylla	australian saltgrass					n	3a					4	23-Feb-2021
Diuris orientis	eastern wallflower orchid					n	2				y	1	16-Oct-1841
Diuris sulphurea	tiger orchid					n	3a				y	1	16-Oct-1841
Durvillaea potatorum	bull kelp					n					y	1	10-Mar-1999
Eucalyptus amygdalina	black peppermint					e	2					41	12-Sep-2018
Eucalyptus nitida	western peppermint					e	3a					11	17-Mar-2004
Euchiton involucratus	star cottonleaf					n	3a					1	23-Mar-2004
Ficinia nodosa	knobby clubsedge					n	3a					2	01-Aug-1993
Goodenia ovata	hop native-primrose					n	3a					13	12-Sep-2018
Gratiola peruviana	southern brooklime					n	3a					2	14-Dec-2020
Hibbertia hirticalyx	bassian guineaflower					n	3a					3	18-Mar-2004
Hibbertia sericea var. sericea	silky guineaflower					n	3a					2	11-Sep-2018
Homoeostrichus olsenii	algae					ae						1	10-Mar-1999
Indigofera australis subsp. australis	native indigo					n	3a					3	18-Mar-2004
Juncus amabilis	gentle rush		y	dnct		n	3a					1	02-Jan-1982
Juncus astreptus	rigid rush					e	3a					2	23-Mar-2004
Juncus bassianus	forest rush					n	3a					1	23-Mar-2004
Juncus kraussii subsp. australiensis	sea rush					n	3a					2	23-Mar-2004
Juncus sarophorus	broom rush					n	3a					6	10-Mar-2004
Juncus subsecundus	finger rush					n	3a					2	17-Mar-2004
Lepidosperma inops	fan sedge					e	2					5	01-Jul-1994
Leptinella longipes	coast buttons					n	3a					2	23-Mar-2004
Leptoceras menziesii	hares ears			dd		n	3a					2	01-Jan-1900
Leptospermum glaucescens	smoky teatree					e	2					12	18-Mar-2004
Leptospermum laevigatum	coast teatree					n	3a					2	12-Sep-2018
Lessonia corrugata	algae					tb						1	10-Mar-1999
Lindsaea linearis	screw fern					n	3a					4	16-Mar-2004
Linum marginale	native flax					n	3a					1	01-Aug-1993
Lobospira bicuspidata	algae					ae						1	10-Mar-1999
Lomatia tinctoria	guitarplant					e	2	y				14	16-Apr-2004
Melaleuca squarrosa	scented paperbark					n	3a					10	18-Mar-2004
Mitrasacme pilosa	hairy mitrewort					n	3a					1	01-Jul-1994
Muehlenbeckia gunnii	forest lignum					n	3a					3	05-May-2004
Notogrammitis billardierei	common fingerfern					n	3a					3	15-Mar-2004
Olearia stellulata	sawleaf daisybush					n	3a					6	01-Jul-1994
Opercularia varia	variable stinkweed					n	3a					3	01-Jul-1994
Pachydictyon paniculatum	algae					ae						2	01-Jan-1880
Parsonsia brownii	twining silkpod					n	3a					2	18-Mar-2004
Patersonia fragilis	short purpleflag					n	3a					7	08-Dec-2016
Perithalia caudata	algae					ae						2	10-Mar-1999
Phyllocladus aspleniifolius	celerytop pine					e	3a	y				1	17-Mar-2004
Phyllospora comosa	algae					ae						2	10-Mar-1999
Plagiochila fuscella						t						1	01-Jan-1901
Pomaderris elliptica var. diemenica	tasmanian yellow dogwood					e	3a					1	31-Oct-2003
Pomaderris elliptica var. elliptica	yellow dogwood					n	3a					4	14-Oct-2018
Pterostylis melagramma	blackstripe greenhood					n	3a					1	14-Sep-1892
Rytidosperma caespitosum	common wallabygrass					n	3a					1	23-Mar-2004
Rytidosperma laeve	smooth wallabygrass					n	3a					2	01-Jul-1994
Rytidosperma pilosum	velvet wallabygrass					n	3a					2	23-Mar-2004
Rytidosperma semiannulare	marsh wallabygrass					n	3a					1	17-Mar-2004
Sambucus gaudichaudiana	white elderberry					n	2				y	2	05-May-2004
Samolus repens var. repens	creeping brookweed					n	3a					1	01-Jan-1992
Sarcocornia quinqueflora	beaded glasswort					n	3a					1	23-Feb-2021

Non-threatened flora of conservation significance within 1000 metres

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Seirococcus axillaris	algae					ae						1	10-Mar-1999
Selaginella uliginosa	swamp spikemoss					n	3a	y				3	16-Mar-2004
Selliera radicans	shiny swampmat					n	3a					2	01-Jan-1992
Senecio glomeratus	purple fireweed					n	3a					1	01-May-1992
Solanum laciniatum	kangaroo apple					n	3a				y	4	27-Jan-2011
Spinifex sericeus	beach spinifex					n	2				y	1	23-Oct-2001
Sprengelia incarnata	pink swampheath					n	3a					4	16-Mar-2004
Stellaria pungens	prickly starwort					n	3a					1	05-May-2004
Sticherus lobatus	spreading fanfern					n	3a	y				2	05-May-2004
Sticherus urceolatus	umbrella fanfern					n	3a	y				3	18-Mar-2004
Stylidium graminifolium	narrowleaf triggerplant					n	2				y	7	16-Apr-2004
Styphelia humifusa	native cranberry					n	2				y	2	27-Jan-2011
Suaeda australis	southern seablite					n	3a					1	19-Jun-1980
Tasmannia lanceolata	mountain pepper					n	2				y	2	15-Mar-2004
Tecticornia arbuscula	shrubby glasswort					n	3a					1	29-Dec-1986
Tetragonia implexicoma	bower spinach					n	2				y	5	23-Jun-2019
Tetragonia tetragonoides	new zealand spinach					n	3b				y	1	22-Nov-2018
Thelionema caespitosum	tufted lily					n	3a					3	18-Mar-2004
Thelymitra aristata	great sun-orchid					n	2				y	3	12-Nov-1991
Thelymitra flexuosa	twisted sun-orchid					n	3a				y	1	18-Nov-1976
Thelymitra pauciflora	slender sun-orchid					n	2				y	2	06-Nov-1990
Thelymitra rubra	pink sun-orchid					n	2				y	3	12-Nov-1991
Thelymitra sp.						n					y	1	01-Aug-1993
Thelymitra x truncata	truncate sun-orchid			dnct		n	3a				y	1	16-Nov-1981
Thysanotus patersonii	twining fringelily					n	3a				y	2	16-Oct-1841
Todea barbara	southern kingfern					n	3a	y			y	6	18-Mar-2004
Urtica incisa	scrub nettle					n	2				y	1	05-May-2004
Utricularia dichotoma	fairies aprons					n	3a					1	11-Jan-2005
Xiphophora gladiata	algae					tb						1	10-Mar-1999
Zieria arborescens subsp. arborescens	stinkwood					n	2				y	13	24-Aug-2020
Zonaria angustata	algae					ae						3	10-Mar-1999
Zonaria spiralis	algae					ae						1	10-Mar-1999

Unverified Records

No unverified records were found!

For more information about flora and fauna species, please contact Natural Values Conservation Enquiries.

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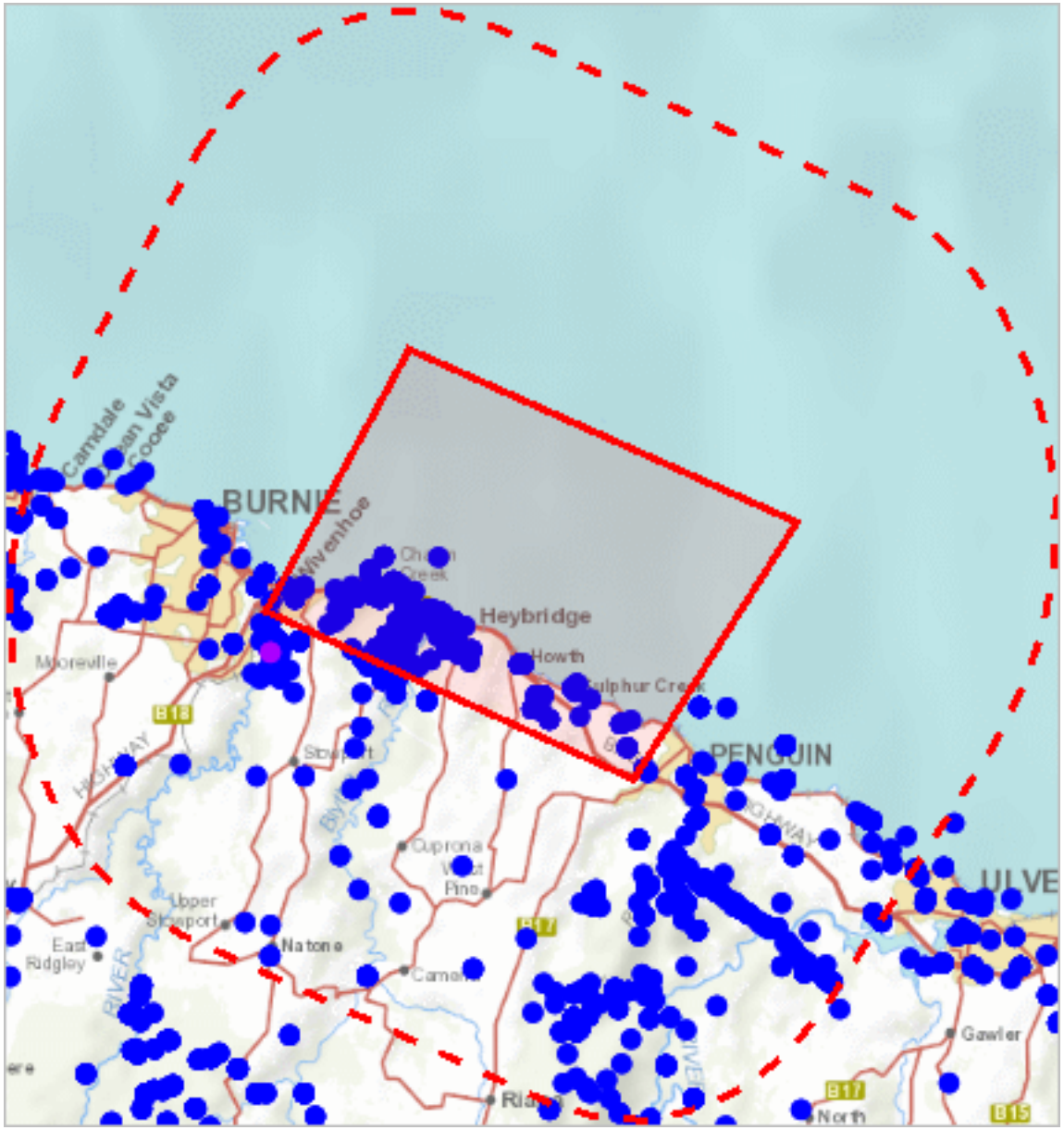
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Non-threatened flora of conservation significance within 10000 metres

432702, 5470591



401337, 5437391

Please note that some layers may not display at all requested map scales

Non-threatened flora of conservation significance within 10000 metres

Legend: Verified and Unverified observations

Point Verified | Point Unverified | Line Verified | Line Unverified

Polygon Verified | Polygon Unverified

Legend: Cadastral Parcels

Non-threatened flora of conservation significance within 10000 metres

Verified Records

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Acacia dealbata subsp. dealbata	silver wattle					n	2				y	43	15-Feb-2021
Acacia leprosa var. graveolens	varnish wattle					n	3a					1	27-Jan-2011
Acacia longifolia subsp. longifolia	sydney coast wattle					u	3a-6-8					1	08-Jul-2019
Acacia longifolia subsp. sophorae	coast wattle					n	3a					24	05-Apr-2021
Acacia mearnsii	black wattle					n	3a				y	1	01-Aug-1993
Acacia melanoxylon	blackwood					n	2				y	92	18-Feb-2021
Acacia mucronata subsp. dependens	blunt caterpillar wattle		n	dnct		e	2					14	30-Jun-2004
Acacia mucronata subsp. mucronata	erect caterpillar wattle					e	H					15	07-Sep-2020
Acacia myrtifolia	redstem wattle					n	3a					17	15-Feb-2021
Acacia stricta	hop wattle					n	3a					3	18-Feb-2021
Acacia suaveolens	sweet wattle					n	3a					12	17-Jun-2020
Acacia verticillata	prickly moses					n	2				y	34	18-Feb-2021
Acacia verticillata subsp. verticillata	prickly moses					n	H				y	4	01-Jul-1994
Acaena pallida	dune buzzy					n	3a					3	21-Jan-2021
Acianthus caudatus	mayfly orchid					n	3a				y	9	07-Nov-2019
Acianthus pusillus	small mosquito-orchid					n	2				y	7	01-Jul-1994
Acrotriche serrulata	ants delight					n	2				y	3	17-Mar-2004
Aira elegantissima	delicate hairgrass					i	3a					4	01-Nov-2004
Allocasuarina littoralis	black sheoak					n	2				y	13	11-Sep-2018
Allocasuarina monilifera	necklace sheoak					e	2				y	14	27-Jan-2011
Allocasuarina verticillata	drooping sheoak					n	3a					5	17-Feb-2021
Apium prostratum subsp. prostratum	sea celery					n	ltl				y	2	01-Jan-1992
Apium prostratum subsp. prostratum var. filiforme	slender sea-celery					n	3a				y	2	21-Jan-2021
Apium prostratum subsp. prostratum var. prostratum	creeping sea-celery					n	3a				y	1	03-Jan-1937
Apodasmia brownii	coarse twinerush					n	3a					1	01-Jan-1992
Argentipallium dealbatum	white everlasting					n	3a					2	24-Dec-1998
Aristotelia peduncularis	heartberry					e	3a				y	4	06-Nov-1996
Arthropodium minus	small vanilla-lily			uc		n	3a				y	1	01-Jan-1858
Asplenium trichomanes subsp. quadrivalens	limestone spleenwort					n	3a					1	18-Mar-2004
Austrostipa flavescens	yellow speargrass					n	3a					2	18-Mar-2004
Austrostipa stipoides	coast speargrass					n	3a					5	14-Nov-2017
Baloskion tetraphyllum subsp. tetraphyllum	tassel cordrush					n	3a					1	08-Dec-1995
Banksia marginata	silver banksia					n	2	y			y	36	15-Feb-2021
Bedfordia salicina	tasmanian blanketleaf					e	3a					1	16-Mar-2004
Beyeria viscosa	pinkwood					n	2				y	1	01-Jul-1994
Billardiera longiflora	purple appleberry					e	2				y	7	18-Feb-2021
Billardiera mutabilis	green appleberry					n	3a				y	1	16-Mar-2004
Blandfordia punicea	christmas bells					e	2				y	1	08-Jan-1947
Bunochilus melagrammus	blackstripe greenhood						3a					1	06-Nov-1984
Bursaria spinosa subsp. spinosa	prickly box					n	2				y	21	18-Feb-2021
Caladenia alata	fairy fingers			dnct		n	3a				y	1	09-Nov-2017
Caladenia angustata	narrowleaf finger-orchid			uc		e	3a				y	2	04-Nov-1984
Caladenia carnea	pink fingers					n	2				y	14	19-Oct-2020
Caladenia cracens	elegant finger-orchid					e	3a				y	5	28-Oct-2020
Caladenia gracilis	musky finger-orchid					n	3a				y	6	23-Nov-2020
Caladenia transitoria	green finger-orchid			uc		n	2				y	1	01-Jan-1975
Calandrinia calyptrata	pink purslane					n	3a				y	1	17-Feb-1948
Caleana major	flying duck-orchid					n	3a				y	2	04-Dec-2016
Calochilus paludosus	strap beard-orchid					n	3a				y	1	28-Nov-1986
Calochilus platychilus	purple beard-orchid					n	2				y	8	07-Nov-2019
Calochlaena dubia	rainbow fern					n	3a	y			y	13	18-Feb-2021
Carpobrotus rossii	native pigface					n	3a				y	11	05-Apr-2021
Cassytha glabella	slender dodderlaurel					n	3a				y	8	18-Mar-2004

Non-threatened flora of conservation significance within 10000 metres

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Cassytha melantha	large dodderlaurel					n	2				y	16	27-Jan-2011
Cassytha pubescens	downy dodderlaurel					n	2				y	13	15-Feb-2021
Centrolepis strigosa subsp. strigosa	hairy bristlewort					n	3a					1	15-Feb-2021
Chiloglottis cornuta	green bird-orchid					n	3a				y	3	15-Dec-1998
Chiloglottis reflexa	autumn bird-orchid					n	2				y	13	18-Feb-2021
Chiloglottis sp.	bird-orchid					n					y	2	01-Jul-1994
Coprosma hirtella	coffeeberry					n	2				y	5	18-Mar-2004
Coprosma nitida	mountain currant					n	2				y	1	05-Mar-1949
Coprosma quadrifida	native currant					n	2				y	45	23-Feb-2021
Corybas aconitiflorus	spurred helmet-orchid					n	3a				y	4	30-Jun-1985
Corybas diemenicus	stately helmet-orchid					n	3a				y	2	15-Jun-1986
Corybas unguiculatus	small pelican-orchid					n	3a				y	4	24-Jun-2021
Cyathea australis subsp. australis	rough treefern					n	3a	y			y	15	17-Feb-2021
Cymbonotus preissianus	southern bears-ears					n	3a					1	17-Feb-1948
Cynoglossum australe	coast houndstongue			dnct		n	3a					1	01-Jan-1900
Cyperus gunnii	flecked flatsedge					n	3a					1	13-Dec-2000
Cyperus lucidus	leafy flatsedge					n	3a					2	19-Jun-1980
Cystophora xiphocarpa	algae					tb						4	10-Mar-1999
Dawsonia superba var. pulchra						ae						1	16-Jul-2019
Dianella brevicaulis	shortstem flaxlily					n	3a				y	2	27-Jan-2011
Dianella revoluta	spreading or black-anther flax-lily					n	2				y	7	27-Jan-2011
Dianella revoluta var. revoluta	spreading flaxlily					n	H				y	2	12-Sep-2018
Dianella tasmanica	forest flaxlily					n	2				y	39	17-Feb-2021
Dichelachne micrantha	shorthair plumegrass					n	3a					1	16-Feb-2021
Dicksonia antarctica	soft treefern					n	2	y			y	61	18-Feb-2021
Dillwynia cinerascens	grey parrotpea					n	3a					2	16-Mar-2004
Diplarrena latifolia	western flag-iris					e	3a				y	1	16-Mar-2004
Diplarrena moraea	white flag-iris					n	2				y	2	16-Mar-2004
Diplazium australe	southern ladyfern					n	3a					3	15-Dec-1998
Dipodium roseum	rosy hyacinth-orchid					n	2				y	12	13-Feb-2021
Distichlis distichophylla	australian saltgrass					n	3a					8	23-Feb-2021
Diuris orientis	eastern wallflower orchid					n	2				y	6	01-Oct-1985
Diuris sulphurea	tiger orchid					n	3a				y	1	16-Oct-1841
Durvillaea potatorum	bull kelp					n					y	4	10-Mar-1999
Epacris paludosa	flinders heath			nt		n	3a					1	14-Nov-2002
Epilobium sarmentaceum	mountain willowherb					n	3a					1	08-Dec-1995
Eucalyptus amygdalina	black peppermint					e	2					107	18-Feb-2021
Eucalyptus dalrympleana subsp. dalrympleana	mountain white gum					n	3a					1	01-Oct-1990
Eucalyptus delegatensis subsp. tasmaniensis	gumtopped stringybark					e	2					5	01-Sep-1994
Eucalyptus nitida	western peppermint					e	3a					15	17-Mar-2004
Eucalyptus regnans	giant ash					n	3a					12	15-Dec-1998
Eucalyptus subcrenulata	alpine yellow gum	ouv				e	2					1	18-Dec-1996
Euchiton involucratus	star cottonleaf					n	3a					1	23-Mar-2004
Eurychorda complanata	flat cordrush					n	3a					3	15-Feb-2021
Ficinia nodosa	knobby clubsedge					n	3a					3	01-Aug-1993
Gahnia filum	chaffy sawsedge					n	3a					1	26-Aug-1985
Gastrodia sesamoides	short potato-orchid					n	3a					1	22-Nov-2018
Gaultheria hispida	copperleaf snowberry					n	3a					1	22-Oct-1975
Goodenia ovata	hop native-primrose					n	3a					25	15-Feb-2021
Gratiola peruviana	southern brooklime					n	3a					2	14-Dec-2020
Helichrysum leucopsideum	satin everlasting			uc		n	3a					1	10-Dec-1980
Heteroscyphus cuneistipulus						t						1	01-Jan-1980
Hibbertia hirticalyx	bassian guineaflower					n	3a					3	18-Mar-2004
Hibbertia sericea var. sericea	silky guineaflower					n	3a					3	11-Sep-2018
Homoeostrichus olsenii	algae					ae						4	10-Mar-1999
Hymenophyton leptopodum						t						1	01-Jan-1886
Indigofera australis subsp. australis	native indigo					n	3a					4	18-Mar-2004
Isolepis marginata	little clubsedge					n	3a					1	14-Jan-1948
Juncus amabilis	gentle rush		y	dnct		n	3a					1	02-Jan-1982

Non-threatened flora of conservation significance within 10000 metres

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Juncus astreptus	rigid rush					e	3a					2	23-Mar-2004
Juncus bassianus	forest rush					n	3a					3	15-Feb-2021
Juncus holoschoenus	jointleaf rush					n	3a					1	26-Jan-2011
Juncus kraussii subsp. australiensis	sea rush					n	3a					3	23-Mar-2004
Juncus revolutus	creeping rush			nt		n	3a					2	29-Dec-1977
Juncus sarophorus	broom rush					n	3a					11	26-Jan-2011
Juncus subsecundus	finger rush					n	3a					3	17-Mar-2004
Lepidium desvauxii	bushy peppercress					n	3a					4	17-Feb-1948
Lepidosperma inops	fan sedge					e	2					5	01-Jul-1994
Leptinella longipes	coast buttons					n	3a					2	23-Mar-2004
Leptoceras menziesii	hares ears			dd		n	3a					3	01-Jan-1900
Leptospermum glaucescens	smoky teatree					e	2					21	15-Feb-2021
Leptospermum laevigatum	coast teatree					n	3a					5	14-Nov-2019
Lessonia corrugata	algae					tb						4	10-Mar-1999
Leucophyta brownii	cushionbush					n	3a					1	18-Jan-1998
Lindsaea linearis	screw fern					n	3a					6	16-Mar-2004
Linum marginale	native flax					n	3a					2	26-Jan-2011
Lobospira bicuspidata	algae					ae						4	10-Mar-1999
Lomatia tinctoria	guitarplant					e	2	y				19	16-Apr-2004
Lunularia cruciata						ae						1	24-Aug-2020
Lycopodium fastigiatum	mountain clubmoss					n	3a	y				2	15-Feb-2021
Lythrum hyssopifolia	small loosestrife					n	3a					1	15-Feb-1945
Melaleuca squamea	swamp honeymyrtle					n	3a					1	15-Feb-2021
Melaleuca squarrosa	scented paperbark					n	3a					29	18-Feb-2021
Mitrasacme pilosa	hairy mitrewort					n	3a					1	01-Jul-1994
Monotoca elliptica	tree broomheath					n	3a					1	11-Dec-1980
Muehlenbeckia adpressa	climbing lignum					n	3a					2	01-Jul-1994
Muehlenbeckia gunnii	forest lignum					n	3a					7	15-Feb-2021
Nematolepis squamea subsp. retusa	blunt satinwood					e	H					2	30-Jun-1986
Notogrammitis billardierei	common fingerfern					n	3a					10	15-Mar-2004
Olearia stellulata	sawleaf daisybush					n	3a					7	10-Apr-2001
Opercularia varia	variable stinkweed					n	3a					5	16-Mar-2004
Oxylobium arborescens	tall shaggypea					n	3a					11	15-Feb-2021
Ozothamnus rosmarinifolius	swamp everlastingbush					n	3a					1	12-Feb-1948
Ozothamnus thyrsoideus	arching everlastingbush					n	3a					3	10-Dec-1980
Pachydictyon paniculatum	algae					ae						4	20-Jan-1954
Parsonsia brownii	twining silkpod					n	3a					2	18-Mar-2004
Patersonia fragilis	short purpleflag					n	3a					11	15-Feb-2021
Pellaea falcata	sickle fern					n	3a					1	14-Jan-1948
Perithalia caudata	algae					ae						5	10-Mar-1999
Phragmites australis	southern reed					n	3a					1	28-Jun-2019
Phyllocladus aspleniifolius	celerytop pine					e	3a	y				2	17-Mar-2004
Phyllospora comosa	algae					ae						5	10-Mar-1999
Pimelea ligustrina subsp. ligustrina	tall riceflower					n	3a					1	01-Jan-1954
Piptoporus australiensis											y	2	27-Mar-1999
Plagiochila fuscella						t						2	01-Jan-1980
Plantago paradoxa	hairtuft plantain	ouv				e	2					1	23-Feb-2006
Polycerea nigrescens	algae					ae						2	22-Jan-1954
Pomaderris apetala subsp. apetala	common dogwood					n	3a					1	18-Jun-2020
Pomaderris aspera	hazel dogwood					n	3a					1	17-Feb-2021
Pomaderris elliptica var. diemenica	tasmanian yellow dogwood					e	3a					1	31-Oct-2003
Pomaderris elliptica var. elliptica	yellow dogwood					n	3a					4	14-Oct-2018
Prasophyllum rostratum	slaty leek-orchid					e	3a					6	01-Jul-1985
Prasophyllum truncatum	truncate leek-orchid			dnct		e	3a					1	01-Jan-1889
Pteris epaleata	netted brake					n	3a	y				1	27-Jan-1991
Pteris tremula	tender brake					n	3a	y				4	22-Nov-2018
Pterostylis aphylla	leafless greenhood					e	3a					1	01-Nov-1925
Pterostylis melagramma	blackstripe greenhood					n	3a					5	28-Oct-2020
Pterostylis pedoglossa	prawn greenhood					n	3a					1	01-May-1979

Non-threatened flora of conservation significance within 10000 metres

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Ranunculus glabrifolius	shining buttercup	ouv				n	3a					1	01-Feb-1948
Rumex brownii	slender dock					n	3a					1	01-Jan-1954
Rytidosperma caespitosum	common wallabygrass					n	3a					2	23-Mar-2004
Rytidosperma laeve	smooth wallabygrass					n	3a					2	01-Jul-1994
Rytidosperma pilosum	velvet wallabygrass					n	3a					5	15-Feb-2021
Rytidosperma semiannulare	marsh wallabygrass					n	3a					2	17-Mar-2004
Sambucus gaudichaudiana	white elderberry					n	2				y	7	30-Oct-2019
Samolus repens var. repens	creeping brookweed					n	3a					2	01-Jan-1992
Sarcochilus australis	gunns tree-orchid	ph		uc		n	3a					1	01-Nov-1925
Sarcocornia blackiana	thickhead glasswort			uc		n	3a					1	26-Aug-1985
Sarcocornia quinqueflora	beaded glasswort					n	3a					3	23-Feb-2021
Schoenus nitens	shiny bogsedge					n	3a					1	11-Feb-1948
Seirococcus axillaris	algae					ae						8	10-Mar-1999
Selaginella uliginosa	swamp spikemoss					n	3a	y				4	16-Mar-2004
Selliera radicans	shiny swampmat					n	3a					3	01-Jan-1992
Senecio glomeratus	purple fireweed					n	3a					1	01-May-1992
Senecio hispidissimus	coarse fireweed			nt		n	5					1	26-Jan-2011
Solanum laciniatum	kangaroo apple					n	3a				y	7	17-Feb-2021
Sphacelaria reinkei	algae					ae						1	26-Jan-1949
Spinifex sericeus	beach spinifex					n	2				y	4	23-Oct-2001
Spiranthes australis	lowland spiral-orchid					n	3a					1	29-Dec-2016
Sprengelia incarnata	pink swampheath					n	3a					6	16-Mar-2004
Stellaria pungens	prickly starwort					n	3a					3	17-Feb-2021
Sticherus lobatus	spreading fanfern					n	3a	y				7	16-Jul-2019
Sticherus urceolatus	umbrella fanfern					n	3a	y				4	18-Mar-2004
Stylidium graminifolium	narrowleaf triggerplant					n	2				y	14	15-Feb-2021
Styphelia humifusa	native cranberry					n	2				y	2	27-Jan-2011
Suaeda australis	southern seablite					n	3a					4	01-Jan-1992
Tasmannia lanceolata	mountain pepper					n	2				y	3	15-Mar-2004
Tecticornia arbuscula	shrubby glasswort					n	3a					3	09-Sep-2020
Tetragonia implexicoma	bower spinach					n	2				y	13	31-Aug-2020
Tetragonia tetragonoides	new zealand spinach					n	3b				y	2	22-Nov-2018
Thelionema caespitosum	tufted lily					n	3a					3	18-Mar-2004
Thelymitra arenaria	forest sun-orchid			dnct		n	3a				y	4	06-Nov-1984
Thelymitra aristata	great sun-orchid					n	2				y	5	12-Nov-1991
Thelymitra brevifolia	shortleaf sun-orchid			dd		n	1-2				y	2	06-Nov-1984
Thelymitra erosa	striped sun-orchid					n	3a				y	2	14-Nov-2015
Thelymitra flexuosa	twisted sun-orchid					n	3a				y	2	12-Oct-1980
Thelymitra ixioides	spotted sun-orchid					n	3a				y	3	16-Nov-1989
Thelymitra pauciflora	slender sun-orchid					n	2				y	3	06-Nov-1990
Thelymitra rubra	pink sun-orchid					n	2				y	10	12-Nov-1991
Thelymitra sp.						n					y	2	26-Jan-2011
Thelymitra x truncata	truncate sun-orchid			dnct		n	3a				y	1	16-Nov-1981
Themeda triandra	kangaroo grass					n	2				y	1	01-Nov-1950
Thysanotus patersonii	twining fringelily					n	3a				y	2	16-Oct-1841
Tinocladia australis	algae					ae						3	20-Jan-1954
Todea barbara	southern kingfern					n	3a	y			y	11	18-Feb-2021
Urtica incisa	scrub nettle					n	2				y	3	05-May-2004
Utricularia dichotoma	fairies aprons					n	3a					1	11-Jan-2005
Xanthosia ternifolia	shrubby crossherb					n	3a					1	09-Jun-1913
Xiphophora gladiata	algae					tb						4	10-Mar-1999
Zieria arborescens subsp. arborescens	stinkwood					n	2				y	46	18-Feb-2021
Zonaria angustata	algae					ae						6	10-Mar-1999
Zonaria spiralis	algae					ae						4	10-Mar-1999

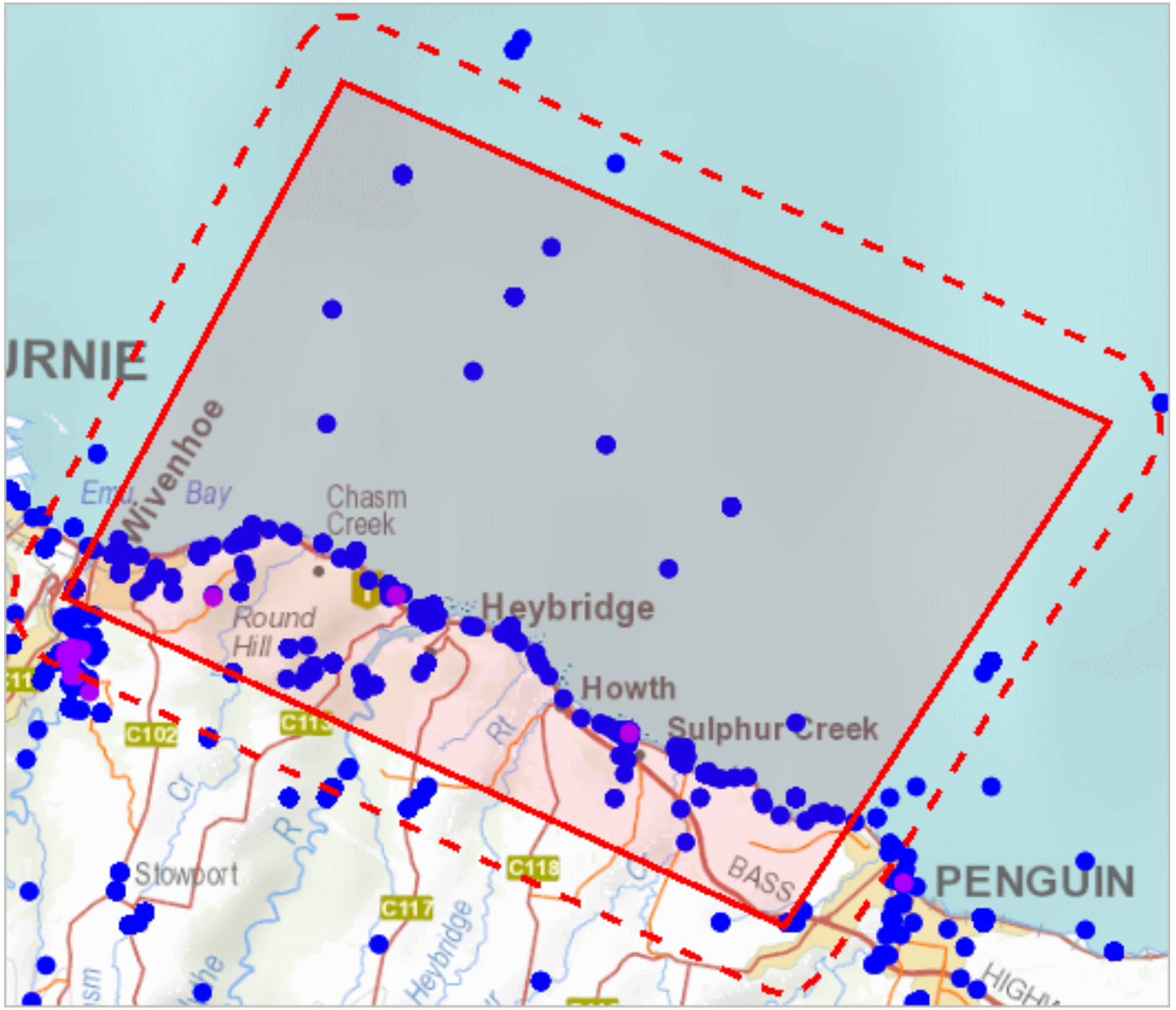
Unverified Records

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count
Lunularia cruciata						ae						1

For more information about flora and fauna species, please contact Natural Values Conservation Enquiries.
Telephone: (03) 6165 4319
Fax: (03) 6233 3477
Email: NaturalValuesConservation.Enquiries@dpipwe.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Non-threatened fauna of conservation significance within 1000 metres

425835, 5461574



408274, 5446457

Please note that some layers may not display at all requested map scales

Non-threatened fauna of conservation significance within 1000 metres

Legend: Verified and Unverified observations

Legend: Cadastral Parcels

Non-threatened fauna of conservation significance within 1000 metres

Verified Records

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Abantiades hyalinatus	ghost moth					ae						2	21-Jan-2019
Acanthiza chrysorrhoa	yellow-rumped thornbill	ouv		nca2		ae						19	07-Nov-2015
Acanthiza ewingii	tasmanian thornbill	ouv		nca2		e						365	24-Apr-2016
Acanthiza pusilla	brown thornbill	ouv		nca2		ae						623	19-Aug-2018
Acanthornis magna	scrubtit	ouv				e						42	31-Jan-2015
Acar squamosa	scaly ark-shell					ae						2	26-Jun-1996
Aclophoropsis festiva	festive sinistral-creeper					ae						1	23-May-2007
Aenetus ligniveren	common splendid ghost moth					ae						3	31-Dec-2018
Aenetus moorei	Tasmanian Spendid Ghost Moth					?e						1	14-Dec-2019
Afrolittorina praetermissa	checkered australwink					ae						4	13-Dec-2011
Agrotis porphyricollis	variable cutworm					ae						3	14-Oct-2019
Alaba monile						ae						2	23-May-2007
Alvania fasciata	banded rice-shell					ae						2	23-May-2007
Alvania strangei	Strange's rice-shell					ae						2	23-May-2007
Amalda marginata	margined olive					ae						9	13-Dec-2011
Amblychilepas javanicensis	rayed keyhole-limpet					ae						1	31-Dec-2006
Amoria undulata	wavy volute					ae						4	13-Dec-2011
Amphithalamus incidata	engraved rice-shell					ae						1	01-Jan-1920
Anabathron contabulatum	boarded false rice-shell					ae						1	23-May-2007
Anabathron lene	gentle false rice-shell					ae						1	01-Jan-1920
Anabathron luteofuscus	yellowish false rice-shell					ae						1	01-Jan-1920
Anachis atkinsoni	Atkinson's dove-shell					ae						2	23-May-2007
Anachloris uncinata	hook-winged carpet moth					ae						5	03-Oct-2019
Aname tasmanica		ouv				e						1	05-Apr-1993
Anas castanea	chestnut teal			nca4		ae						94	24-Apr-2016
Anthochaera chrysoptera subsp. tasmanica	little wattlebird	ouv				e						10	31-May-1981
Anthochaera paradoxa	yellow wattlebird	ouv		nca2		e						57	06-Sep-2014
Ascorhis tasmanica	Tasmanian hydrobia					ae						1	01-Jul-1948
Astralium aureum	Golden Small Star					ae						8	13-Dec-2011
Australaria australasia	Australian Horse Conch					ae						4	24-Sep-2020
Australeuma jeekeli						e						1	11-Feb-1992
Austroaeschna parvistigma	swamp darner dragonfly					ae						1	05-Feb-2020
Austrocochlea brevis	short top-shell					te						1	23-May-2007
Austrocochlea constricta	Periwinke					ae						8	24-Sep-2020
Austrodrillia beraudiana	Beraud's turrid					ae						1	01-Nov-1947
Austroliotia australis	southern liotia					ae						4	23-May-2007
Austroliotia subquadrata	The Squared Munditia					ae						1	23-May-2007
Austrolittorina unifasciata	Banded Periwinkle					ae						5	13-Dec-2011
Austromactra rufescens	Reddish Trough Shell					ae						1	01-Jan-1900
Austromitra analogica	analog ribbed-mitre					ae						6	13-Dec-2011
Austropyrgus lochi						eH						3	01-Jan-1920
Badepigrus pupoideus	chrysalis-like false rice-shell					ae						2	23-May-2007
Barbatia pistachia	hairy ark-shell					ae						8	13-Dec-2011
Bassina disjecta	wedding-cake venus					ae						1	02-Feb-1971
Bathytricha truncata	sugarcane and maize stemborer					ae						1	21-Jan-2019
Bedeva baileyana	Bailey's rock-shell					ae						3	23-May-2007
Bedeva paivae	mussel drill					ae						1	31-Jan-1955
Bedeva vinosa	purple-mouthed rock-shell					ae						6	13-Dec-2011
Belloliva leucozona	White-Zoned Wheat-Olive					ae						2	23-May-2007
Bembicium auratum	estuarine conniwink					ae						2	26-Jun-1996
Bembicium nanum	Striped-mouth Conniwink					ae						8	24-Sep-2020
Benthoxystus petterdi	Petterd's trophon					ae						2	23-May-2007
Biziura lobata	musk duck			nca2		ae						1	01-Jan-1900
Brachidontes erosus	Beaked Mussel					ae						3	13-Dec-2011
Brechites strangei						ae						2	01-Dec-1945
Brookula nepeanensis	Point Nepean false-top-shell					ae						2	23-May-2007
Cacozeliana granarium	grainy creeper					ae						4	13-Dec-2011
Cacozeliana icarus	icarus creeper					ae						1	23-May-2007
Calamanthus fuliginosus	striated fieldwren	ouv		nca2		ae						44	05-Aug-2015

Non-threatened fauna of conservation significance within 1000 metres

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Callista diemenensis	Tasmanian callista					ae						2	03-Feb-1971
Cantharidella tiberiana	tiberian kelp-shell					ae						1	23-May-2007
Cardita aviculina	excavated false-cockle					ae						6	23-May-2007
Carditellopsis elegantula	elegant false-cockle					ae						1	23-May-2007
Catoryctis subnexella						ae						1	18-Dec-2018
Cellana solida	Orange-edged Limpet					ae						7	24-Sep-2020
Ceraon tasmaniae						ae						2	22-Jan-2019
Cercophonius squama	southern scorpion or wood scorpion					ae						1	07-Apr-2007
Chaetophyes compacta						ae						1	14-Jan-2019
Cheirimedon adentatus						tb						2	01-Apr-1986
Cheirimedon denturus						tb						2	01-Apr-1986
Chlorodiloma adelaidae	Adelaide Periwinkle					ae						5	12-Dec-2011
Chlorodiloma odontis	chequered top-shell					ae						4	13-Dec-2011
Cinctiuga diaphana	transparent pyramid-shell					ae						1	01-Jan-1920
Clanculus plebejus	Plebeian Clanculus					ae						3	13-Dec-2011
Clanculus undatus	wavy top-shell					ae						1	23-May-2007
Cleobora mellyi	southern ladybird					ae						3	13-Sep-2019
Coenaculum minutulum	minute graphidid					ae						3	23-May-2007
Colluricincla harmonica subsp. harmonica	grey shrike-thrush	ouv				e						29	11-Dec-1981
Cominella eburnea	ivory whelk					ae						3	23-May-2007
Cominella lineolata	Lineated Buccinum Whelk					ae						10	24-Sep-2020
Conasprella rutila	fiery cone					ae						2	01-Jun-1944
Condylocardia limaeformis	file-like condyl-clam					ae						4	23-May-2007
Conuber conicus	Conical Moon Snail					ae						4	23-May-2007
Conus anemone	anemone cone					ae						9	14-Jul-2019
Cosa fimbriata	basket micromussel					ae						1	01-May-1947
Coturnix ypsilophora	brown quail			nca4		ae						13	30-Apr-2018
Coturnix ypsilophora subsp. ypsilophorus	brown quail or swamp quail (ssp. of brown quail)	ouv		nca4		e						1	31-May-1978
Cracticus torquatus subsp. cinereus	grey butcherbird	ouv		nca2		e						13	28-Feb-1981
Crassitoniella erratica	erratic eaton-shell					ae						1	23-May-2007
Crinia tasmaniensis	tasmanian froglet	ouv		nca2		e		y				1	21-Sep-1993
Cristiceps australis	Southern Crested Weedfish					ae						1	17-Jan-1934
Crossea concinna	ivory false-top-shell					ae						5	23-May-2007
Crypsiphona tasmanica						e						1	10-Dec-2018
Cryptophasa albacosta	small fruit-tree borer					ae						1	29-Jan-2019
Ctena tatei	Tate's lucine					ae						1	01-May-1949
Cupidoliva nympha	Nymph Rice Shell					ae						2	23-May-2007
Cyclodomorphus casuarinae	she-oak skink	ouv		nca2		e						1	01-Jan-1900
Cymatiella eburnea	pink-tipped rock-whelk					ae						6	13-Dec-2011
Cymatiella verrucosa	Little Southern Triton					ae						9	13-Dec-2011
Dermomurex goldsteini	Goldstein's murex					ae						2	23-May-2007
Diala suturalis	sutured diala					ae						1	23-May-2007
Diloma concamerata	Speckled Or Wavy Periwinkle					ae						8	13-Dec-2011
Diloma concameratum	Speckled Or Wavy Periwinkle					ae						1	24-Sep-2020
Discobola australis						ae						1	25-Sep-2019
Dolicrossea labiata	lipped elachisinid					ae						1	23-May-2007
Dosinia crocea	yellowish dosinia					ae						1	01-May-1944
Dosinia victoriae	Victorian dosinia					ae						1	01-May-1944
Eatoniella melanochroma	blackish eaton-shell					ae						2	23-May-2007
Electroma papilionacea	common butterfly-shell					ae						1	01-Feb-1945
Emarginula candida	Notched False Limpet					ae						4	13-Dec-2011
Engaeus disjuncticus						e						2	30-Jun-1996
Engaeus fossor						ae						7	30-Jun-1998
Eoacmaea calamus	delicate limpet					ae						1	23-May-2007
Epitonium minorum	lesser wentletrap					ae						1	01-Dec-1968
Ericusa papillosa	nippled volute					ae						1	01-Jan-1950
Etrema bicolor	bicoloured turrid					ae						1	23-May-2007
Eucrassatella kingicola	King Island Crassatella					ae						4	03-Feb-1971
Eulima augur	large urchin-snail					ae						4	23-May-2007
Eunaticina umbilicata	umbilicated sand-snail					ae						2	17-Feb-1972

Non-threatened fauna of conservation significance within 1000 metres

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Falco berigora subsp. tasmanica	brown falcon or brown falcon (tasmanian)	ouv				e						18	31-Aug-1981
Fletchamia sugdeni						ae						1	29-Oct-2017
Fossarina legrandi	Legrand's Top Shell					ae						2	23-May-2007
Fossarina petterdi	Petterd's Top Shell					ae						1	23-May-2007
Fraus simulans	lesser ghost moth					ae						1	17-Apr-2019
Friginatica beddomei	Beddome's sand-snail					ae						2	23-May-2007
Gadila spreta	common tusk-shell					ae						1	23-May-2007
Gadopsis marmoratus	blackfish					ae						4	02-Jan-1992
Gallinula mortierii	tasmanian native hen			nca2		e						37	27-Jul-2018
Gazameda tasmanica	Tasmanian screw-shell					ae						1	03-Feb-1971
Geitoneura klugii	Klug's xenica					ae						1	04-Feb-2020
Gelonus tasmanicus	[Tasmanian] gelonus bug					ae						1	05-Jan-2007
Gibberula diplostreptus	two-plaited margin-shell					ae						1	01-Jan-1949
Gibbomodiola albicostus	Narrow Horse Mussel					ae						1	13-Dec-2011
Glycymeris mayi	May's dog-cockle					ae						3	06-Feb-1973
Glycymeris radians	Common Dog Cockle					ae						3	01-Sep-1946
Glycymeris striatularis	Striated Dog Cockle					ae						3	13-Dec-2011
Granata imbricata	tiled top-shell					ae						2	31-Aug-2019
Guraleus alucinans	dreaming turrid					ae						2	13-Dec-2011
Guraleus flaccidus	flaccid turrid					ae						3	23-May-2007
Guraleus pictus	painted turrid					ae						4	23-May-2007
Haliotis rubra	Black-lip Abalone					ae						6	12-Dec-2011
Haliotis rubra rubra						ae						2	01-Jan-1960
Haliotis scalaris emmae	Emma's abalone					ae						4	13-Dec-2011
Hastula brazieri	Brazier's auger					ae						1	23-May-2007
Hedleytriphora fasciata	banded sinistral-creeper					ae						1	23-May-2007
Heliothis punctifera						ae						2	07-Dec-2008
Herpetopoma aspersus	speckled top-shell					ae						3	23-May-2007
Heteronympha merope	common brown butterfly					ae						5	05-Feb-2020
Hiatella australis	Australian rock borer					ae						1	23-May-2007
Hinemoa tasmanica	mask pyramid-shell					ae						2	23-May-2007
Hippomedon rodericki						ae						2	01-Apr-1986
Hipponix australis	southern bonnet-limpet					ae						4	13-Dec-2011
Irus carditoides	White Irus					ae						2	12-Dec-2011
Ischnochiton australis	southern chiton					ae						2	24-Sep-2020
Isoodon obesulus subsp. affinis	southern brown bandicoot	ouv				e						10	14-Apr-1993
Isotriphora amethystina	amethyst sinistral-creeper					ae						1	01-Dec-1947
Kellia rotunda	rounded lepton					ae						2	23-May-2007
Keratroides angulosus						e						4	13-Sep-1990
Keratroides vulgaris						e						8	13-Sep-1990
Laevilitorina mariae	Maria's winkle					ae						2	23-May-2007
Lasaea australis	Australian Lasaea					ae						4	12-Dec-2011
Leuconopsis pellucidus	transparent air-breather					tb						2	23-May-2007
Lichenaula calligrapha						ae						2	03-Mar-2019
Lichenostomus flavicollis	yellow-throated honeyeater	ouv		nca2		e						31	11-Dec-1981
Limatula strangei	Strange's file-shell					ae						2	23-May-2007
Liotella compacta	compact false-top-shell					ae						2	23-May-2007
Lironoba australis	southern rice-shell					ae						2	23-May-2007
Lissodesmus perporosus						e						1	11-Feb-1992
Litozamia brazieri	Brazier's Trophon					ae						5	13-Dec-2011
Lophopagurus lacertosus						ol						4	10-Feb-1970
Lottia mixta	mixed limpet					ae						2	23-May-2007
Lunella undulatus	Common Warrener					ae						9	24-Sep-2020
Macroceps tonnoiri						ae						1	28-Jan-1949
Macroschisma tasmaniae	Tasmanian keyhole-limpet					ae						6	13-Dec-2011
Macteola anomala	anomalous turrid					ae						5	13-Dec-2011
Mactra pura	Pure Trough Shell					ae						1	01-Feb-1945
Marinula xanthostoma	delicate air-breather					ae						2	13-Dec-2011
Marita compta	margin-like turrid					ae						3	23-May-2007
Megalurus gramineus subsp. gramineus	little grassbird	ouv				e						4	11-Dec-1981
Melanella orthopleura						ae						1	23-May-2007
Melanodryas vittata	dusky robin	ouv		nca2		e						224	30-Apr-2018

Non-threatened fauna of conservation significance within 1000 metres

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Melithreptus affinis	black-headed honeyeater	ouv		nca2		e						303	18-Apr-2019
Melithreptus validirostris	strong-billed honeyeater	ouv		nca2		e						236	08-Apr-2016
Merelina cancellata	latticed rice-shell					tb						2	23-May-2007
Merelina hirta	hairy rice-shell					ae						2	23-May-2007
Mesoginella pygmaeoides	pygmy margin-shell					ae						5	13-Dec-2011
Microdes diplodonta						e						2	12-Dec-2018
Microdon amabilis						ae						1	11-Mar-2017
Microdryas janjucensis	Jan Juc false rice-shell					ae						1	01-Jan-1920
Mictodoca callipolia						e						1	18-Mar-2019
Mimachlamys asperrima	Doughboy Scallop					ae						1	10-Feb-1971
Mitra badia						ae						6	13-Dec-2011
Mitra glabra						ae						6	13-Dec-2011
Mitrella austrina						ae						3	13-Dec-2011
Mitrella leucostoma						ae						5	13-Dec-2011
Mitrella semiconvexa						ae						5	13-Dec-2011
Mnesampela privata	autumn gum moth					ae						1	28-Dec-2018
Montfortia subemarginata	giant notch-limpet					ae						2	23-May-2007
Montfortula rugosa	Rough Notch Limpet					ae						6	13-Dec-2011
Myllita tasmanica	Tasmanian myllita					ae						1	23-May-2007
Mysella donaciformis	wedge-shaped lepton					ae						1	23-May-2007
Mysella dromanaensis						tb						1	23-May-2007
Naricava angasi	Angas' vanikoro					ae						1	01-Jan-1920
Nassarius nigellus	Tasmanian Dog Whelk					ae						4	13-Dec-2011
Nassarius pauperatus	Impoverished Dog Whelk					ae						1	26-Jun-1996
Nassarius pyrrhus	Banded Dog Whelk					ae						2	23-May-2007
Neolucia agricola	fringed blue butterfly					ae						6	14-Dec-1994
Neorchestia plicibrancha						e						1	28-Jul-1975
Nerita atramentosa	black nerite sea snail					ae						7	24-Sep-2020
Nesoptilotis flavicollis	Yellow-throated Honeyeater					e						512	12-Jul-2018
Neumichtis mesophaea						ae						1	16-Oct-2017
Neumichtis nigerrima						ae						1	11-Sep-2019
Neumichtis saliaris	green cutworm					ae						1	25-Sep-2019
Neumichtis signata						ae						1	11-Sep-2019
Ninox novaeseelandiae subsp. leucopsis	southern boobook	ouv		nca2		e						8	14-May-1986
Notoacmea flammea	flame limpet					ae						3	12-Dec-2011
Notocypraea angustata	Brown Cowry					ae						3	23-May-2007
Notocypraea comptoni	Compton's Cowry					ae						1	01-Mar-1956
Notocypraea declivis	Sloping Cowry					ae						2	23-May-2007
Notocypraea piperita	Peppered Cowry					ae						3	23-May-2007
Notogibbula lehmanni	Many Coloured Top Shell					ae						1	26-Jun-1996
Notoscolex simsoni						?e						2	13-Oct-1954
Odostomia deplexa	unwoven pyramid-shell					ae						1	23-May-2007
Oenochroma barcodificata						ae						1	20-Oct-2017
Oenochroma vetustaria	Ribbed Wine Moth					ae						2	26-Dec-2018
Oenosandra boisduvalii	Boisduval's Autumn Moth					ae						2	17-Mar-2017
Ollaphon molorthus	sounding-lead trophon					ae						1	01-Sep-1947
Ombrastacoides leptomerus						e						1	10-Sep-1990
Oncopera intricata	corbie					e						1	06-Feb-2018
Onoba demessa	mown rice-shell					te						1	23-May-2007
Ooperipatellus cryptus	northwest velvet worm					e						3	01-Oct-1998
Opalia australis	southern wentletrap					ae						8	14-Jul-2019
Opalia granosa	grainy wentletrap					ae						8	13-Dec-2011
Ophicardelus ornatus	mangrove air-breather					ae						1	06-Jan-1937
Ornithorhynchus anatinus	platypus			nca2		ae						14	24-Apr-2013
Ovacuna atkinsoni	Atkinson's condyl-clam					ae						1	23-May-2007
Ovaginella ovulum	egg margin-shell					ae						2	23-May-2007
Oxycanus australis	moth in grassgrub genus					ae						2	31-May-2019
Paragrapsus quadridentatus						tb						1	24-Sep-2020
Paropsis aegrota subsp. elliotti	eucalyptus leaf beetle					e						1	20-Nov-2009
Paropsis tasmanica	eucalyptus leaf beetle					?e						1	17-Nov-2017
Patelloida insignis	Maltese Cross Limpet					ae						8	13-Dec-2011
Patelloida latistrigata	lateral-striped limpet					ae						3	12-Dec-2011

Non-threatened fauna of conservation significance within 1000 metres

Species	Common Name	Sci	RFA	Nat	Int	Bio	Res	Pri	Unc	Sen	Cul	Observation Count	Last Recorded
Petaloconchus caperatus	captured worm-shell					ae						1	23-May-2007
Petroica boodang subsp. leggii	scarlet robin			nca2		e						405	12-Jul-2018
Phallomedusa austrina	southern air-breather					eH						1	06-Jan-1937
Phallomedusa solida	solid air-breather					ae						2	23-May-2007
Phasianella australis	Painted Lady or Australian Pheasant					ae						1	01-Jan-1945
Phasianella ventricosa	Swollen Pheasant Shell					ae						10	13-Dec-2011
Phasianotrochus eximius	choice kelp-shell					ae						10	24-Sep-2020
Phasianotrochus irisodontes	Rainbow Kelp Shell					ae						5	13-Dec-2011
Philippia lutea	yellow sundial-shell					ae						1	01-Jun-1949
Philobrya ruber	reddish micromussel					ae						1	23-May-2007
Philobrya rubra	reddish micromussel					ae						1	01-Jan-1920
Phycothais reticulata	knobbly rock-shell					ae						7	13-Dec-2011
Pisinna albizona						ae						1	01-Jan-1920
Pisinna approxima	approximate false rice-shell					ae						1	01-Jan-1920
Pisinna labrotoma	labrotoma false rice-shell					te						2	01-Jan-1920
Pisinna oblata	exposed false rice-shell					ae						1	01-Jan-1920
Pisinna olivacea	olivaceous false rice-shell					ae						1	23-May-2007
Platycercus caledonicus	green rosella	ouv		nca2		e						441	22-Nov-2018
Plaxiphora albida	whitened chiton					ae						2	18-Jun-1979
Plaxiphora matthewsi	Matthews' chiton					ae						1	02-Jan-1971
Plesiotrochus monachus	Monk Creeper					ae						1	23-May-2007
Pleuroloba quoyi	Quoy's air-breather					ae						1	06-Jan-1937
Pleuroploca australasia	Australian Horse Conch					ae						2	13-Dec-2011
Potorous tridactylus subsp. apicalis	long-nosed potoroo	ouv		nca2		e						1	18-Mar-1980
Pratulum thetidis	Pretty Cockle					ae						1	04-Feb-1972
Prismatopus spatulifer						ae						1	02-Feb-1971
Proteuxoa tortisigna						ae						1	26-Feb-2019
Pseudaphritis urvillii	sandy or freshwater flathead					ae						2	29-Nov-1989
Pseudarcopagia botanica	Botany Bay tellin					ae						5	13-Dec-2011
Pseudocheirus peregrinus subsp. viverrinus	common ringtail possum	ouv				e						7	04-Jun-1991
Pterochelus triformis	three-cornered murex					ae						1	23-May-2007
Ptomaphila lacrymosa						ae						1	02-Oct-2017
Pugillaria stowae	Stow's siphon-shell					ae						1	23-May-2007
Puncturella harrissoni	Harrisson's notch-limpet					ae						2	23-May-2007
Purpurocardia bimaculata	splashed false-cockle					ae						1	01-Mar-1945
Pyreneola fulgida	gleaming dove-shell					ae						1	23-May-2007
Reticunassa compacta	compact dog-whelk					ae						4	13-Dec-2011
Reuplemmeles hobartensis						ae						1	19-Dec-2017
Rhyssoplax tricostalis	three-ribbed chiton					ae						1	17-Feb-1972
Rissoina angasii	Angas' rice-shell					ae						2	23-May-2007
Rissoina elegantula						ae						2	23-May-2007
Rissoina fasciata	banded rice-shell					ae						4	13-Dec-2011
Rolandiella umbilicata	umbilicated murex					ae						4	23-May-2007
Sassia bassi	Bassian rock-whelk					ae						3	23-May-2007
Sassia subdistorta	distorted rock-whelk					ae						5	13-Dec-2011
Scalenostoma lodderae	Lodder's coral-snail					ae						1	01-Aug-1947
Scutus antipodes	common elephant-snail					ae						4	24-Sep-2020
Seila albosutura	white-mouthed false-creeper					ae						1	23-May-2007
Sepia apama	giant cuttlefish					ae						2	13-Dec-2011
Sericornis humilis	tasmanian scrubwren			nca2		e						266	11-Nov-2018
Siphonaria diemenensis	common siphon-shell					ae						7	13-Dec-2011
Siphonaria funiculata	corded siphon-shell					ae						3	23-May-2007
Smilasterias multipara						tb						2	10-Mar-1999
Sminthopsis leucopus subsp. leucopus	white-footed dunnart	ouv				e						11	02-Oct-1978
Somethus tasmani						?e						1	27-Aug-1964
Spondylus tenellus	slender thorny-oyster					ae						3	01-May-1946
Stathmopoda melanochra	eriococcus caterpillar					ae						1	15-Jan-2019
Stenacapha hamiltoni	Hamilton's pinwheel Snail	ouv				e						2	06-Mar-2004
Strepera fuliginosa	black currawong			nca2		e						5	31-Aug-1981
Sukashitrochus atkinsoni	Atkinson's slit-shell					ae						2	23-May-2007

APPENDIX F

The effects of electromagnetic fields (EMF) from subsea transmission cables on marine fauna

by

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Memorandum

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Project reference	754-MELEN215878		
Memo subject	The effects of EMF from subsea transmission cables on marine fauna		

1. Introduction

As part of the feasibility assessment for Project Marinus, TasNetworks is investigating several technology options for the interconnector, including bundled and unbundled high voltage direct current (HVDC) cables. Power cables emit electric and magnetic fields (EMF). The configuration of the cables can affect the strength of EMF around the cables. Unbundled cables have elevated EMF over bundled cables. EMF can interfere with marine fauna with electroreceptors (e.g., sharks and cartilaginous fish) and marine mammals with heightened sensitivity to magnetic fields (e.g., whales and dolphins).

A review of interconnectors using symmetrical monopole and bipole technologies and how EMF was addressed has been undertaken for interconnectors with publicly available information. The results of the review are summarised in Table 1. Basslink is included in the table for comparison purposes.

Our research shows that some interconnectors have adopted bundled cable configurations to reduce EMF, while others have assessed the significance of impacts on marine mammals, fish and benthic fauna as minor or negligible. In reaching those conclusions, the proponents relied heavily on research undertaken into the effects of EMF on marine fauna, in particular Gill et al. (2005).

Consequently, Coffey has undertaken a desktop review of available literature surrounding the current knowledge of impacts to marine fauna from EMFs emitted by subsea power cables. This review has included various studies, research papers, journal articles, etc. and assesses how cable configuration and installation can influence the strength of EMFs, and whether EMFs pose a significant impact to marine fauna. The results of our literature review are presented below.

Table 1 Summary of symmetrical monopole and bipole interconnectors and EMF

Name	From / to	Voltage	Capacity	Configuration	Subsea length	Cable configuration
Basslink *Entered operation 2006*	Tasmania to Victoria *Bass Strait*	+/-400 kV	500 MW	Asymmetrical monopole with metallic return MI cables	290 km	Bundled and buried; reduced EMF noted
Nordlink *Under construction*	Norway to Germany *North Sea*	+/-525 kV	1,400 MW	Bipole (no metallic or earth return) MI cables	516 km	Bundled and buried; reduced EMF noted
NorthConnect *Approvals received*	United Kingdom to Norway *North Sea*	+/-525 kV	1,400 MW	Bipole MI cables	648 km	Cables laid 20 m to 100 m apart; buried 0.8 m; EMF impacts assessed as minor
BritNed *Entered operation 2011*	United Kingdom to Netherlands *North Sea*	+/-450 kV	1,000 MW	Bipole (no metallic or earth return) MI cables	250 km	Bundled and buried; reduced EMF noted
North Sea Link *Under construction*	United Kingdom to Norway *North Sea*	+/-525 kV	1,400 MW	Bipole (no metallic or earth return) MI cables	720 km	Cables laid 50 m apart and buried 1.5 to 2 m; EMF impacts assessed as minor noting east–west orientation of cables

Name	From / to	Voltage	Capacity	Configuration	Subsea length	Cable configuration
Western HVDC Link *Entered operation 2018*	Scotland to Wales *Irish Sea*	+/-600 kV	2,200 MW	Bipole (no metallic or earth return) MI cables	385 km	Bundled in waters less than 40 m; laid 30 m apart in deeper waters; conclude no significant impacts but no information on cetaceans
Maritime Link *Entered operation 2018*	Newfoundland to Nova Scotia *Cabot Strait*	+/-200 kV	500 MW	Bipole (with earth return) MI or XLPE cables	170 km	Not stated but subsea cables to be buried at least 1 m. Approval condition states: *ENL will develop a pre-construction study and monitoring program to verify potential effects of magnetic fields on migration of benthic organisms for relevant fisheries.*
Viking Link *Approvals pending*	United Kingdom to Denmark *North Sea*	+/-500 kV	1,400 MW	Bipole MI or XLPE cables	635 km	Laid in same trench or up to 50 m apart; buried to approximately 1 m; EMF impacts assessed as not significant; burial proposed to reduce effects

2. Desktop Assessment

EMF occur naturally in the marine environment because of the earth's magnetic field. Electric fields are created by induction as seawater moves (tidal flows and currents) through the geomagnetic field. Weaker electric fields are created by living organisms as they move in the earth's geomagnetic field.

'Many species of marine fauna can detect electric fields and use the Earth's geomagnetic field and induced electric fields to orient themselves' (Walker 2001). This ability is fundamental in key behavioural activities for marine fauna, including hunting and migration.

Based on our review, it is known that EMFs are elevated when cables are separated and lowered when cables are bundled (or closely laid). In regard to potential impacts to marine fauna, the consensus of scientific research and opinion is that electroreceptor and magnetoreceptor marine species sense and react to EMF, with behavioural changes observed. The responses and behavioural changes are not (at this stage) considered significant or fundamentally detrimental to such species.

Importantly, research indicates EMFs do not act as a physical barrier to migration activity, with species able to navigate past or away from the source. The majority of sources reviewed note that further scientific study is required into whether low impact behavioural changes in certain species are likely to pose a greater long-term impact. This issue is discussed further below.

2.1. Cable design and configuration

As discussed by Normandeau et al. (2011), it is common practice for cables to have conductive sheathing to block electric fields produced by the cable from the external environment. Magnetic fields are still produced and are not blocked by the sheathing. Movement through the cables' magnetic fields (by an organism or water current) creates induced electric fields, the strength of which is influenced by the speed and orientation of the current or of the organism's movement relative to the magnetic field.

Cable configuration influences EMF profiles for cables (Normandeau et al. 2011), with closer laid cables providing greater cancellation of the magnetic fields. Normandeau et al. (2011) noted that 'Placing the cables close together not only reduces the peak magnetic field, but it increases the rate at which the field diminishes with distance from the cables. [HV]DC cable configurations that place cables closer together and with equal current will have the lowest magnetic fields.' Figure 1 below, taken from Normandeau et al. (2011), shows the relationship between the separation of two adjacent HVDC cables and the strength/spatial distribution of the produced magnetic field.

Hutchison et al. (2018) also notes that '… deeper burial depth of cables leads to lower magnetic fields at the seabed and in the water column', where mobile species would encounter the fields. Figure 1 is based on a cable burial depth of 1 m; any increase in burial depth would have a subsequent impact on the magnetic field strength in the water column. The nominal burial depth for Marinus Link is 1 m – the balance between protection from third party interference and seabed thermal resistivity.

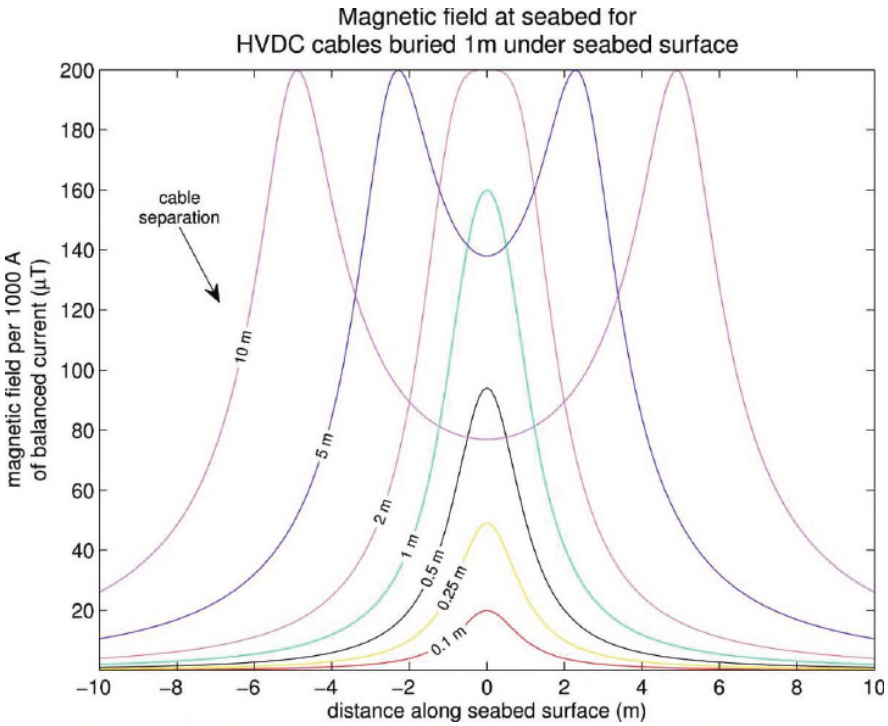

Figure 1: Magnetic field profiles at the seabed surface for a HVDC cable buried 1 m below the seabed. Vertical axis shows the magnetic field per 1,000 amperes of balanced current (in either a bipolar or monopolar with return cable system) (Normandeau et al. 2011)

Normandeau et al. (2011) noted that the magnetic field from HVDC cables can also '… influence the intensity of the local geomagnetic field, as well as its inclination and declination …', affecting species that rely on geomagnetic fields for navigation as well as vessel compasses. The orientation of cables in relation to the natural geomagnetic field should therefore be considered when assessing the effects of HVDC cables on sensitive marine fauna (Normandeau et al. 2011) and vessel navigation.

2.2. Sensitive marine fauna species

Electroreception refers to the ability to sense weak electric fields. Marine chondrichthyans (cartilaginous fish including sharks, skates and rays) are 'highly sensitive to electric fields' (Walker 2001) and '… are attracted by the weak electric fields generated by the movement of their prey' (Walker 2001), while being repelled by strong electric fields. Walker (2001) maintains that magnetoreception is '… more common and more complex than electroreception in animals, …' and influences orientation, migration and homing. Whales and dolphins are magnetoreceptor species. Behavioural studies indicate that fauna will respond to both the Earth's geomagnetic field and to artificial magnetic sources (Walker 2001).

Based on the literature reviewed, primary examples of marine fauna known to exhibit electro and/or magneto-reception include (but are not limited to):

- elasmobranchs, such as sturgeons, sharks, skates, and rays
- marine mammals such as whales and dolphins
- sea turtles
- lobsters
- crabs
- eels.

Due to their sensitivity, these species are at a higher risk of influence from artificial EMF sources. Potential impacts to sensitive marine fauna species are discussed further below.

2.3. Potential impacts on sensitive species

Orientation, homing, and navigation (both for long and short-range movement/migration) are natural capabilities or functions of marine fauna that are attributed to a sensitivity to magnetic fields, while senses such as the detection of prey and predators, and social or reproductive behaviours can be linked to electroreception (Normandeau et al. 2011). Subsea power cables and artificial EMF have the potential to interfere with these functions.

2.3.1. General behavioural impacts

Hutchison et al. (2018) found that while EMFs can cause specific behavioural responses in some species, current evidence suggests the responses are not significant to the species. Based on their field study undertaken on elasmobranchs (sharks, skates, rays) and the American lobster, Hutchison et al. (2018) conclude that clear behavioural responses do occur in both American lobsters and skates when exposed to the EMF from a subsea HVDC cable, noting however that there was no evidence of the cable acting as an ultimate barrier to movement for either species.

Results from the Hutchison et al. (2018) field study showed that American lobsters exhibited movements that were '… closer to the seabed, increased their turning behaviour and were distributed differently in the presence of EMF' (Hutchison et al. 2018) within the test area. Without being confined within the test area however, the expectation was that they would move freely past or away from the cable.

Skates exhibited an attraction response to the EMF which Hutchison et al. (2018) note is '… consistent with benthic elasmobranch foraging behaviour.' It is possible that a biological impact could occur in this case, if for instance the skates were attracted to the artificial EMF because it was associated with prey and if the energy expended to reach the cable was higher than if the artificial EMF had not been detected (Hutchison et al. 2018). Alternatively, given elasmobranchs experience a 'threshold between attraction and avoidance of electric fields' (Hutchison et al. 2018), if the skates encountered higher intensity fields it could lead to avoidance behaviour rather than attraction, which could also impact the species if, for example, it resulted in avoidance of biologically important habitat areas.

Walker (2001) maintains that sharks will likely sense and learn to avoid elevated EMF areas by swimming around or above them.

2.3.2. Breeding/developmental impacts

EMF impacts on breeding activity have been considered by Normandeau et al. (2011) for loggerhead turtles, a species which depends on its geomagnetic sense for orientation in reaching key destinations such as nesting beaches and feeding grounds. It was found that when exposed to artificial magnetic fields, hatchlings swam randomly, compared to those that swam purposefully and directionally when not exposed. Therefore, it is considered likely that the location of artificial EMF sources (such as power cables) in close proximity to nesting beaches for loggerhead turtles could potentially 'affect the ability of hatchlings to swim towards nursery grounds.' (Normandeau et al. 2011). Normandeau et al. (2011) also maintains that it is possible that other sea turtle species could be similarly impacted.

2.3.3. Migratory impacts

Kavet et al. (2016) indicate that empirical evidence shows marine animals 'perceive and orient to local distortions in the earth's main geomagnetic field.' One concern regarding subsea power cables is that the generated EMFs could interrupt or alter the natural geomagnetic distortions used by magnetoreceptor species for navigation, and cause disruption to migratory pathways and/or extreme behavioural responses (e.g., beaching by whales).

Kavet et al. (2016) and Hutchison et al. (2018) both discuss how various studies have generally found that marine migratory species will sense EMF but conclude that they do not pose a physical barrier, and that species will navigate around or above the EMF source in the water column. As discussed by Hutchison et al. (2018), increased EMF emitted by a subsea cable was found to have caused European eels to decrease their swimming speed as they passed over the cable, however the effect was temporary and was not considered to pose a significant impact (Westerberg and Lagenfelt 2008, as cited in Hutchison et al. 2018).

Normandeau et al. (2011) maintains that marine mammals (e.g., whales) have a relatively low likelihood of being affected by EMF from power cables (despite being magnetosensitive) 'because their high mobility would limit the duration of exposure.'

3. Summary and conclusions

The body of scientific research reviewed by Baruah (2016) confirms that many species can detect and will respond to artificial electric and magnetic fields. Our review supports the scientific findings that EMFs have been found to impact on sensitive marine fauna species, through behavioural responses. Based on current data those impacts are not considered to be significant. It is important to note, however, that there have been limited studies into the effects of prolonged EMF exposure, or the effects of EMF on various species developmental stages.

Results from two years of experimentation at the Pacific Northwest National Laboratory (as reported in Woodruff et al. 2012) indicate there is little evidence to suggest major detrimental effects to those species tested, under high magnetic fields and extended exposure conditions. Notwithstanding these findings, the proponent (ENL Maritime Link Inc.) committed to:

> *ENL will develop a pre-construction study and monitoring program to verify potential effects of magnetic fields on migration of benthic organisms for relevant fisheries.*

The Nova Scotia Minister of Environment, in approving Maritime Link, required the proponent in Condition 5.2 to:

> *The Approval Holder must develop and implement an environmental effects monitoring program (EEMP). The EEMP must be developed using relevant baseline data and identify appropriate environmental effects indicators. The plan must be developed and implemented in consultation with the Fisheries Advisory Committee and shall consider Project effects on, but not be limited to, fish, shellfish, marine birds and marine mammals.*

This condition highlights the potential risk that failure to adequately address EMF impacts on marine fauna may result in an extensive monitoring program. The Basslink marine monitoring program was designed to negate the need for comprehensive monitoring of effects on the marine environment and fauna by validating whether actual impacts were within predicted impacts including EMF. The paper *Installation and operational effects of a HVDC submarine cable in a continental shelf setting: Bass*

Strait, Australia by Sherwood et al. (2016) presents the findings of the monitoring program which included measurement of EMF at the seabed and comparison with predicted values. Measurements show the magnetic fields reduce to background just above the seabed, as predicted. The EMF predictions were based on bundling the cables and burial to at least 1 m.

Uncertainty regarding the behavioural responses of species not studied and different settings, as is the case in Bass Strait, necessitates consideration of means to minimise EMF from the subsea cables. Recommended ways to reduce EMF strength from subsea cables include:

- **Cable configuration**. By placing the cables closer together, preferably bundled, there is a greater mutual cancellation of EMFs. Closer cables also increase the rate at which the magnetic field diminishes with distance from the cables. Bundling has been adopted by some proponents to assist with mitigating EMF effects.
- **Burial depth**. Cables buried at least 1 m reduce magnetic fields at the seabed and reduce the strength of induced electric fields. Lower strength electric and magnetic fields at the seabed are less likely to be detected by marine fauna or affect their behaviour. Proponents of all interconnectors reviewed have proposed burial or buried subsea cables, noting the benefits for reducing EMF in the water column.

If you would like to discuss any of the above in further detail please contact Barton Napier, Senior Principal/Project Director at barton.napier@coffey.com or mobile +61 428 110 024.

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